U.S. Fish & Wildlife Service

Hanford Reach National Monument

Comprehensive Conservation Plan and Environmental Impact Statement

The Hanford Reach National Monument (Monument) covers an area of 196,000 acres on the Department of Energy's (DOE) Hanford Reservation in south-central Washington State. Of this, the U.S. Fish and Wildlife Service (FWS) manages approximately 165,000 acres through a DOE permit (see Appendix F) and other agreements with the DOE. The DOE directly manages approximately 29,000 acres, and the Washington Department of Fish and Wildlife currently manages the remainder (approximately 800 acres) under a DOE permit.

The Presidential Proclamation establishing the Monument (Presidential Proclamation 7319, see Appendix C) directs that it be jointly managed by the DOE and FWS. However, the development of a comprehensive conservation plan (CCP) for management of the Monument (i.e., any lands managed as part of the National Wildlife Refuge System) is solely a requisite of the FWS under the National Wildlife Refuge System Improvement Act (see Appendix E). As such, this CCP is being written to guide the FWS in its management of the Monument, although the DOE may also adopt the final CCP. As this is a FWS document and directs its management of the Monument, throughout the CCP references are made to "FWS management of the Monument" or other similar phrases. It should be understood that this is meant to mean 'FWS management of the Monument through permits or agreements with the DOE.' Further, whatever the context of any particular portion of the CCP, it should be kept firmly in mind that the FWS and DOE are joint managers of the Monument.

Although the DOE is a cooperating agency in the preparation of this environmental impact statement (EIS), this document is the FWS's, and as such, although the differences may not be expressly stated in the text, the document may not in all instances reflect the DOE's views.

Comprehensive Conservation Plans provide long-term guidance for management decisions and set forth goals, objectives and strategies needed to accomplish refuge purposes and identify the U.S. Fish and Wildlife Service's best estimate of future needs. These plans detail program planning levels that are sometimes substantially above current budget allocations and, as such, are primarily used for strategic planning and program prioritization purposes. The plans do not constitute a commitment for staffing increases, operational and maintenance increases, or funding for future land acquisition.

Hanford Reach National Monument
Vision Statement

The Hanford Reach National Monument is a biologically diverse landscape, embracing a remarkable natural and historic legacy. The Hanford Reach, the last free-flowing non-tidal stretch of the Columbia River, is the ribbon that weaves shrub-steppe and riverine communities together, defining an irreplaceable landscape—a place to discover the richness of life, to reflect upon history, and to experience nature in solitude.

The Monument's diversity of plants and wildlife are critical to the biological integrity of the Columbia Basin. The unique combination of an expansive and increasingly rare shrub-steppe ecosystem, the free-flowing river, and the last major salmon spawning grounds in the Columbia River create a diverse and precious mosaic of habitats. The Monument is a refuge for a multitude of species, many new to science.

The Monument is a natural gathering place to learn, to experience and celebrate cultures, where stories are protected and passed on. Its history of immigrant settlement and the dawning of the atomic era is acknowledged, as well as its continuing physical and spiritual sustenance of the Native Americans who have used the area and those who came later.

The Monument is a testimonial to the past and the sacrifices of our ancestors. The Monument is also a vision into the future where visitors, neighbors and partners are valued and respected; where natural and historic resources are protected; and where all may come to experience the Monument and its magnificent resources.

Executive Summary

The Hanford Reach National Monument Comprehensive Conservation Plan (CCP) will provide direction to the United States Fish and Wildlife Service (FWS) and the United States Department of Energy (DOE) on management of the Hanford Reach National Monument (Monument) for the next 15 years. The CCP will provide the framework for making decisions on conserving natural, cultural and recreational resources; managing visitor use; developing facilities; and addressing day-to-day operations of the Monument. The CCP will ensure that future opportunities are realized and problems addressed effectively.

The Monument was created from buffer lands that were no longer necessary for the mission of the DOE's Hanford Site in eastern Washington. These buffer lands form a horseshoe around lands still needed by the DOE for its current missions. Being a buffer for the Hanford Site, the lands within the Monument have remained largely untouched, or at least undeveloped, for over six decades. It was this remnant of the vast shrub-steppe ecosystem that once covered the interior Columbia Basin that lead to Presidential Proclamation 7319 on June 9, 2000, establishing a 195,000-acre national monument, managed by the FWS and DOE, superimposed over the outskirts of the 375,040-acre Hanford Site. The FWS administers the Monument as an overlay national wildlife refuge.[1]

The Monument encompasses a biologically diverse landscape containing an irreplaceable natural and historic legacy. Limited development over the years has allowed for the Monument to become a haven for important and increasingly scarce objects of scientific, historic and cultural interest. It supports a broad array of newly discovered or increasingly uncommon native plants and animals. Migrating salmon, birds and hundreds of other native plant and animal species, some found nowhere else in the world, rely on its natural ecosystems. The Monument also includes 46.5 miles of the last free-flowing, non-tidal stretch of the Columbia River, the 51-mile "Hanford Reach."

The Monument is managed by the FWS and the DOE; each agency has several missions they fulfill at the Hanford Site. The FWS, under existing permits from the DOE, is responsible for the protection and management of Monument resources and the management of people and their access to Monument lands under FWS control. The FWS also has the responsibility to protect and recover threatened and endangered species; administer the Migratory Bird Treaty Act; and

[1] The Secretary of the Interior has authority pursuant to the Fish and Wildlife Coordination Act of 1934, as amended (16 U.S.C. § 661-666c), and the Fish and Wildlife Act of 1956, as amended (16 U.S.C. § 742a-j; 70 Statute 1119), to enter into cooperative agreements to manage fish and wildlife resources on lands owned by, or under the jurisdiction of, another entity. The National Wildlife Refuge System Act of 1966, as amended (16 U.S.C. § 668dd), consolidates all areas administered by the FWS for the management, conservation and protection of fish and wildlife (including those areas managed by the FWS under cooperative agreement with other federal departments or agencies) into the National Wildlife Refuge System.

protect fish, wildlife and Native American and other trust resources within and beyond the boundaries of the Monument. The DOE is responsible for protecting the resources of the Monument, managing energy research, and remediating wastes remaining from weapons material production. The DOE also administers land use agreements and permits with the Washington Department of Transportation, United States Bureau of Reclamation, South Columbia Basin Irrigation District, Bonneville Power Administration, Energy Northwest, adjacent counties, and others to enable these entities to fulfill their missions in energy production, energy distribution, communications, transportation and irrigation. Because the DOE is currently the underlying land holder, it retains approval authority over certain management aspects of the Monument.

A Notice of Intent to begin development of this CCP and environmental impact statement (EIS) was published in the *Federal Register* on June 12, 2002. This began a multi-year process to identify issues that needed to be addressed and the management alternatives that would best address those issues. Along the way, the FWS received assistance and input from the Hanford Reach National Monument Federal Advisory Committee (FAC); 15 cooperating agencies and/or governments;[2] internal resource reviews; and the public through formal scoping, a series of three public workshops, and other means. The following key issues were identified (defined as matters of controversy, dispute, or general concern over resource management activities, the environment, or land uses) during the planning process.[3]

1) How will the biological resources be managed, protected, enhanced and/or restored?

2) What actions can be taken to protect fisheries?

3) How will cultural resources be protected?

4) How will geological and paleontological resources be protected?

5) How will contamination issues be addressed?

6) How will the elk population be managed on the Monument?

7) What recreation activities and interpretation and education programs are appropriate and where will they occur?

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[2] City of Richland; Adams, Benton and Grant Counties; Washington State Departments of Ecology, Fish and Wildlife, and Natural Resources; Army Corps of Engineers, Bonneville Power Administration, Bureau of Reclamation, DOE, and Federal Highway Administration; Confederated Tribes of the Umatilla Indian Reservation; Confederated Tribes and Bands of the Yakama Nation, and Nez Perce Tribe

[3] This CCP either directly addresses these issues, or it lays the foundation to address them in subsequent, more detailed "step-down plans."

8) How will transportation be managed to provide access for public uses, management needs, and valid existing rights?

9) What facilities and infrastructure are needed and where?

10) Which additional Monument lands are suitable and appropriate for FWS management as part of the National Wildlife Refuge System?

In order to address these issues, the FWS—in partnership with the public, the FAC, other agencies, and tribal governments—identified and developed six management alternatives in the draft CCP. Based the comments received on the draft and on an unrelated lawsuit, eight alternatives are considered in the final CCP.

The eight alternatives each vary by emphasis theme and degree of public access. Under each alternative (likely including Alternative A), historic administrative units would be reorganized into new management units for administrative purposes. The proposed new units are based primarily on ecological values rather than geographical, historical, or political boundaries; however, easily identifiable features were used to the extent possible to define boundaries, both to aid the public and the FWS in its management. The proposed new units reflect a culmination of ideas and input received from the FAC, cooperating agencies, tribal governments, and the public, as well as the combined expertise of Monument staff.

Alternative A: No Action

Alternative A assumes no change from existing management and thus provides a baseline for evaluating impacts of the other alternatives. Current management practices would be continued in accordance with Monument Proclamation mandates and agreements to conserve and protect biological, geological, paleontological and cultural resources. Conservation activities would involve inventory and monitoring, habitat restoration, invasive species control, fire protection, fire rehabilitation, and maintenance of existing facilities. Land use designations that were in place at the time of Monument establishment would be maintained.

Public access for recreational, interpretive and educational purposes would continue to be allowed year-round in designated areas and restricted from sensitive resource areas. Limited interpretive and educational programs would be presented on request, dependent upon the availability of staff.

Alternative B

Alternative B emphasizes the restoration of native plants and animals in upland, riparian and aquatic habitats. Compared to the other alternatives, Alternative B would provide the greatest emphasis on the conservation, protection and monitoring of the biological, geological, paleontological and cultural resources described in the Monument Proclamation. Increased opportunities for restoration-based research of the native landscape and habitat for species of concern would be promoted, and information sharing between partners and researchers would be encouraged.

Public access for day-use recreation, interpretation, and education would continue to be allowed year-round in designated areas, with a greater degree of management controls and use restrictions in place to ensure resource protection as compared to the other alternatives.

Visitor facilities would be developed only in the least sensitive areas of the Monument and only after a comprehensive inventory of Monument resources is conducted and sensitive areas are identified in the area under consideration.

Interpretation and education programs would be provided; however, fewer people would be served than in Alternatives C, C-1, D, E and F.

Alternative B-1

Alternative B-1 is identical to Alternative B, except no hunting would be allowed anywhere on the Monument. This alternative was developed due to a lawsuit challenging expansion of hunting opportunities on a number of national wildlife refuges across the country.

Alternative C

Alternative C would protect and conserve biological, geological, paleontological and cultural resources described in the Monument Proclamation by creating and maintaining extensive areas within the Monument free of facility development. This would serve conservation, restoration, protection and recreation purposes by maintaining large natural landscapes, protecting sensitive resources, and providing opportunities for solitude.

The facilities and access points that would be provided would be concentrated together to minimize overall impacts to the Monument and to provide economies of scale in management and maintenance. Public access points and recreational facilities would be planned and developed along highways and in perimeter areas of the Monument. Certain existing facilities and infrastructure within the Monument would be relocated. Facilities, such as the boat-in

campsites along the Hanford Reach provided for in this alternative, would be developed after inventories of resources are conducted and sensitive areas are identified in the area under consideration. Vehicle access into the interior of the Monument would be limited; however, much of the Monument would be open to foot and other non-motorized access.

Interpretation and education programs would serve greater numbers of people than Alternatives A, B, C-1 and F, but fewer than Alternatives D and E.

Alternative C-1 (Preferred Alternative)

Alternative C-1 was developed in response to comments received on the draft CCP. Most comments received did not want extremes in public use, either it being too extensive or too tightly controlled. This pointed to developing an alternative that allowed for a high level of resource protection while permitting a wide range of public access and uses. Of all the initial alternatives, Alternative C came closest to meeting the needs of the FWS; complying with the policies and laws affecting native resources; incorporating the advice of the FAC; and providing the public the access it desired, all the while protecting Monument resources. However, in order to best respond to comments, Alternative C needed some minor modifications (described in Chapter 2).

Like Alternative C, Alternative C-1 would protect and conserve the biological, geological, paleontological and cultural resources described in the Monument Proclamation by creating and maintaining extensive areas within the Monument free of facility development. This would serve conservation, restoration, protection and recreation purposes by maintaining large natural landscapes, protecting sensitive resources, and providing opportunities for solitude. The facilities and access points that would be provided would be concentrated together to minimize overall impacts to the Monument and to provide economies of scale in management and maintenance. Public access points and recreational facilities would be planned and developed along highways and in perimeter areas of the Monument.

In contrast to Alternative C, few existing facilities and infrastructure currently present within the Monument would not be relocated or closed, such as the White Bluffs Boat Launch. Vehicle access into the interior of the Monument would be less limited, although like Alternative C much of the Monument would be open to foot and other non-motorized access. Facilities, such as the boat-in campsites along the Hanford Reach provided for in this alternative, would be developed after inventories of resources are conducted and sensitive areas are identified in the area under consideration.

Interpretation and education programs would serve greater numbers of people than Alternatives A, B, B-1 and F, but fewer than Alternatives C, D and E.

Alternative D

Alternative D provides the greatest degree of public access, recreational opportunities, and facilities development. The conservation, protection and monitoring of the biological, geological, paleontological and cultural resources described in the Monument Proclamation would still be the primary priorities; however, more time, effort and resources would be devoted to public use than in the other alternatives, likely decreasing the resources available for restoration activities. Resource inventories, identification of sensitive areas, and restoration activities would be concentrated in the areas of highest public use. Resource protection, restoration research, and monitoring would focus on the impacts created from recreational activities.

Public access sites and facilities would be developed throughout the Monument and to a greater extent than Alternatives A, B, B-1, C, C-1 and F; access would be restricted from the most sensitive areas. Visitor facilities would include improved boat launches, auto tour routes, and campgrounds.

Interpretation and education programs under Alternative D would serve a higher number of people of than the other alternatives.

Alternative E

Alternative E was formulated by the FAC during a workshop held June 16-17, 2004. It provides an alternate public use emphasis to that of Alternative D.

Alternative E provides a high degree of public access and facilities development. It does this through the combination of elements from Alternatives C and D. The underlying open space concept of Alternative C is maintained through the concentration of facilities in perimeter areas of the Monument; however, access and areas open to the public more closely resemble Alternative D. The conservation, protection and monitoring of the biological, geological, paleontological, and cultural resources described in the Monument Proclamation are the top priorities, but as in Alternative D, substantial effort and resources would be devoted to public use, likely decreasing the resources and attention available to restoration activities.

Resource inventories, identification of sensitive areas and restoration activities would be concentrated in the areas of highest public use. Resource protection, restoration research, and monitoring would focus on the impacts created from recreational activities.

Public access points and facilities would be developed in perimeter areas of the Monument and to a greater extent than Alternatives A, B and F; access would be restricted from the most sensitive areas. Visitor facilities would include improved boat launches and campgrounds.

Interpretation and education programs would serve a high number of people, although not as many as Alternative D.

Alternative F

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) developed this alternative using Alternative B as the basis for management emphasis and public access. Public use would be controlled through a permit system, with some areas requiring use fees to help fund Monument programs.

While similar to Alternative B, Alternative F provides for slightly more areas open to public access. The one significant difference is the addition of a public access permit system, with the possible establishment of fee areas.

Interpretation and education programs would be provided; however, fewer people would be served than in Alternatives C, C-1, D and E.

Preferred Alternative

All alternatives, in some form, meet the primary purposes of the Monument Proclamation and the National Wildlife Refuge System (NWRS) mission; therefore, every alternative had the potential to be selected as a final management plan. However, Alternative C-1 has been identified as the preferred alternative because it best achieves Monument Proclamation mandates; fulfills FWS and DOE missions and purposes; allows for public uses as defined by the National Wildlife Refuge System Improvement Act; and is consistent with principles of sound wildlife management.

Possible Consequences/Impacts

The alternatives are assessed for their potential consequences to biological, geological, paleontological, recreational, aesthetic and economic resources and systems. Chapter 4 provides a detailed analysis of these impacts, and a summary is provided in the table following the Reader's Guide.

Reader's Guide

The FWS will manage the Monument through an approved CCP and in accordance with a permit and Memorandum of Agreement with the DOE. The CCP provides long-range guidance on Monument management through its vision, goals and objectives. The CCP also provides a basis for a long-term adaptive management process, including implementation, monitoring progress, evaluating and adjusting, and revising plans accordingly.

This CCP is a landscape-scale plan and addresses what areas are open to what uses. It provides the basis for protection of natural, cultural, scenic and recreational resources, setting the goals that the FWS will strive to meet in management of the Monument. The specific details of those uses and protection mechanisms, and how they will be achieved, will require additional step-down planning. For example, the management of invasive species—an Integrated Pest Management Plan—was included in the draft CCP as a draft step-down plan for public comment; it will be finalized following the signature of an ROD on this CCP. Other step-down plans will follow on everything from habitat management to visitor use.

This document combines both a CCP and an EIS. The draft CCP/EIS was released for review and comment by the public, tribes, special interest organizations, and local, state and federal agencies (see Chapter 5 for details). Based on the comments received, the FWS modified the draft as necessary and appropriate and selected a final Preferred Alternative. Following publication of this final CCP/EIS, the FWS will publish an ROD that identifies the alternative selected as the CCP. The FWS will then publish a stand-alone CCP comprised of parts of Chapter 1, the selected alternative from Chapter 2, appropriate sections of Chapters 3 and 5, and the necessary appendices.

The following chapter and appendix descriptions are provided to assist readers in locating and understanding the various components of this combined document.

Chapter 1: Introduction, Purpose, Need For Action, and Issues, includes the regional context, establishment and purposes of the Monument; the vision for future management; and the purpose of, and need for, a CCP. This chapter also provides background on major planning issues identified by FWS staff; federal, tribal, state and local agencies; and the general public.

Chapter 2: Management Goals, Objectives and Alternatives, describes ten management goals, the objectives to meet those goals, and eight management alternatives. Each alternative represents a potential CCP for the Monument. Alternative A describes current management on the Monument. Alternative B places a heavy emphasis on resource protection. Alternative B-1 mirrors Alternative B and considers an elimination of recreational hunting on the Monument. Alternative C outlines a method of using social engineering to protect resources. Alternative C-1 uses Alternative C as its base, but pulls in elements of Alternatives D and E. Alternative D,

while still protecting resources, places an increased emphasis on recreational use of the Monument. Alternative E, provided by the FAC, combines elements from Alternatives C and D. Alternative F, provided by the CTUIR, overlays a use-permit system over Alternative B.

Chapter 3: Affected Environment, describes the existing physical and biological environment, public uses, cultural resources, and socioeconomic conditions. These represent baseline conditions for the comparisons made in Chapter 4.

Chapter 4: Environmental Consequences, describes the potential impacts of each of the eight alternatives on the resources, programs and conditions outlined in Chapter 3.

Chapter 5, Consultation, Coordination and Preparation, provides details on public involvement, interagency coordination, and tribal consultation during the planning process. It also presents the people who prepared this CCP/EIS.

Appendix A – Glossary & Abbreviations, contains acronyms, abbreviations and definitions of terms used in this document.

Appendix B – Comments Received & Responses, provides a summary of the public, agency and tribal comments received on the draft CCP/EIS and how the FWS addressed the comments.

Appendix C – Monument Proclamation, includes the Presidential Proclamation signed by President Clinton that established the Monument and a White House background paper providing management direction.

Appendix D – Public Laws 100-605 and 104-333, Section 404, is the text of the legislation that initiated the study of the conservation of DOE lands and the subsequent legislation that amended the original legislation to permanently protect the Hanford Reach of the Columbia River from certain types of water projects.

Appendix E – Laws, Executive Orders, and Policies of Impact, contains brief descriptions of some of the more pertinent laws, executive orders, and policies applicable to management of the Monument.

Appendix F – Permit To Operate A National Wildlife Refuge, includes the agreement signed between the DOE and FWS to manage DOE lands as part of the National Wildlife Refuge System.

Appendix G – Hanford Reach National Monument Federal Advisory Committee, includes the members that helped to shape this draft CCP.

Appendix H – Appropriate Uses, considers the possible public uses of the Monument and if they are appropriate for the Monument, in consideration of applicable laws, FWS policies, the Monument Proclamation, and resource protection.

Appendix I – Compatibility Determinations, describe uses, anticipated impacts, stipulations and a determination of compatibility or non-compatibility for existing and proposed public uses on the Monument.

Appendix J – Common & Scientific Names of Plants & Animals Identified in the CCP, represents a cumulative list of all the plants and animals mentioned in the CCP.

Appendix K – Common Vascular Plants on the Monument, lists the more common plants that have been observed on the Monument.

Appendix L – Summary of Plant Communities, lists the different plant communities and associations that have been observed on the Monument.

Appendix M – Plant Communities by Management Unit, lists the different plant communities and associations that have been observed on the Monument by unit for all units, except the Arid Lands Ecology Area, according to a 2003 study.

Appendix N – Reptiles and Amphibians on the Monument, lists reptiles and amphibians that have been observed on the Monument.

Appendix O – Fish Species in the Hanford Reach and Monument Waters, lists fish species found in the Hanford Reach, WB-10 Ponds, and Saddle Mountain Lake.

Appendix P – Birds on the Monument, lists birds that have been observed on the Monument, as well as when they can be found.

Appendix Q – Mammals on the Monument, lists mammals that have been observed on the Monument.

Appendix R – National Wildlife Refuge System Strategic Goals and the Hanford Reach National Monument RONS and MMS Project Lists, briefly describes projects and costs associated with the current management of the Monument as well as projects anticipated under Alternative A.

Appendix S – Monument Staffing Needs, describes the current and staffing levels needed to fully implement any of the alternatives.

Appendix T – Literature Cited, provides bibliographic references for the citations in this document.

Appendix U – Distribution List, contains the list of federal, tribal, state and local agencies; non-government organizations; academic institutions; and individuals who received planning updates, summaries and other mailings associated with this planning effort, including the release of this draft CCP/EIS.

Comparison of Hanford Reach National Monument CCP/EIS Alternatives

Plan Features	Alternative A (No Action)	Alternative B	Alternative B-1	Alternative C	Alternative C-1 (Preferred)	Alternative D	Alternative E	Alternative F
Biological Resource Actions • Biological Resource Actions • Biological Resource Actions • Biological Resource Actions • Biological Resource Actions • Biological Resource Actions								
Treat Invasive Species	Treat 9,000 acres annually.	Treat 18,000 acres annually.	Same as Alternative B.	Treat 13,000 acres annually.	Same as Alternative C.	11,000 acres treated annually	12,000 acres treated annually	Treat 18,000 acres annually.
Restore Upland Habitat	Restore 500 acres annually.	Restore 6,000 acres annually.	Same as Alternative B.	Restore 4,000 acres annually.	Restore 3,000 acres annually.	Restore 2,000 acres annually.	Restore 3,000 acres annually.	Restore 6,000 acres annually.
Restore Rattlesnake Mountain Summit	The DOE to remove unused military buildings and restore the site.	The DOE to remove unused military buildings, including the observatory, and restore the site.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative A.	Same as Alternative A.	Same as Alternative B.
Protect, Manage and Restore Riparian and Aquatic Areas	Treat 1,166 acres over the life of the CCP.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.
Cultural Resource Actions • Cultural Resource Actions • Cultural Resource Actions • Cultural Resource Actions • Cultural Resource Actions • Cultural Resource Actions								
Cultural Resource Management	No cultural resource plan currently exists.	Develop a cultural resource management plan with tribes and stakeholders.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.
Monument-Specific Policies for Artifact Recovery and Human Remains Discovery	No specific procedures exist for recovered artifacts and inadvertent discoveries of human remains. Existing FWS regulations, policies and procedures are used.	Develop new, Monument-specific policies and procedures with tribes and stakeholders.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.
Cultural Resource Inventories	Cultural resource inventories are solely project-driven (e.g., for wildfire area rehabilitation).	Same as A, plus at least 1,000 additional acres inventoried annually.	Same as Alternative B.	Same as A, plus at least 750 additional acres inventoried annually.	Same as Alternative C.	Same as A, plus at least 500 additional acres inventoried annually.	Same as Alternative C.	Same as Alternative B.
Historic Properties Inspections	Conduct mandatory project-related Section 106 inspections.	Conduct all project-related Section 106 inspections plus 1,000 acres annually.	Same as Alternative B.	Conduct all project-related Section 106 inspections plus 750 acres annually.	Same as Alternative C.	Conduct all project-related Section 106 inspections plus 500 acres annually.	Same as Alternative C.	Same as Alternative B.

Comparison of Hanford Reach National Monument CCP/EIS Alternatives

Plan Features	Alternative A (No Action)	Alternative B	Alternative B-1	Alternative C	Alternative C-1 (Preferred)	Alternative D	Alternative E	Alternative F
Public Access • Public Access • Public Access • Public Access • Public Access • Public Access • Public Access • Public Access • Public Access • Public Access								
Columbia River Corridor Unit	11,718 acres open.	9,642 acres open.	Same as Alternative B.	25,840 acres open.	Same as Alternative B.	Same as Alternative C.	25,301 acres open.	9,642 acres open.[1]
Rattlesnake Mountain Unit	Closed except by Special Use Permit.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A, plus one hiking trail established.	Same as Alternative C.	Same as Alternative A, plus two hiking trails established.	Same as Alternative D.	Same as Alternative A.[1]
Ringold Unit	3,120 acres open.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.[1]
Saddle Mountain Unit	24,055 acres open.	21,411 acres open.	Same as Alternative B.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.[1]
Wahluke Unit	29,486 acres open.	Open additional acres west end of unit, 35,176 acres open.	Same as Alternative B.	Open west end of unit, 57,747 acres open.	Same as Alternative C.	Same as Alternative C.	Same as Alternative C.	Same as Alternative C.[1]
Recreational Uses and Facilities • Recreational Uses and Facilities • Recreational Uses and Facilities • Recreational Uses and Facilities • Recreational Uses and Facilities								
Big Game and Upland Game Hunting	58,260 acres open.	59,707 acres open.	No hunting.	67,769 acres open — plus 42,204 additional acres possibly open for elk population control on the Rattlesnake Unit.[3]	67,245 acres open.	70,669 acres open.	Same as Alternative D.	84,922 acres open.[1]
Waterfowl Hunting	Ringold Unit, WB-10 Ponds, and most north shore areas 1/4-mile from the high water mark open.	Same as Alternative A.	No hunting except for below the ordinary high water mark on the Columbia River.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.[1]
Fishing	9,994 surface acres open (9,642 on the Columbia River, 352 on the Bureau of Reclamation's WB-10 ponds).	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.	Same as Alternative A.[1]
Interpretative and Education Sites	Four primitive interpretive sites currently exist.	Up to ten new interpretive sites created.	Same as Alternative B.	Up to fifteen new interpretive sites created.	Up to thirteen new interpretive sites created.	Up to twenty new interpretive sites created.	Same as Alternative C.	Same as Alternative B.[1]
Interpretative Trails	No interpretive trails exist.	Up to two interpretive trails created.	Same as Alternative B.	Up to four interpretive trails created.	Same as Alternative C.	Up to six interpretive trails created.	Same as Alternative C.	Same as Alternative B.[1]

Comparison of Hanford Reach National Monument CCP/EIS Alternatives								
Plan Features	**Alternative A (No Action)**	**Alternative B**	**Alternative B-1**	**Alternative C**	**Alternative C-1 (Preferred)**	**Alternative D**	**Alternative E**	**Alternative F**
Interpretive Programs and Special Events	Conduct one program/ event on the Monument and six programs/ events off the Monument annually.	Same as Alternative A.	Same as Alternative A.	Conduct two programs/ events on the Monument and eight programs/events off the Monument annually.	Same as Alternative C.	Conduct three programs/events on the Monument and twelve programs/events off the Monument annually.	Same as Alternative C.	Same as Alternative A.
Wildlife Photography Sites	No photography sites exist.	Same as Alternative A.	Same as Alternative A.	Up to two photography sites created.	Same as Alternative C.	Up to three photography sites created.	Up to two photography sites created.	Same as Alternative B.
Wildlife Observation Sites	One wildlife viewing site currently exists.	Up to six new wildlife viewing sites created.	Same as Alternative B.	Up to eight new wildlife viewing sites created.	Same as Alternative C.	Up to twelve new wildlife viewing sites created.	Same as Alternative C.	Same as Alternative B.[1]
Hiking Trails	Zero miles of designated hiking trails exist.	Create/designate up to 30 miles of trails.	Same as Alternative B.	Create/designate up to 100 miles of trails, including trails on the Rattlesnake Unit and sand dunes in the River Corridor Unit.	Same as Alternative C, except no trails in the sand dunes.	Create/designate up to 150 miles of trails, including trails on the Rattlesnake Unit and sand dunes in the River Corridor Unit.	Same as Alternative C, but only on the east half of the sand dunes in the River Corridor Unit.	Same as Alternative B.[1]
Campgrounds (Float-In/Drive-In)	No campgrounds.	No campgrounds, one proposed campground at the Ringold Fish Hatchery.	Same as Alternative B.	Three-six non-motorized boat-in sites;[2] one proposed campground at the Ringold Fish Hatchery.	Same as Alternative C.	Three-six non-motorized boat-in sites;[2] two developed campgrounds on the Monument (Vernita area and Near State Route 24); one proposed campground at the Ringold Fish Hatchery.	Three-six non-motorized boat-in sites;[2] one developed campground (Vernita area); one proposed campground at the Ringold Fish Hatchery.	Same as Alternative B.[1]
Boat Launching Facilities (Onsite and/or Adjacent to the Monument)	One developed (White Bluffs Boat Launch), one primitive (Vernita), one primitive (Ringold).	One developed (White Bluffs Boat Launch), one primitive (Vernita), one proposed developed (Ringold).	Same as Alternative B.	One developed (Vernita), one proposed developed (Ringold).	Two developed (White Bluffs, Vernita), one proposed developed (Ringold).	Three developed (White Bluffs, Vernita, South Shore launch), one proposed developed (Ringold).	One developed (Vernita), one non-motorized access only (White Bluffs Boat Launch), one proposed developed (Ringold).	One primitive (Vernita), one proposed developed (Ringold).[1]

Comparison of Hanford Reach National Monument CCP/EIS Alternatives								
Plan Features	**Alternative A (No Action)**	**Alternative B**	**Alternative B-1**	**Alternative C**	**Alternative C-1 (Preferred)**	**Alternative D**	**Alternative E**	**Alternative F**
Horseback Riding	Cross-country use allowed in portions of the proposed Ringold, Saddle Mountain and Wahluke Units (58,034 acres).	Allowed in the Ringold, Saddle Mountain and Wahluke Units but limited to existing roads and trails.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.[1]
Motorized Vehicle Access (Does Not Include State/County Roads)	Saddle Mountain Road and roads on the Ringold and Wahluke Units open (25 miles).	Saddle Mountain Road closed at halfway point, roads on the Ringold and Wahluke Units same as Alternative A (19.5 Miles open).	Same as Alternative B.	Saddle Mountain Road closed, Wahluke Road to White Bluffs Boat Launch closed, Ringold Unit roads same as Alternative A (18 miles open).	Same as Alternative A.	Same as Alternative A plus two auto tour routes opened. Access roads opened to points on the south side of the river (37 miles open).[2]	Same as Alternative C except Saddle Mountain and White Bluffs Roads remain open (23 miles open).	Same as Alternative B.[1]
Hunting and Fishing Plans	A hunting plan has been developed, no revisions are necessary; no fishing plan exists.	Revise hunting plan based on the final CCP, if necessary; create a fishing plan within five years.	Close hunting; create a fishing plan within five years.	Revise hunting plan based on the final CCP, if necessary; create a fishing plan within three years.	Same as Alternative C.	Revise hunting plan based on the final CCP, if necessary; create a fishing plan within two years.	Same as Alternative D.	Same as Alternative B.
Aesthetic Resources Plan		Develop plans and/or standards for controllable aesthetic variables (e.g., building design, noise).	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.	Same as Alternative B.

1 - Use allowed/area open by permit only.
2 - Pending DOE clean-up.
3 - The DOE has determined that hunting in the Rattlesnake Unit is not consistent with its current mission. As the mission of the DOE changes, or as the current ownership situation changes, hunting may be desirable and possible for elk population management. This possibility is addressed under Alternative C.

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Tables

Tables, *cont.*

Maps

Maps

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 1 - Location of the Hanford Reach National Monument within the Northwest

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map01_location_NW

0 125 250 500 Miles

0 130 260 520 Kilometers

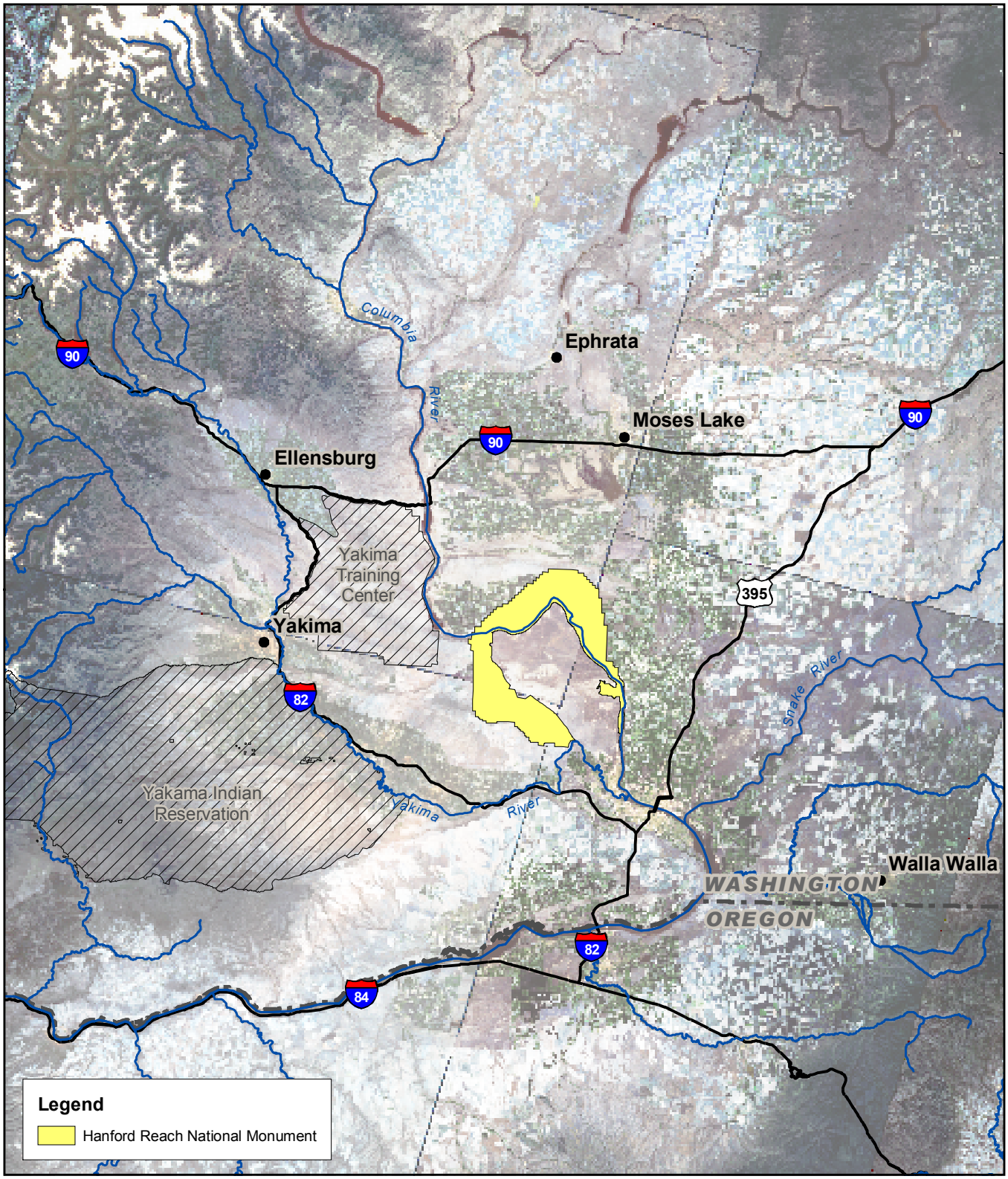
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 2 - Location of the Hanford Reach National Monument within the Region



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map02_location_landsat.mxd

0 12.5 25 50 Miles

0 12.5 25 50 Kilometers

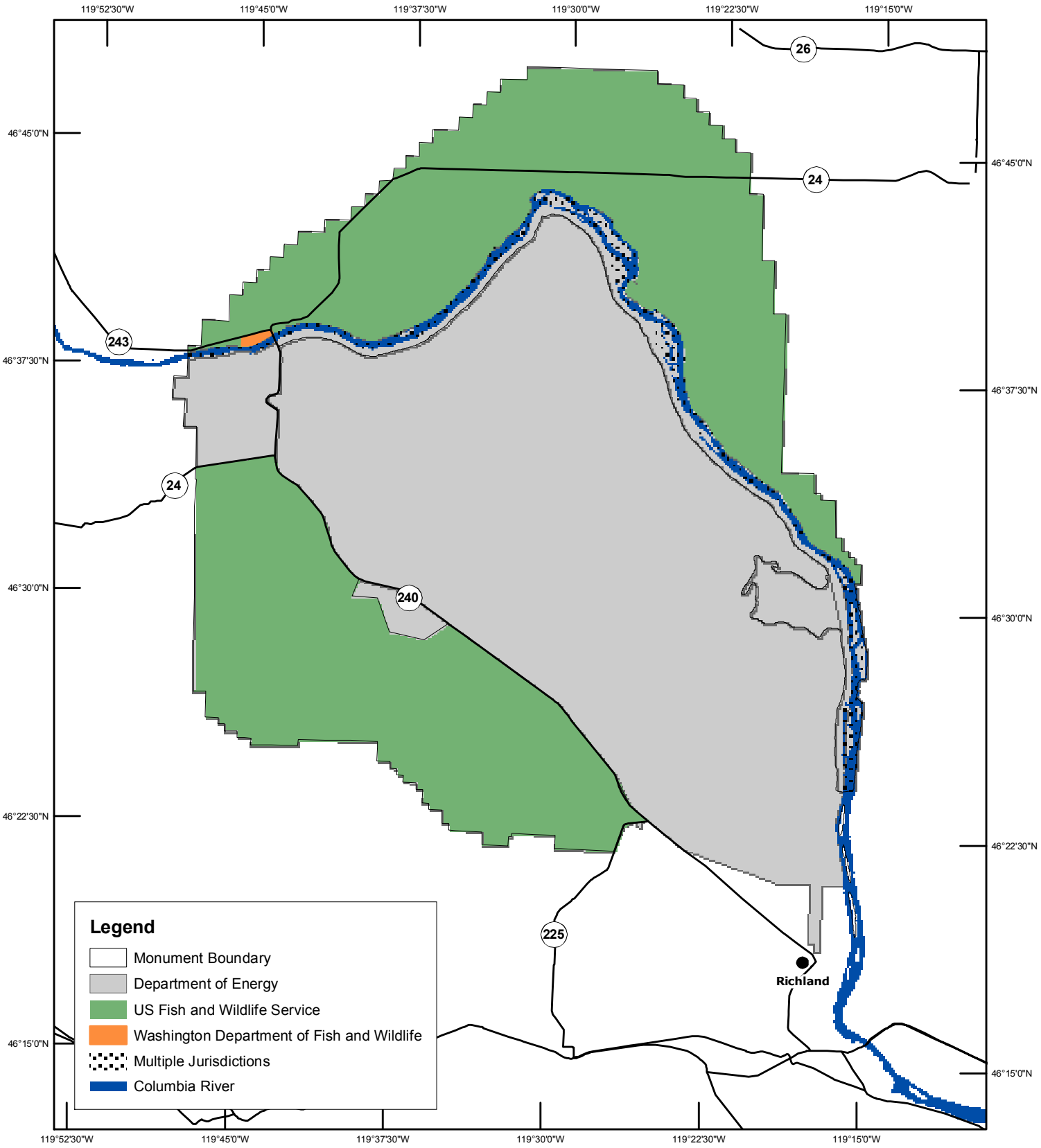
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 3 - Jurisdictions within the Hanford Reach National Monument



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map03_jurisdiction.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

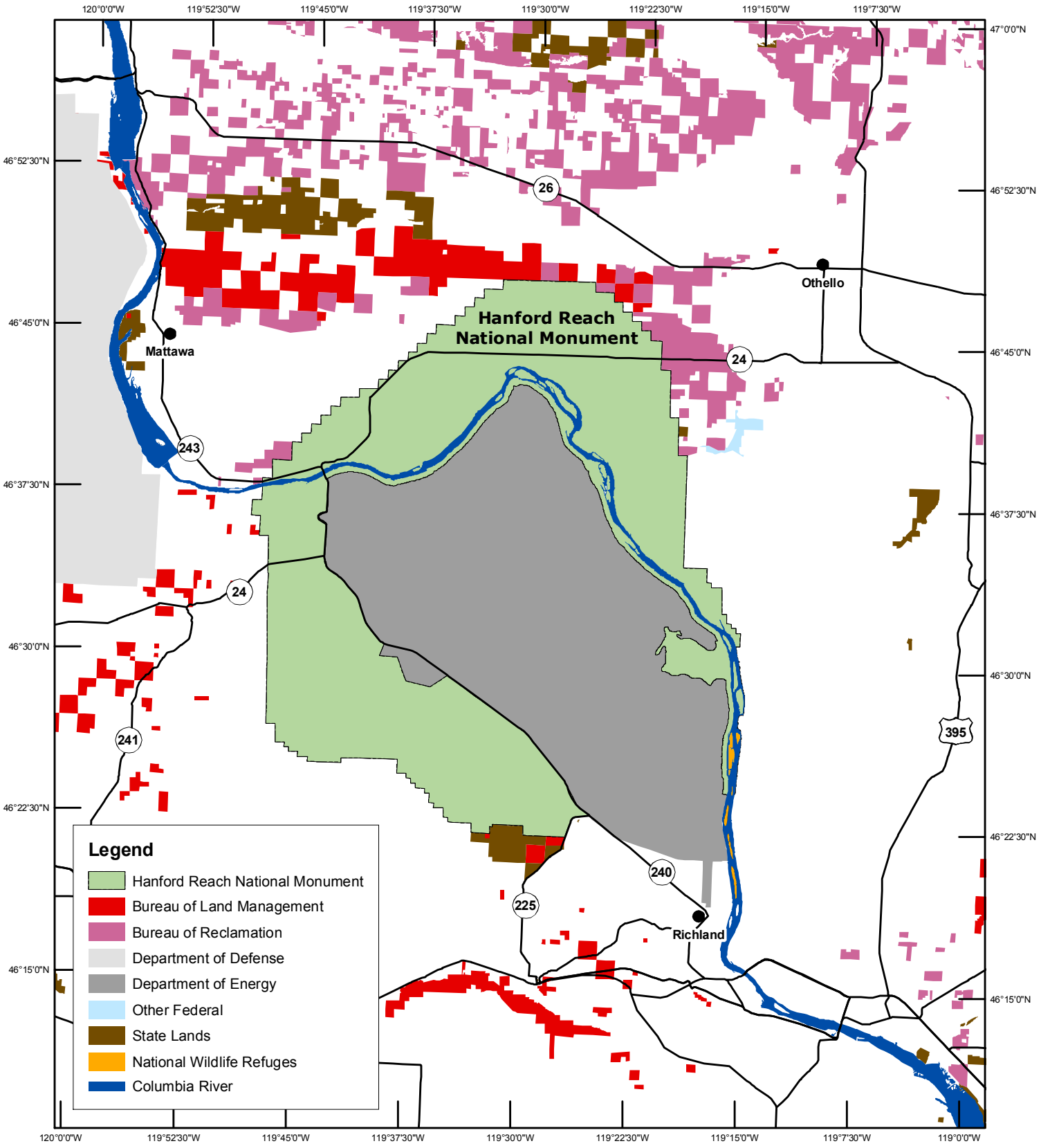
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 4 - Surrounding Land Ownership



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map04_ownership.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

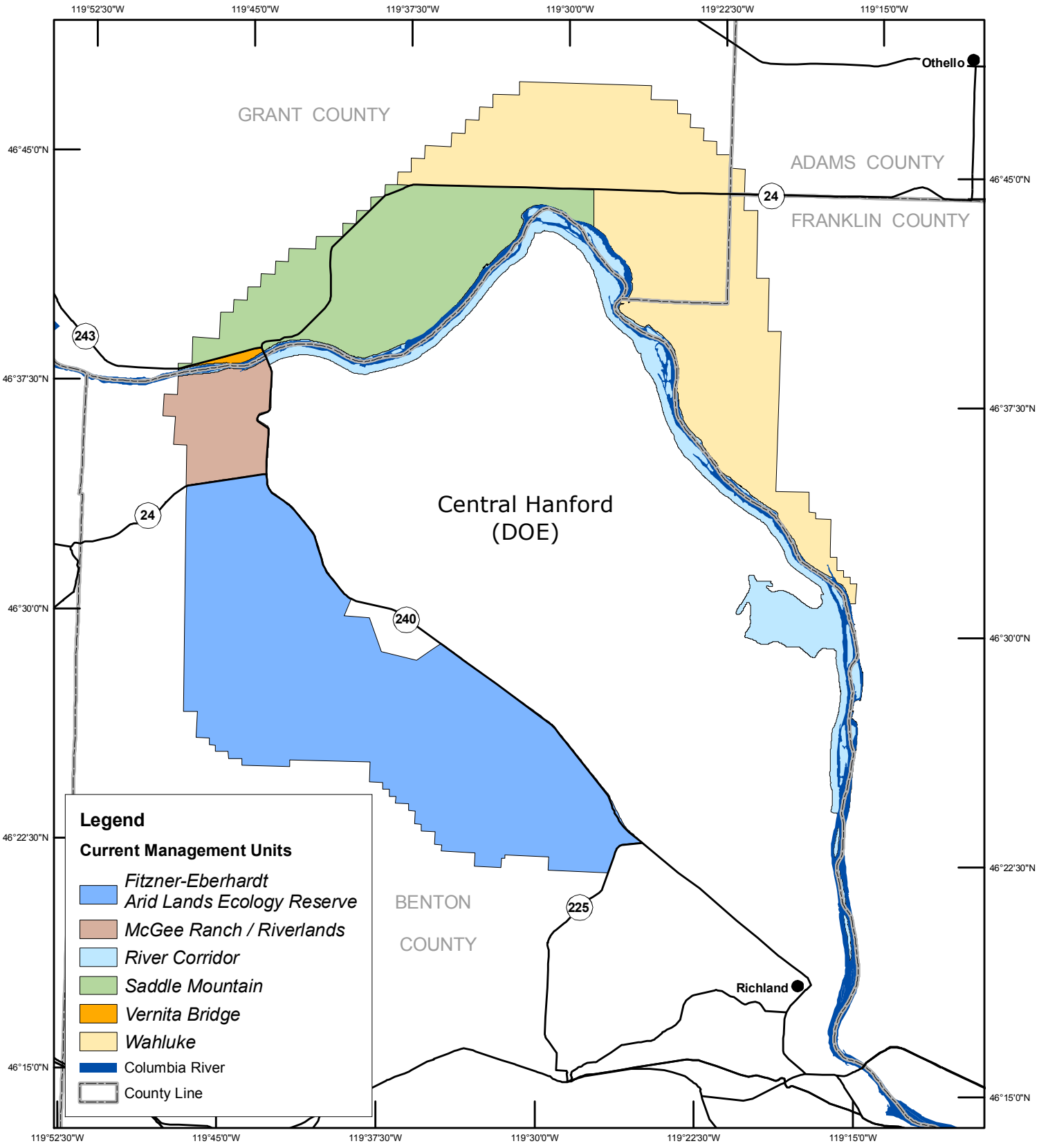
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 5 - Current Management Units



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map05_current_units.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

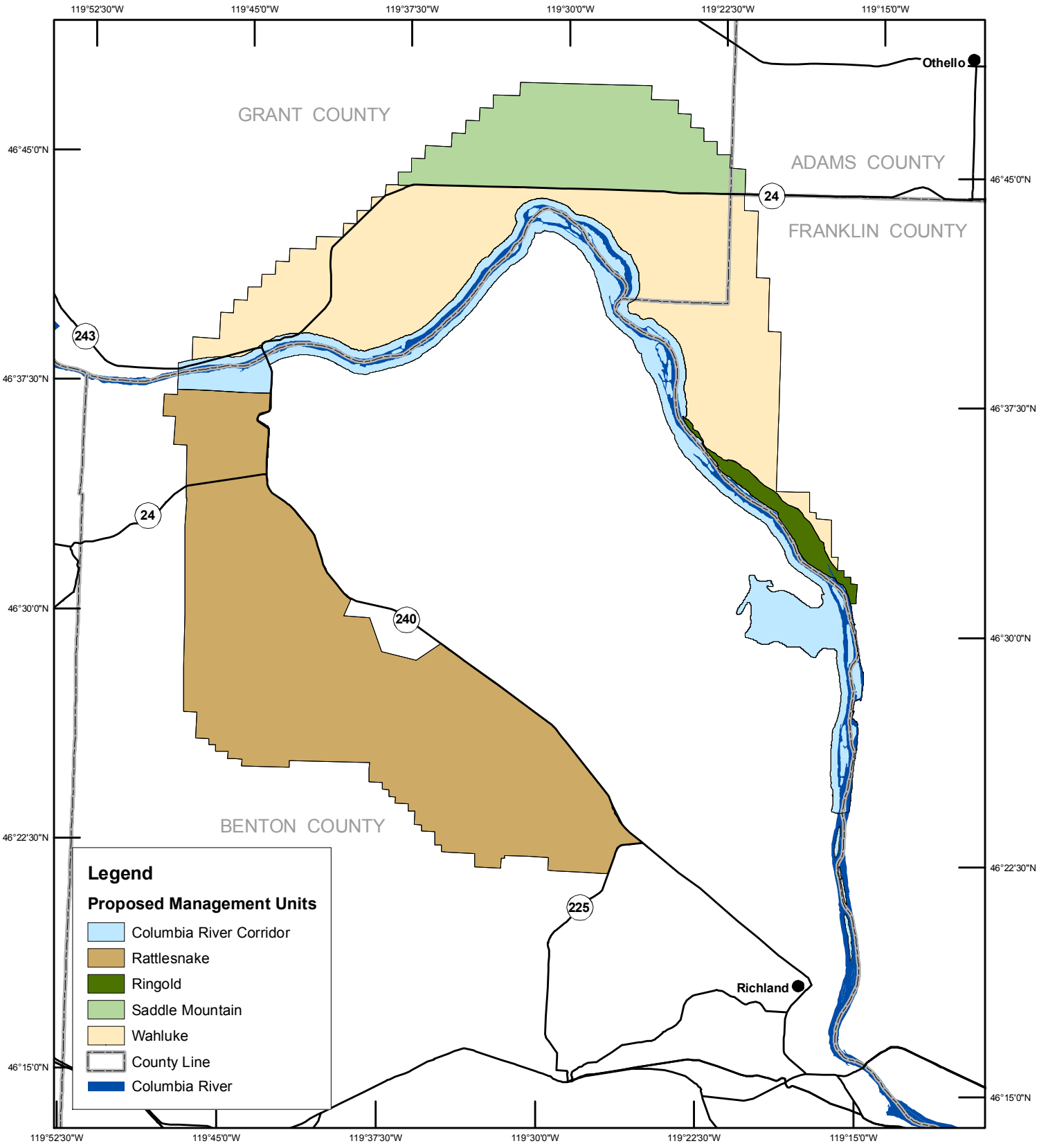
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 6 - Proposed New Management Units



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map06_propnew_units.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

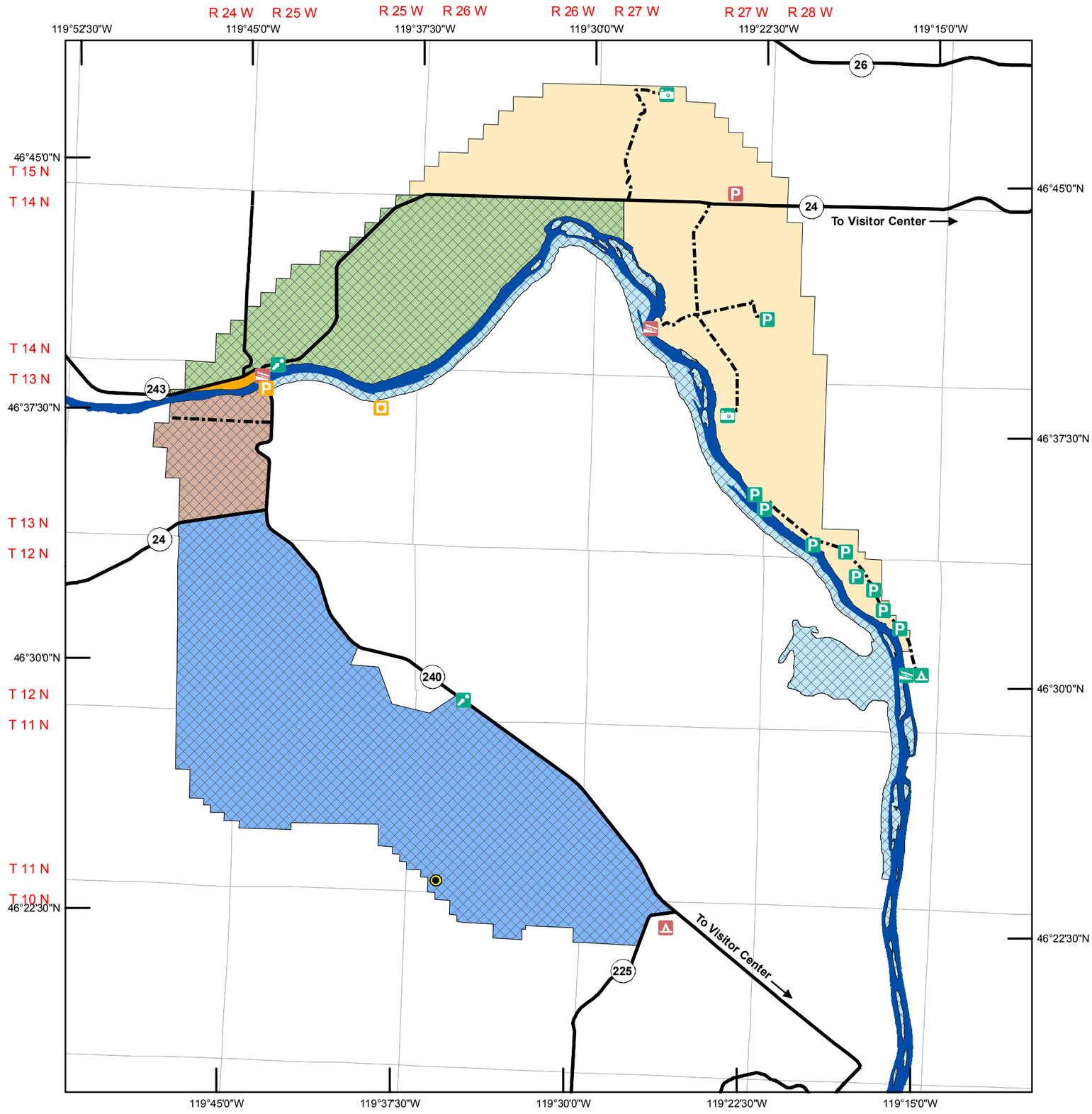
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 7 - Alternative A



Administrative Unit
- Arid Lands Ecology Reserve
- McGee Ranch / Riverlands
- River Corridor
- Saddle Mountain
- Vernita Bridge
- Wahluke

Nodes of Activity*
- B Reactor
- Boat Launch
- Campground
- Interpretation
- Overlook
- Parking

Public Use
- Closed
- Open

Road Access
- Primary
- Secondary
- Observatory
- Columbia River

* Color represents the relative size of activity node
- Small
- Medium
- Large

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map07_AltA_HRNMCCP.mxd

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers

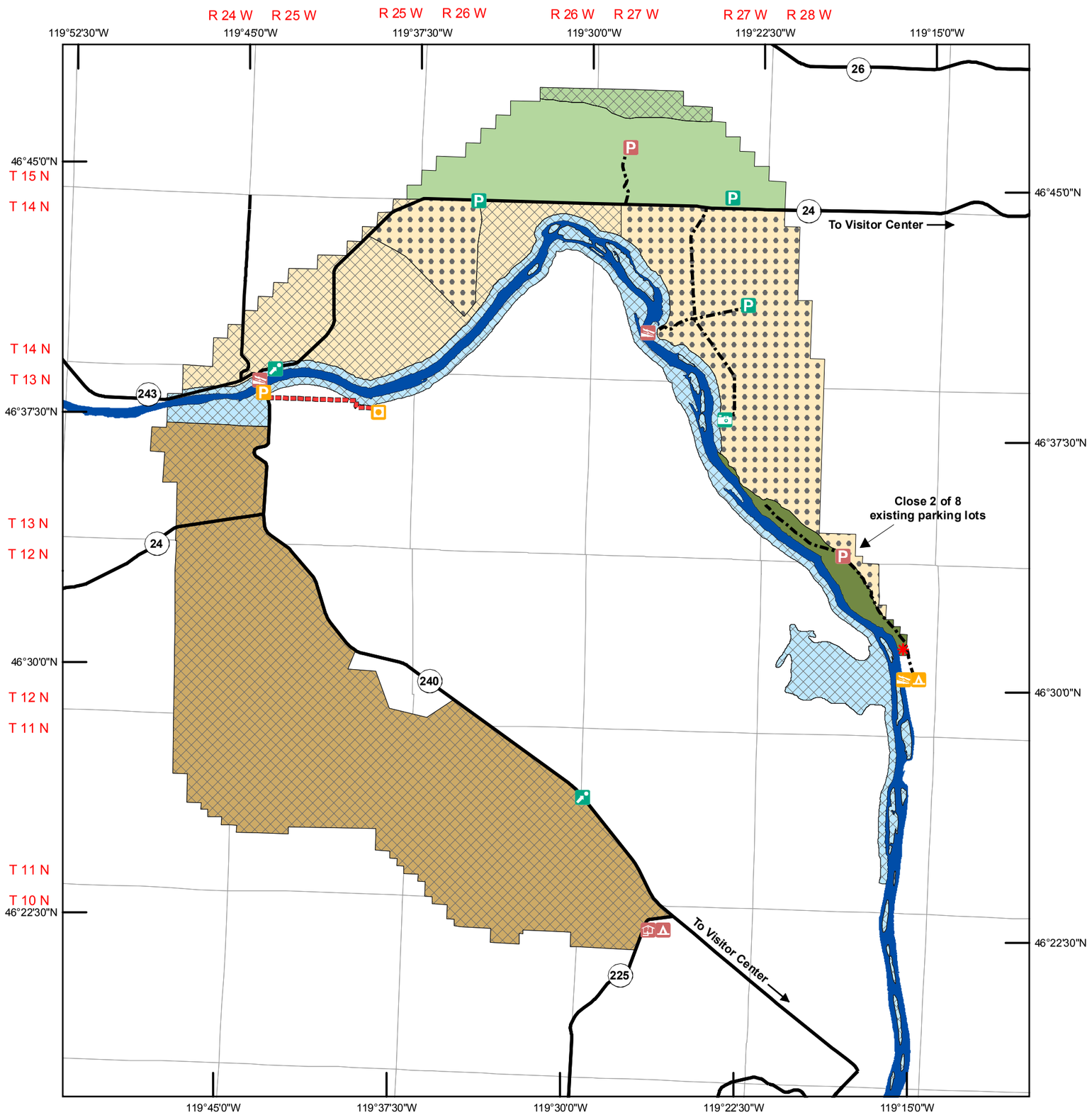
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 8 - Alternative B



Administrative Unit
- Columbia River Corridor
- Rattlesnake
- Ringold
- Saddle Mountain
- Wahluke

Nodes of Activity*
- B Reactor
- Boat Launch
- Campground
- Contact Station
- Interpretation
- Overlook
- Parking

Public Use
- Closed
- Open, controlled
- Open

Road Access
- Primary
- Secondary
- Proposed
- Native Plant Nursery
- Columbia River

* Color represents the relative size of activity node
- Small
- Medium
- Large

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map08_AltB_HRNMCCP.mxd

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers

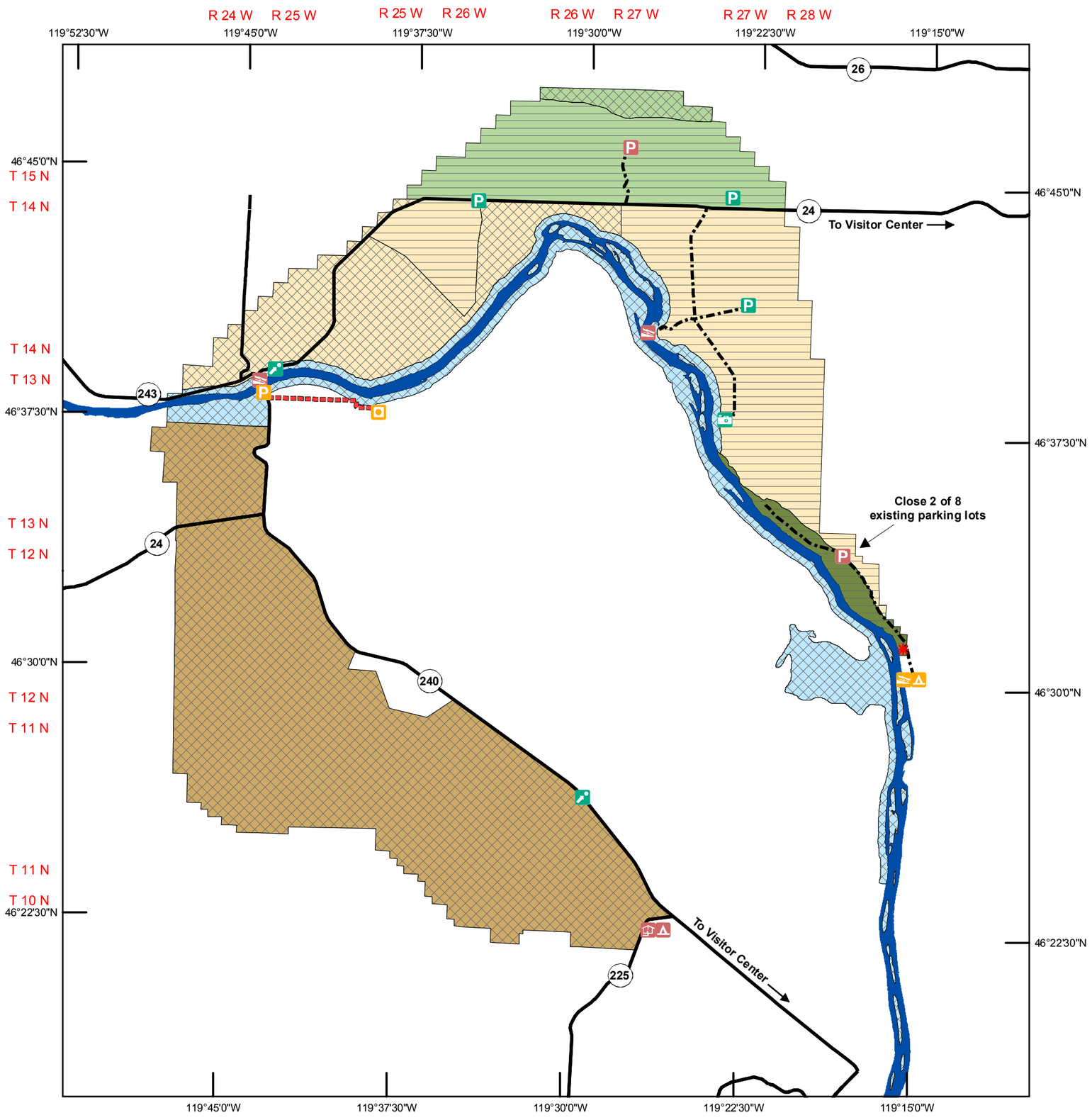
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 9 - Alternative B1



Administrative Unit
- Columbia River Corridor
- Rattlesnake
- Ringold
- Saddle Mountain
- Wahluke

Nodes of Activity*
- B Reactor
- Boat Launch
- Campground
- Contact Station
- Interpretation
- Overlook
- Parking

Public Use
- Closed
- Open, controlled, hunting exclosure

Road Access
- Primary
- Secondary
- Proposed
- Native Plant Nursery
- Columbia River

* Color represents the relative size of activity node
- Small
- Medium
- Large

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map09_AltB1_HRNMCCP.mxd

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers

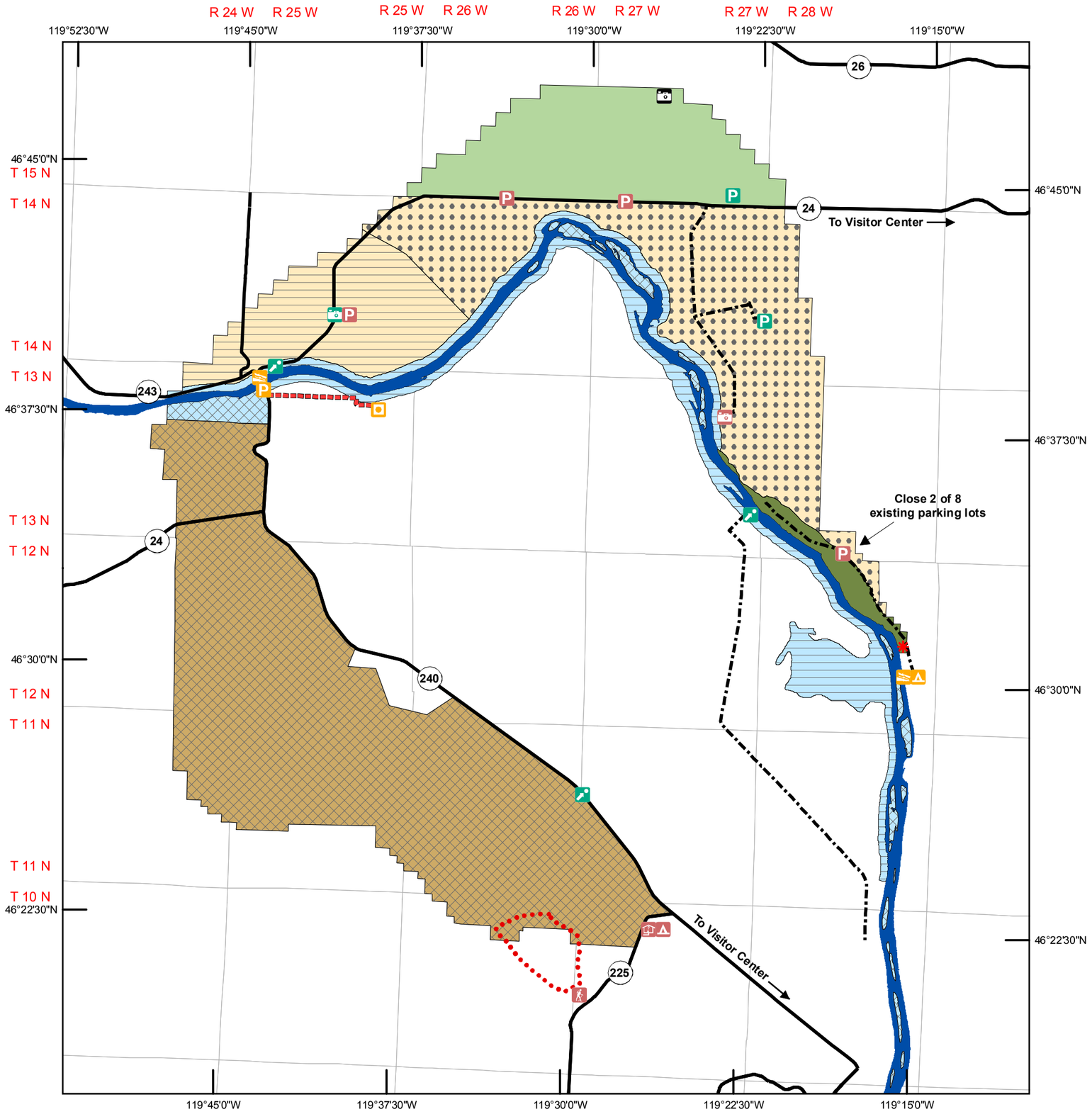
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 10 - Alternative C



Administrative Unit
- Columbia River Corridor
- Rattlesnake
- Ringold
- Saddle Mountain
- Wahluke

Nodes of Activity*
- B Reactor
- Boat Launch
- Campground
- Contact Station
- Interpretation
- Overlook
- Parking
- Trailhead

Public Use
- Closed
- Open, controlled
- Open, controlled, hunting exclosure
- Open

Road Access
- Primary
- Secondary
- Proposed
- Conceptual Trail Corridor
- Native Plant Nursery
- Columbia River

* Color represents the relative size of activity node
- Small
- Medium
- Large

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map10_AltC_HRNMCCP.mxd

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers

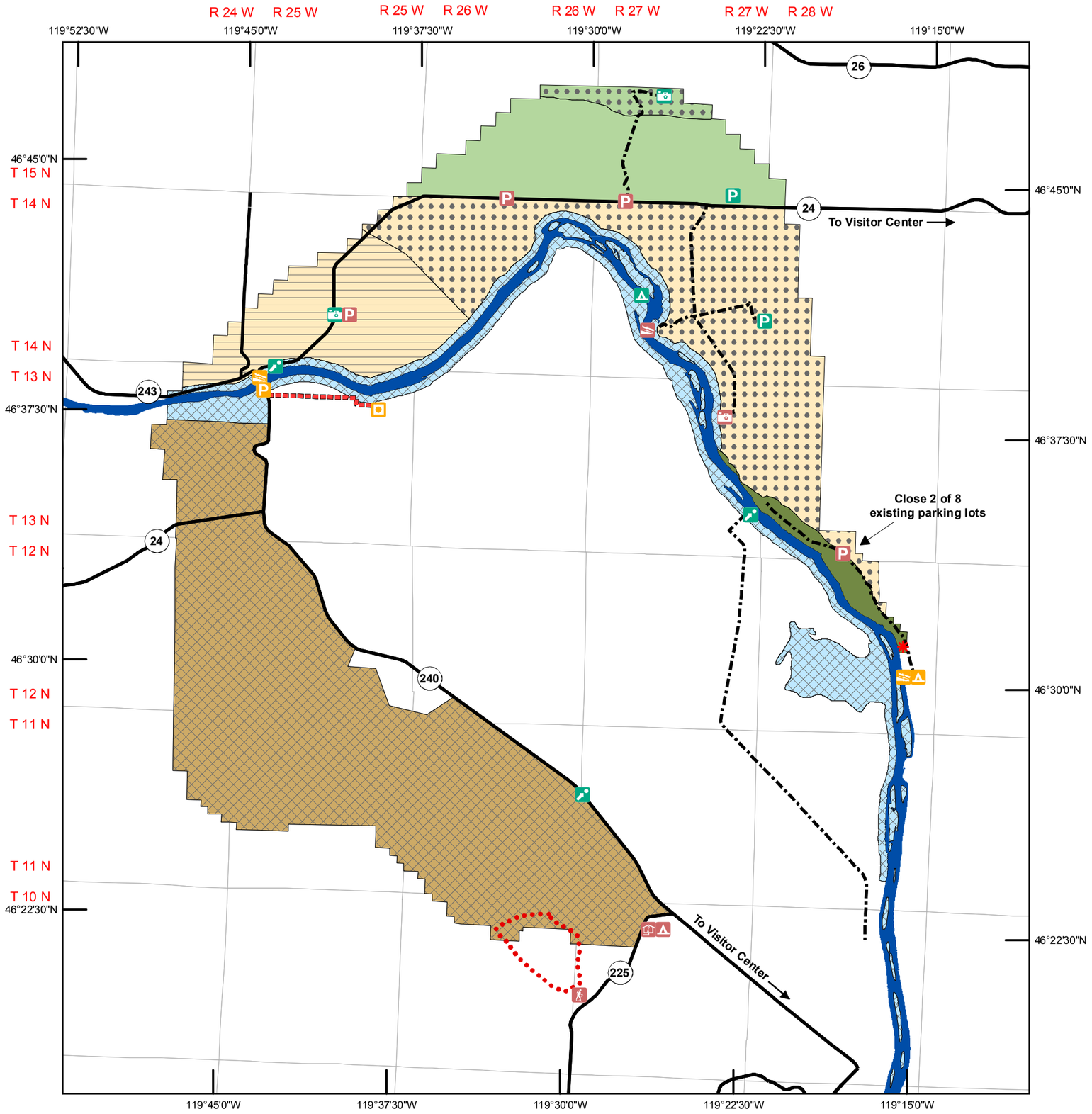
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 11 - Alternative C1



Administrative Unit
- Columbia River Corridor
- Rattlesnake
- Ringold
- Saddle Mountain
- Wahluke

Nodes of Activity*
- B Reactor
- Boat Launch
- Campground
- Contact Station
- Interpretation
- Overlook
- Parking
- Trailhead

Public Use
- Closed
- Open, controlled
- Open, controlled, hunting exclosure
- Open

Access Roads
- Primary
- Secondary
- Proposed
- Conceptual Trail Corridor
- Native Plant Nursery
- Columbia River

* Color represents the relative size of activity node
- Small
- Medium
- Large

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map11_AltC1_HRNMCCP.mxd

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers

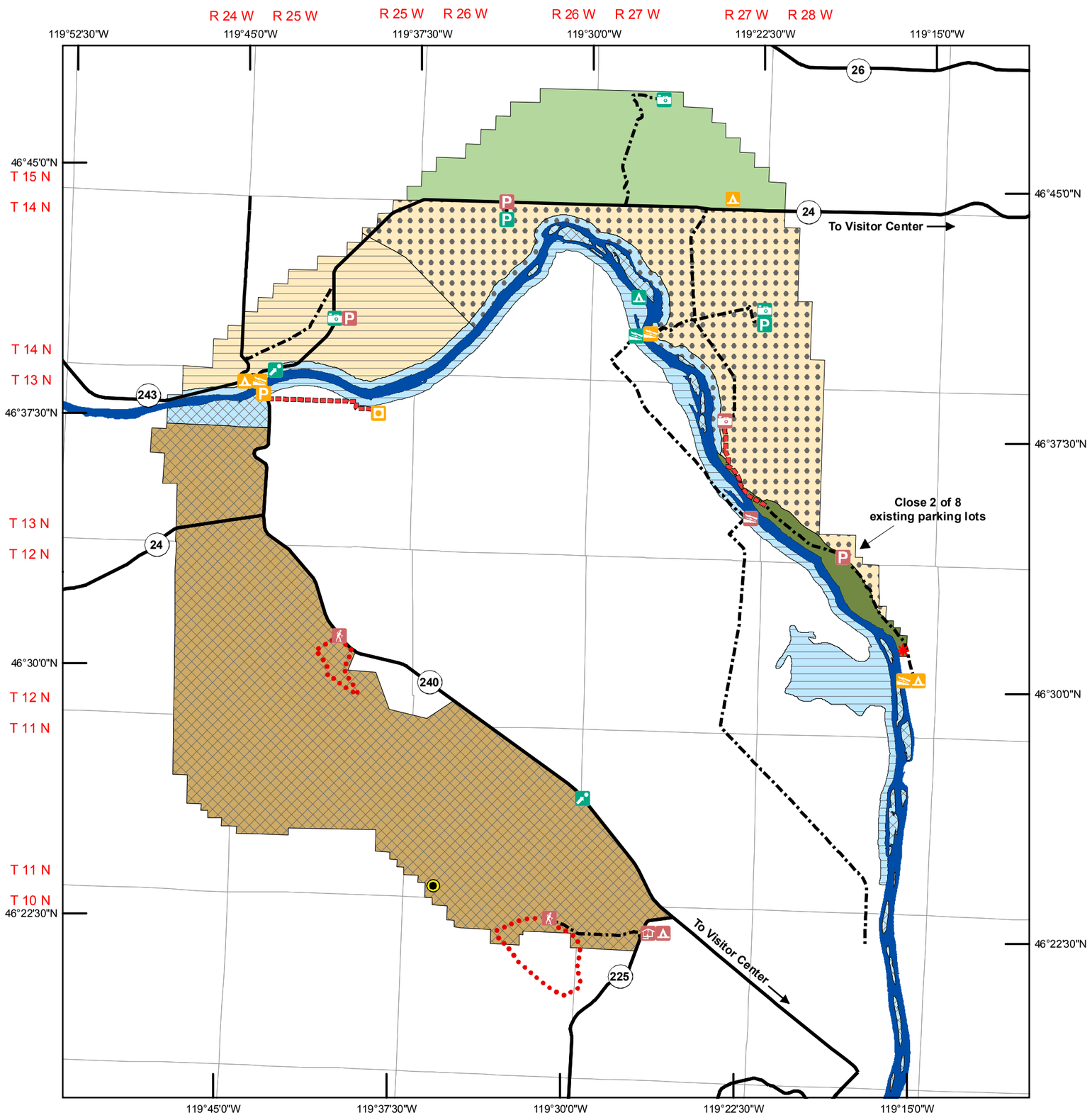
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 12 - Alternative D



Administrative Unit
- Columbia River Corridor
- Rattlesnake
- Ringold
- Saddle Mountain
- Wahluke

Nodes of Activity*
- B Reactor
- Boat Launch
- Campground
- Contact Station
- Interpretation
- Overlook
- Parking
- Trailhead

Public Use
- Closed
- Open, controlled
- Open, controlled, hunting exclosure
- Open

Road Access
- Primary
- Secondary
- Proposed
- Conceptual Trail Corridor
- Observatory
- Native Plant Nursery
- Columbia River

* Color represents the relative size of activity node
- Small
- Medium
- Large

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map12_AltD_HRNMCCP.mxd

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers

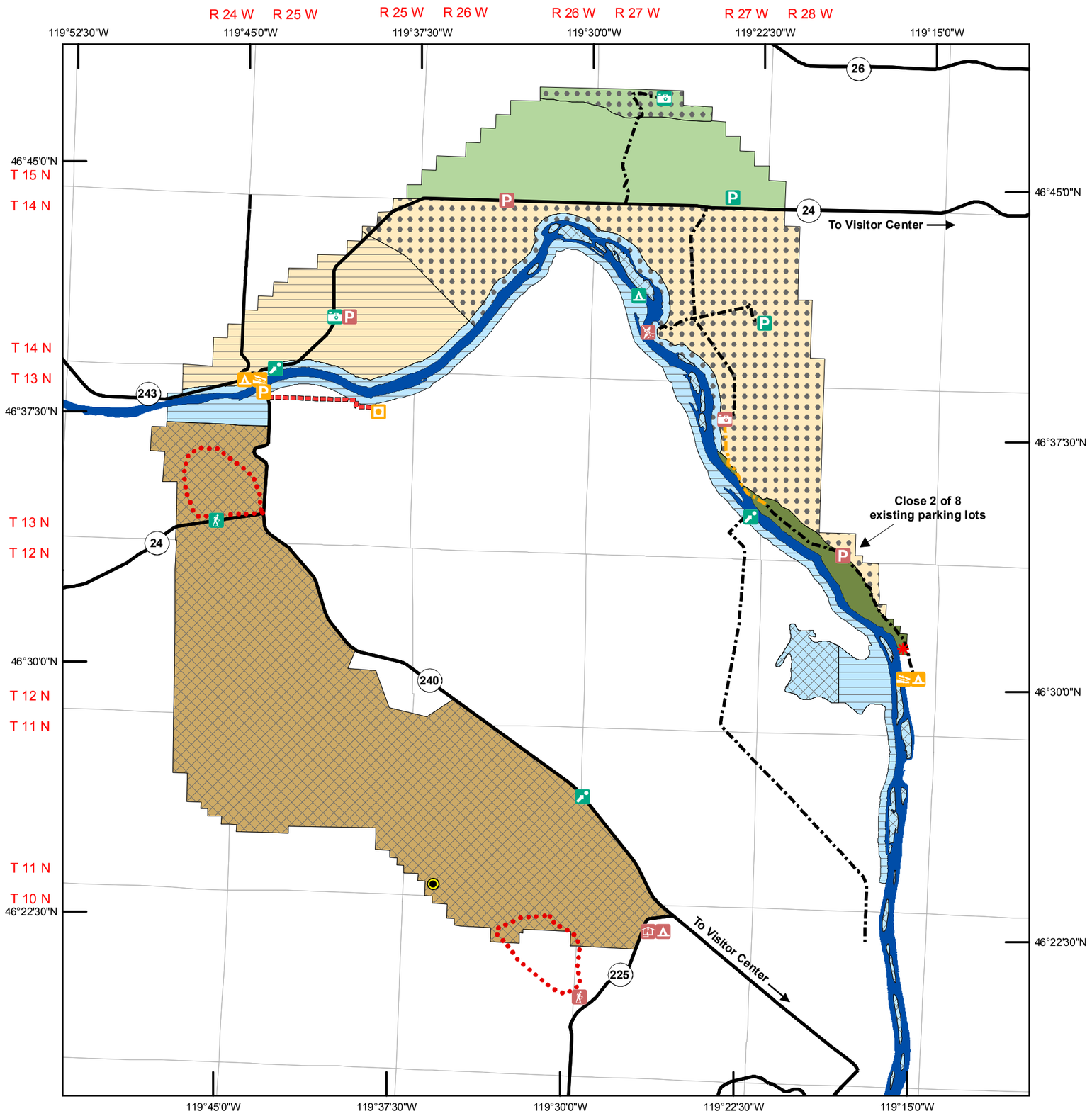
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 13 - Alternative E



Administrative Unit
- Columbia River Corridor
- Rattlesnake
- Ringold
- Saddle Mountain
- Wahluke

Nodes of Activity*
- B Reactor
- Boat Launch
- Campground
- Contact Station
- Interpretation
- Non-motorized Boat Launch
- Overlook
- Parking
- Trailhead

Public Use
- Closed
- Open, controlled
- Open, controlled, hunting exclosure
- Open

Road Access
- Primary
- Secondary
- Service
- Proposed
- Conceptual Trail Corridor
- Observatory
- Native Plant Nursery
- Columbia River

* Color represents the relative size of activity node: Small, Medium, Large

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map13_AltE_HRNMCCP.mxd

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers

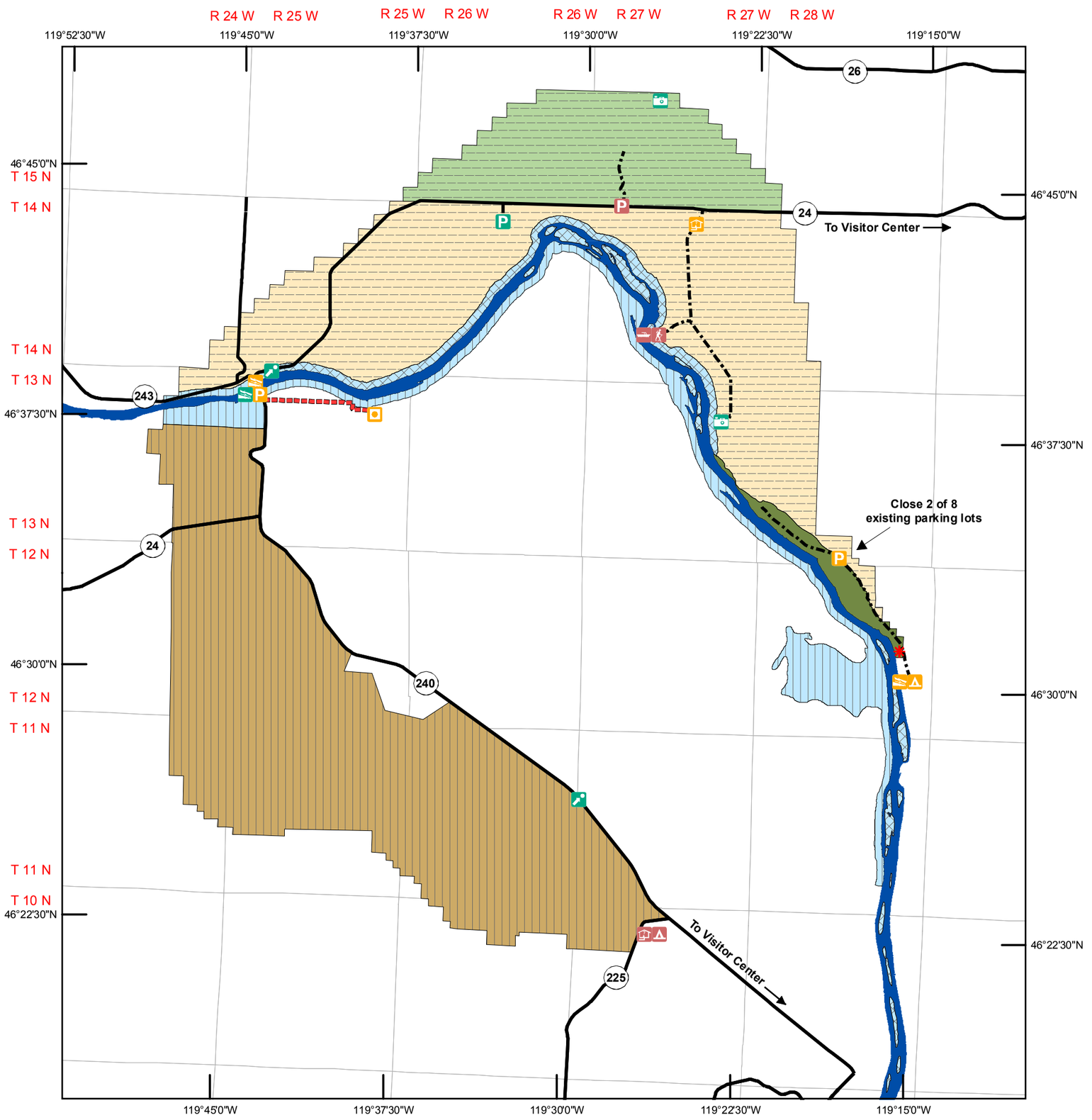
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 14 - Alternative F



Administrative Unit
- Columbia River Corridor
- Rattlesnake
- Ringold
- Saddle Mountain
- Wahluke

Nodes of Activity*
- B Reactor
- Boat Dock
- Boat Launch
- Campground
- Contact Station
- Interpretation
- Overlook
- Parking
- Trailhead

Public Use
- Closed
- Open
- Research & Education
- Recreation

Road Access
- Primary
- Secondary
- Proposed
- Native Plant Nursery
- Columbia River

* Color represents the relative size of activity node
- Small
- Medium
- Large

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map14_AltF_HRNMCCP.mxd

0 2.5 5 10 Miles
0 2.5 5 10 Kilometers

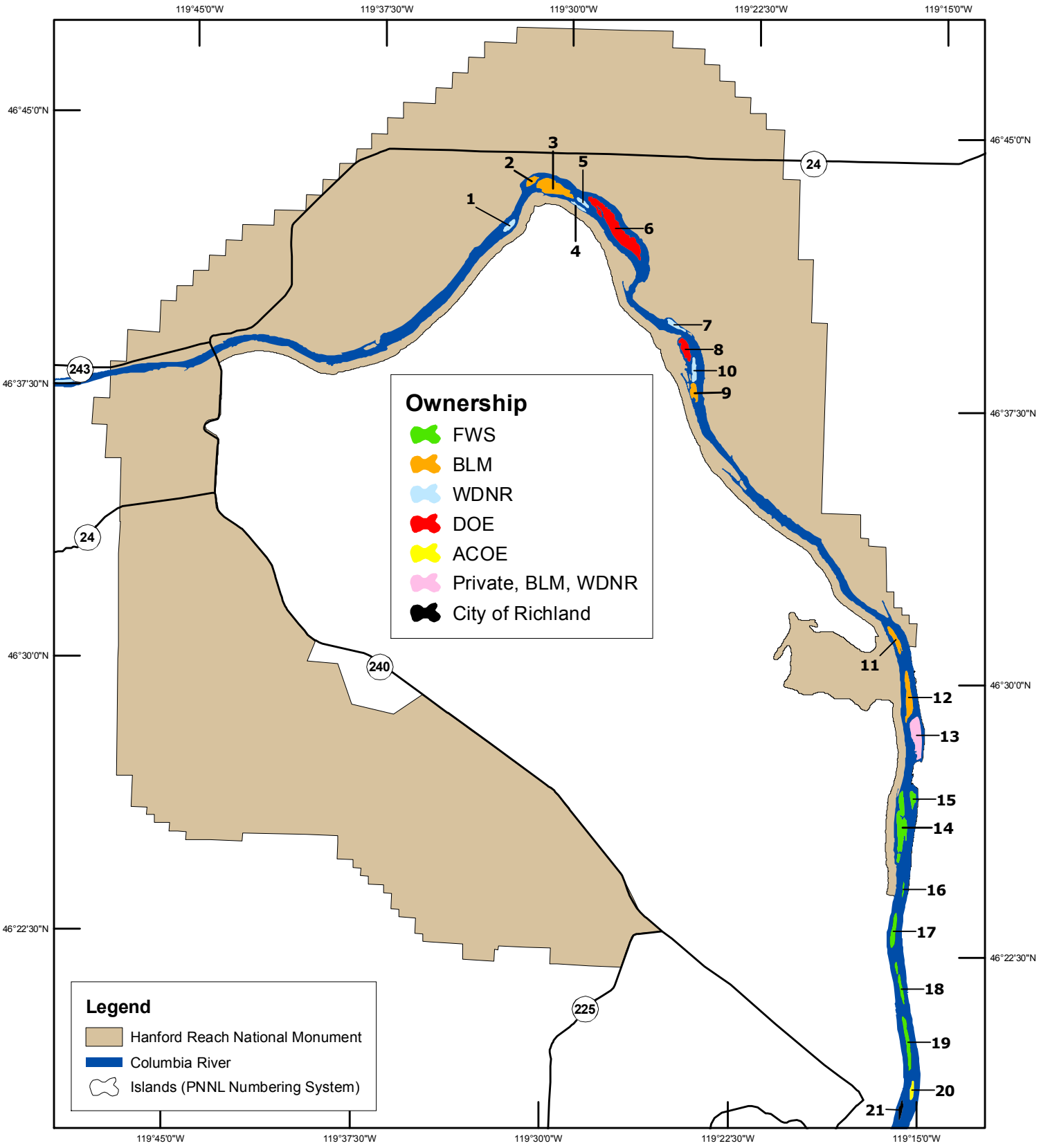
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 15 - Islands within the Columbia River



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map15_islands.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 16 - Dams on the Columbia River

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: November 2007
File: map16_dams.mxd

0 25 50 100 Miles

0 25 50 100 Kilometers

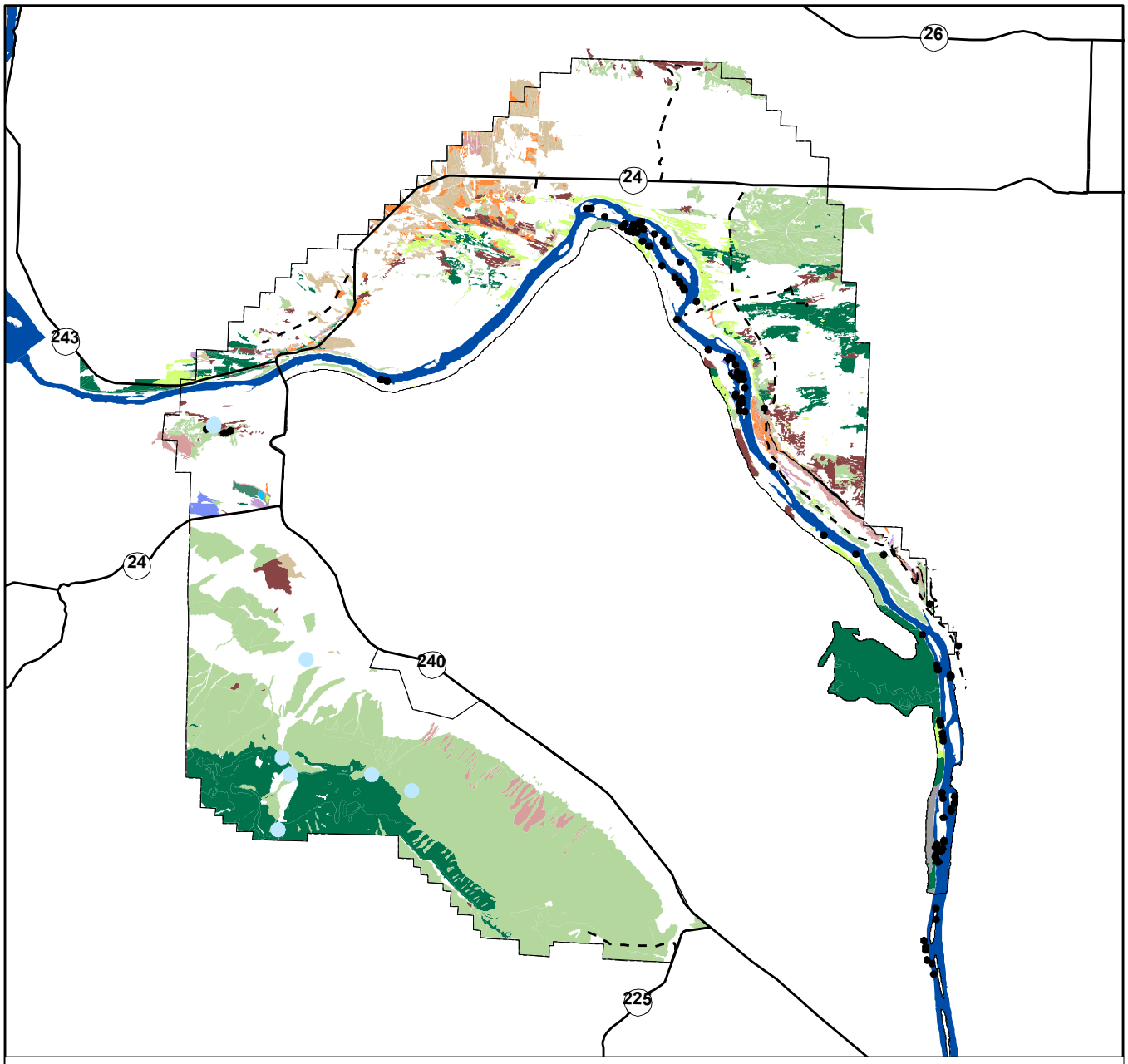
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 17 - Sensitive Vegetation



Legend

- Hanford Reach National Monument
- Primary Roads
- Secondary Roads

Sensitive Plant Communities

- Bitterbrush
- Grass
- Purple Sagebrush
- Rabbitbrush
- Rabbitbrush - Snow Buckwheat
- Spiny Hopsage
- Three-tip Sagebrush
- Winterfat
- Wyoming Big Sagebrush
- Wyoming Big Sagebrush - Spiny Hopsage
- Wetlands and Deep Water
- Riparian
- Springs
- Rare Plants
- Columbia River

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map17_sens_vegetation.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

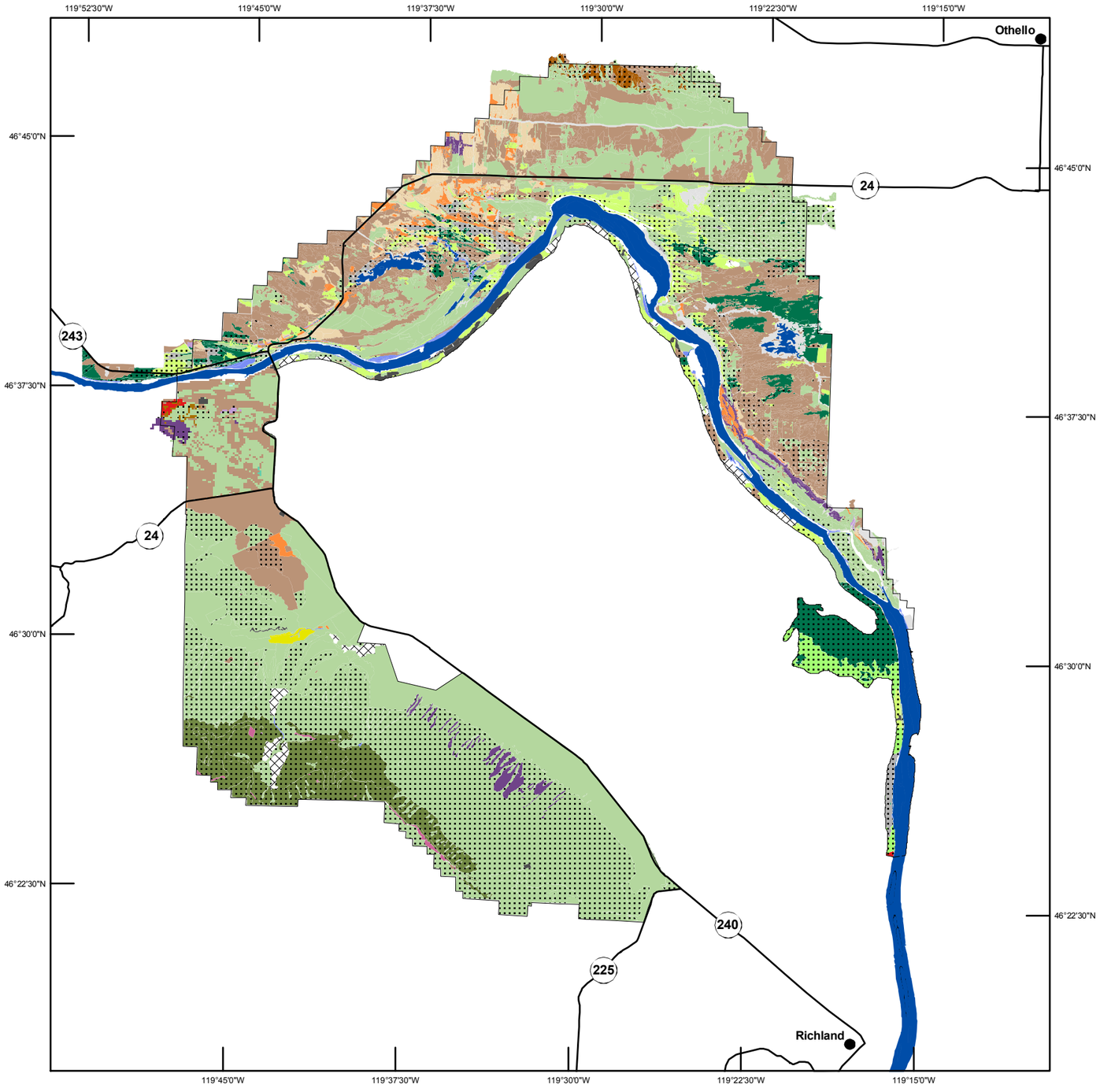
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 18 - Vegetation Type



Legend

Hanford Reach National Monument

Overstory

- Abandoned Agricultural Fields
- Bitterbrush
- Black Greasewood
- Cheatgrass
- Crested Wheatgrass
- Disturbed
- Grass
- Non-shrub Steppe
- Purple Sagebrush
- Rabbitbrush
- Rabbitbrush - Snow Buckwheat
- Riparian
- Riverine Wetlands and Deep Water
- Rock Buckwheat
- Snow Buckwheat - Bitterbrush
- Spiny Hopsage
- Stiff Sagebrush
- Three-tip Sagebrush
- Thyme-leaf Buckwheat
- Winterfat
- Wyoming Big Sagebrush - Bitterbrush
- Wyoming Big Sagebrush - Spiny Hopsage
- Wyoming Big Sagebrush

Understory

- Native Bunchgrass

Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map18_vegetation.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

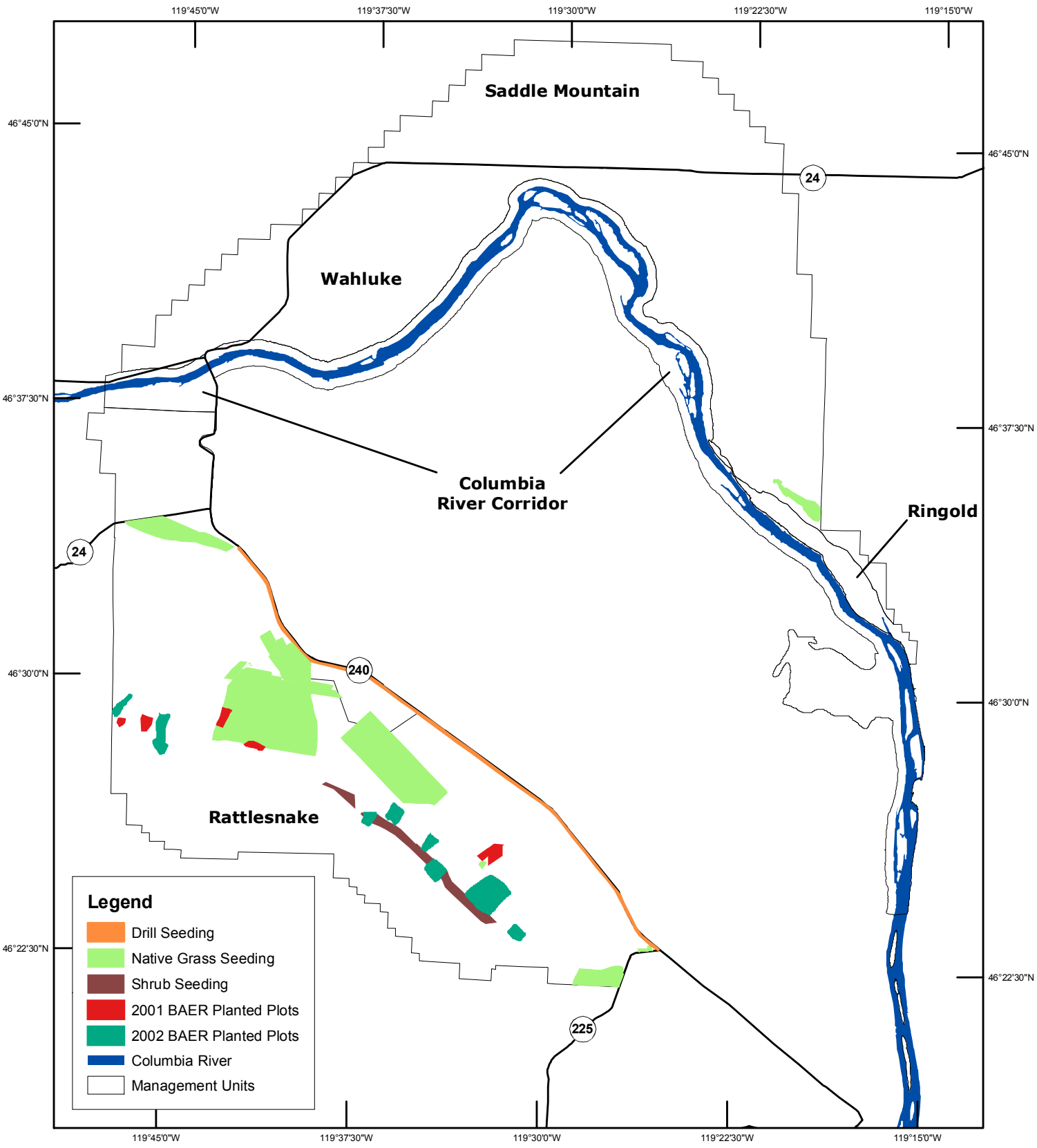
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 19 - Restoration following the 24 Command Fire



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map19_restoration.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

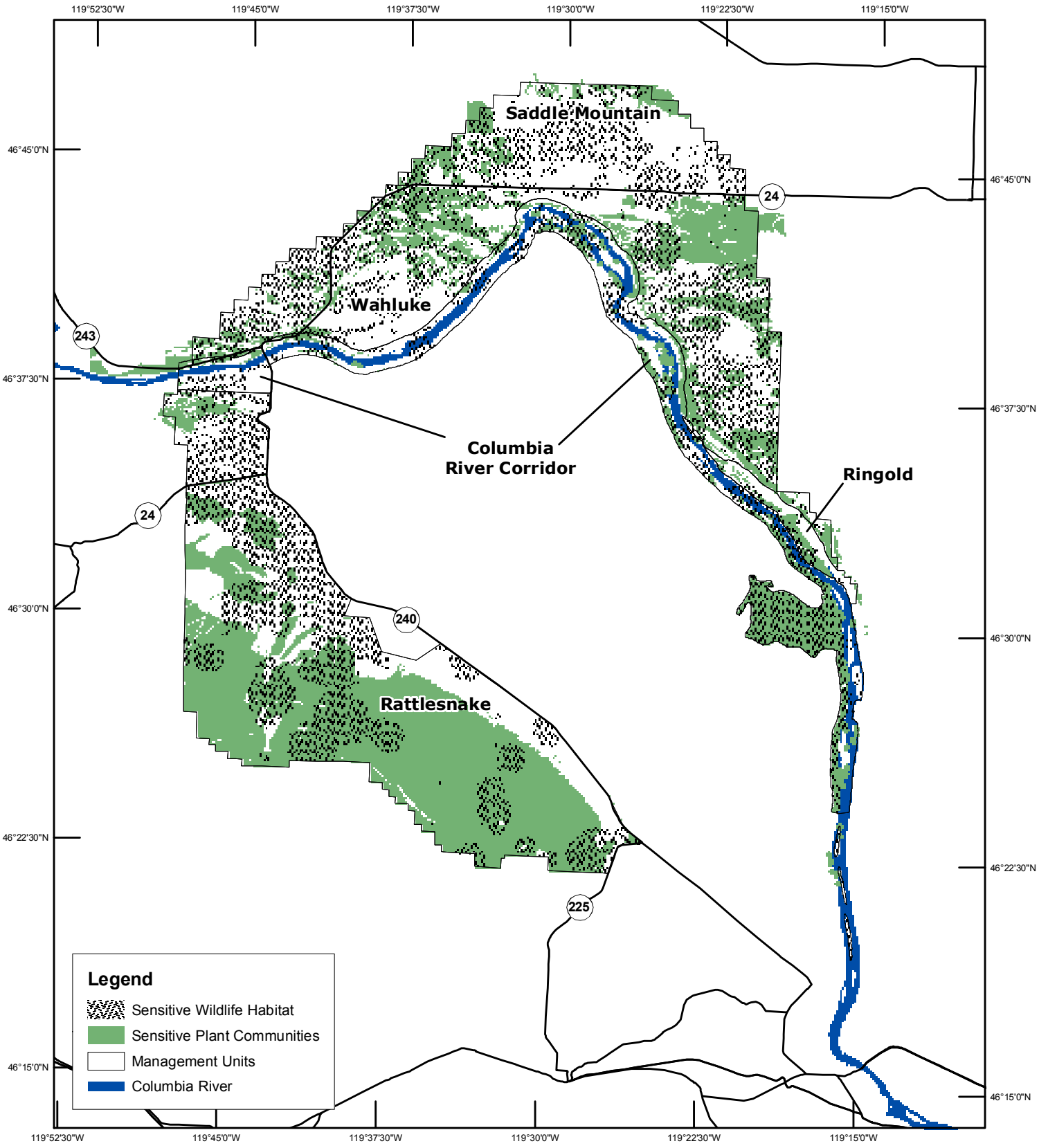
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 20 - Sensitive Wildlife



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map20_sens_wildlife.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

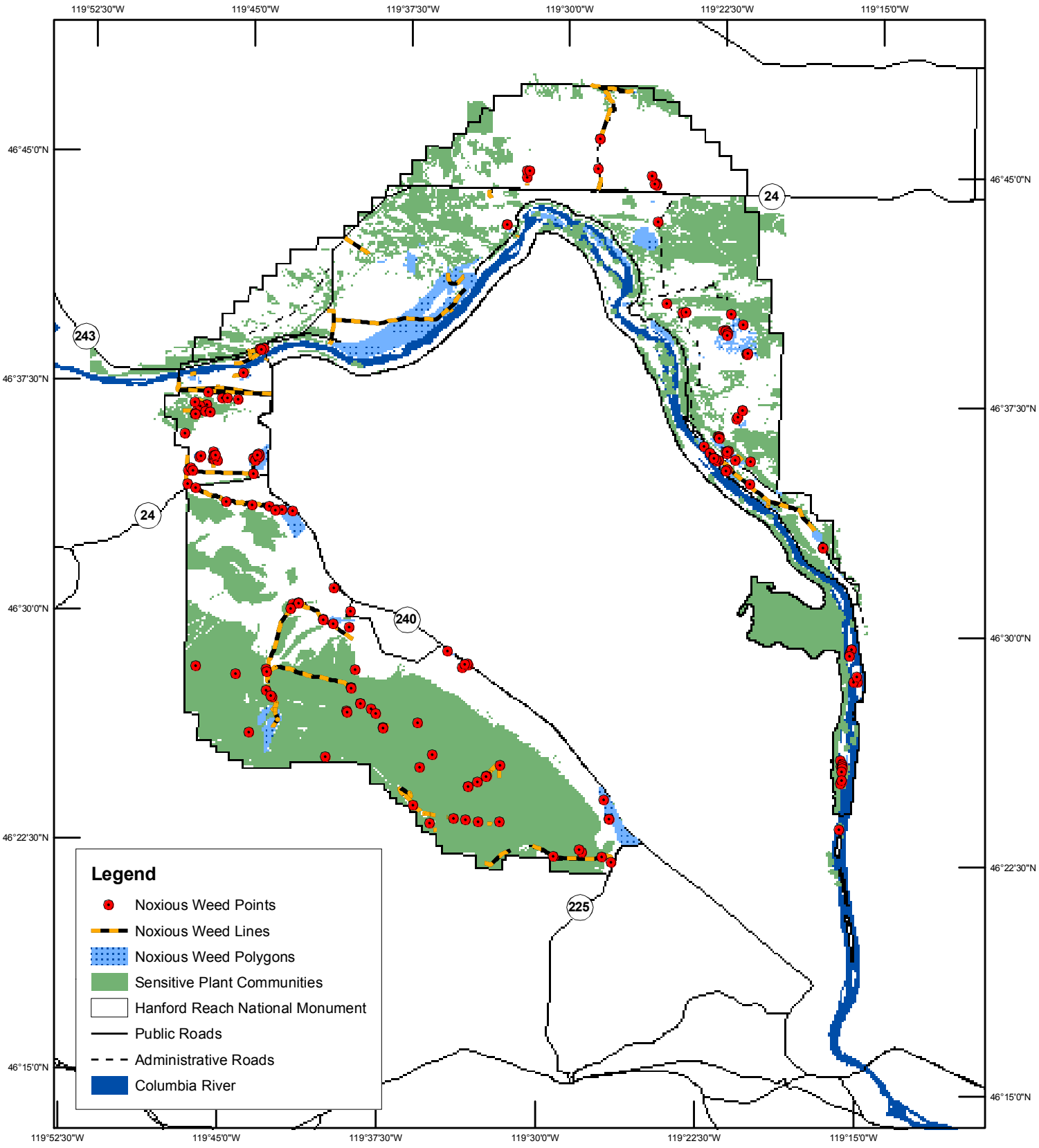
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 21 - Noxious Weeds



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map21_weeds.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

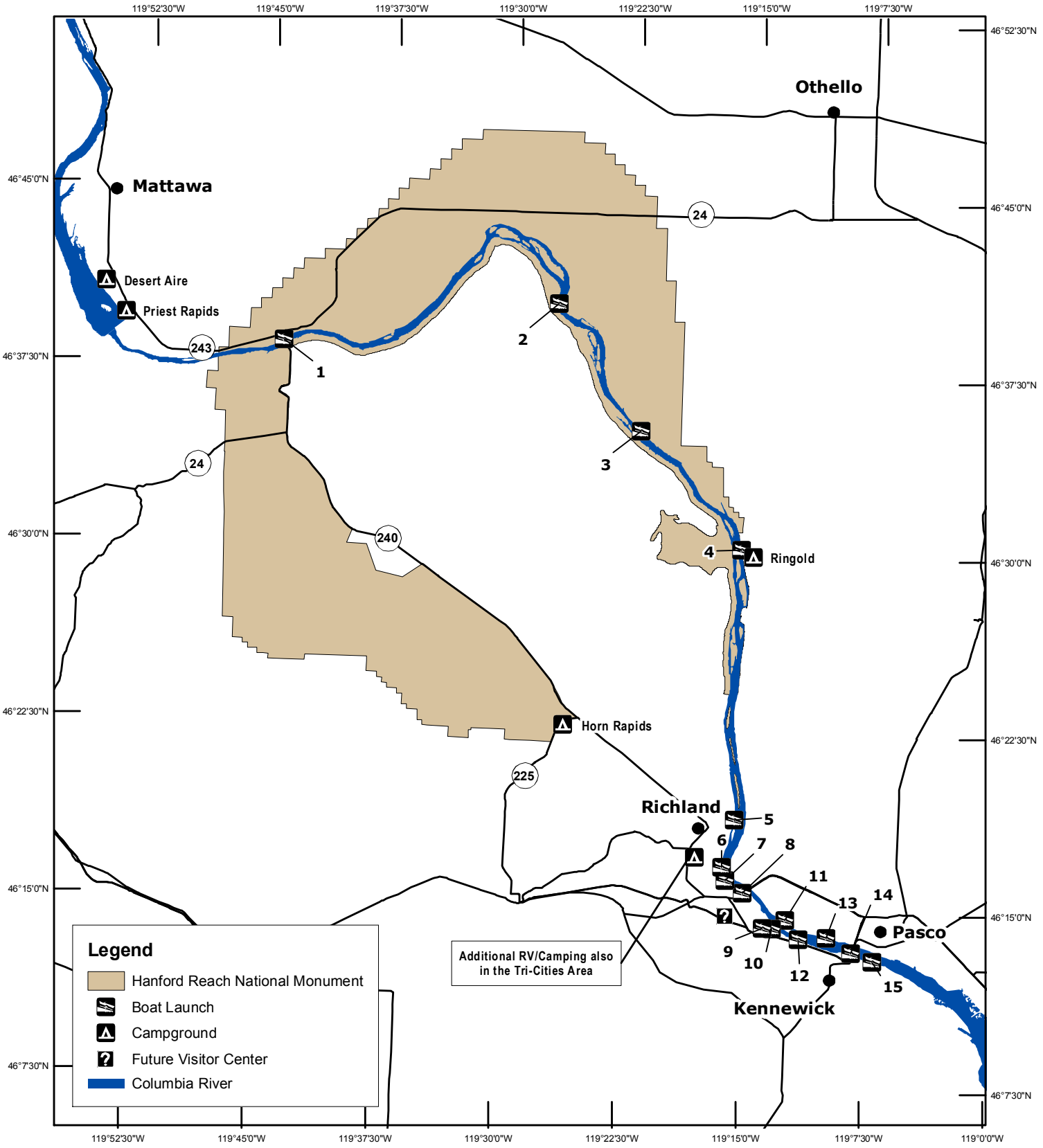
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 22 - Local Recreation Facilities



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map22_recreation.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

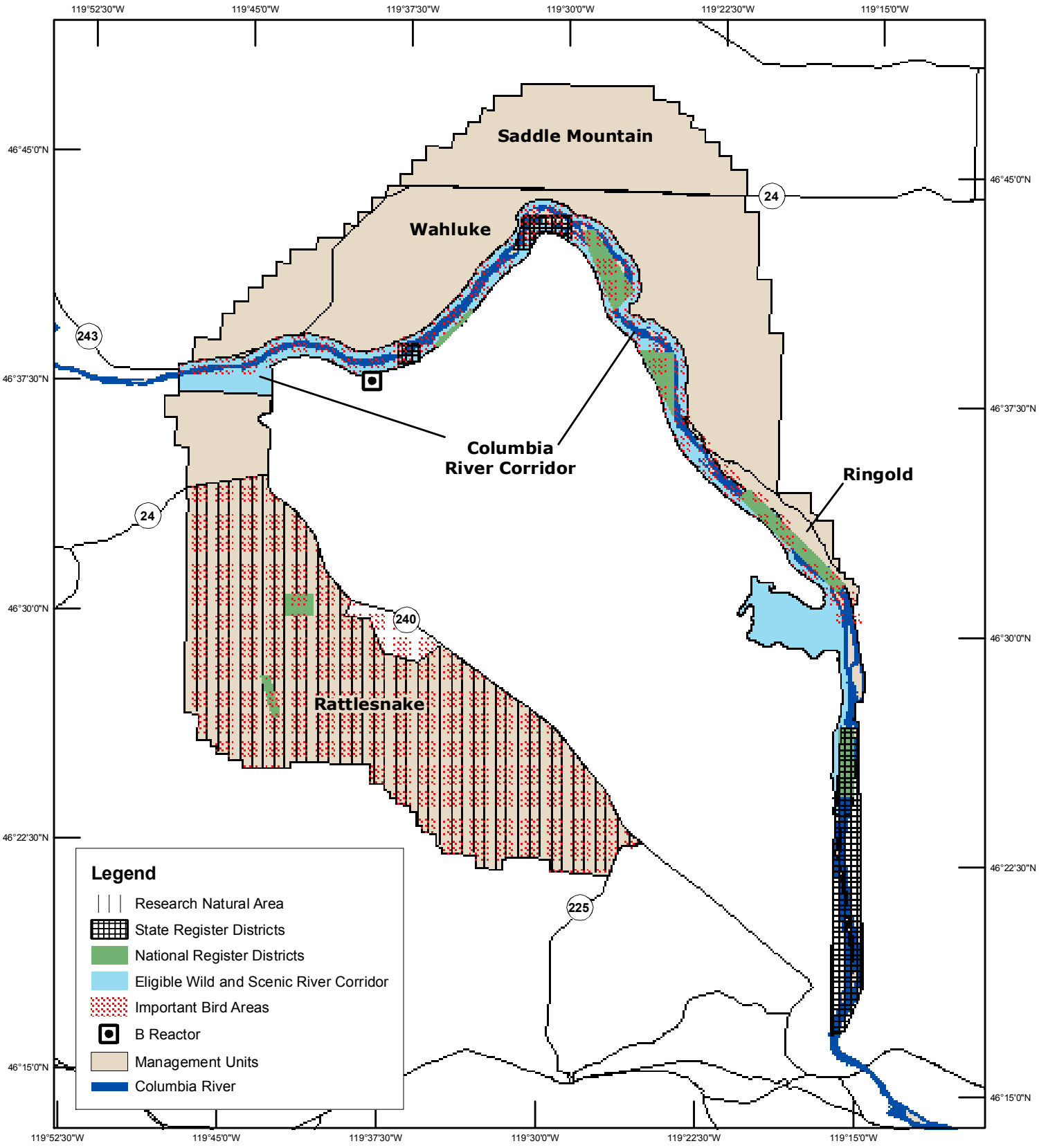
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 23 - Special Management Areas



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map23_spec_mgmt.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

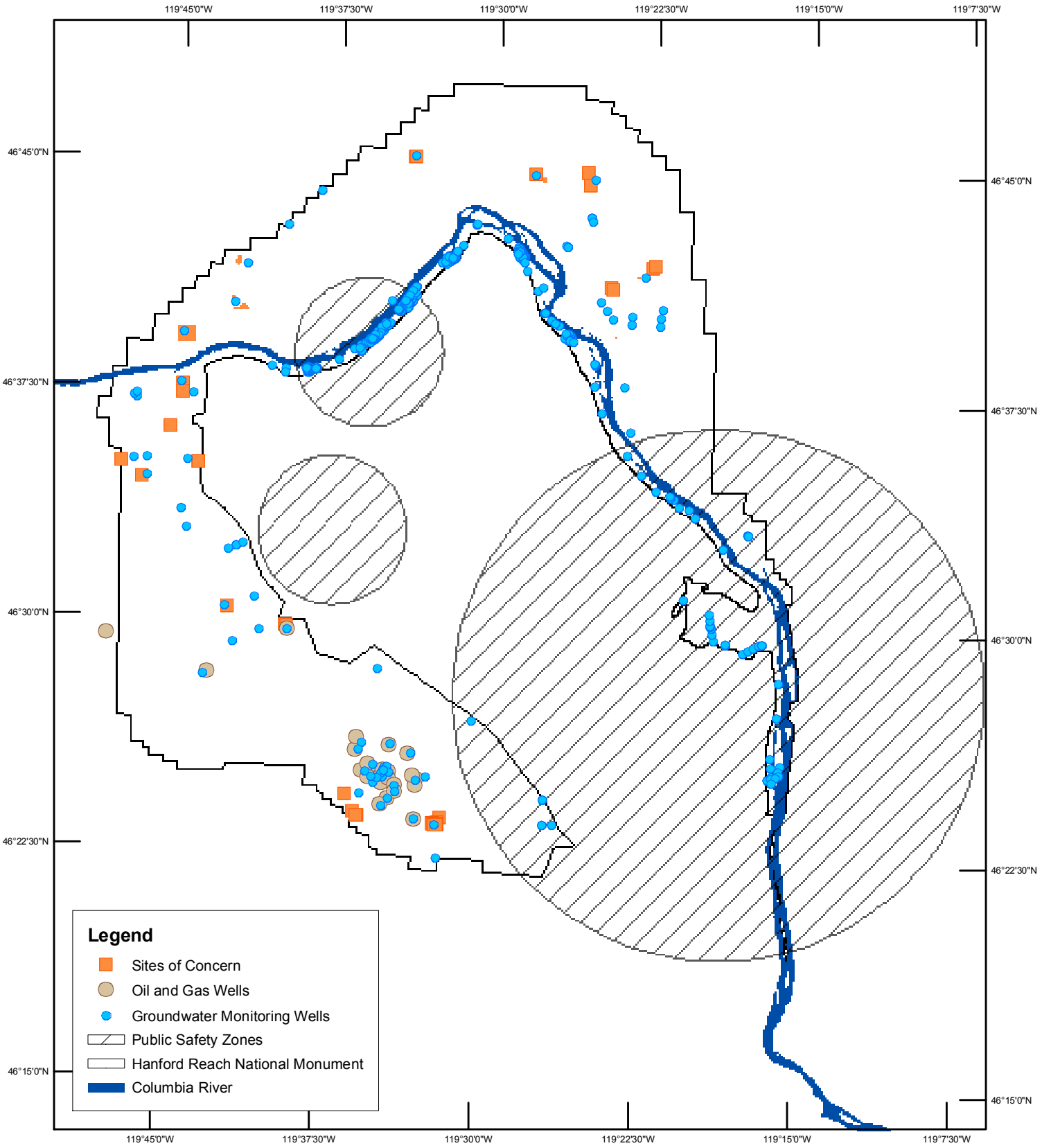
UTM ZONE 11
NAD 83

U.S. Fish & Wildlife Service

Hanford Reach National Monument

Adams, Benton, Franklin, and Grant Counties, Washington

Map 24 - Areas of Concern



Produced for the Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
Richland, Washington
Current to: May 2005
File: map24_areas_concern.mxd

0 2.5 5 10 Miles

0 2.5 5 10 Kilometers

UTM ZONE 11
NAD 83

Chapter 1

Introduction, Purpose and Need For Action

1.0 Introduction and History

The Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge (Monument), located near the Tri-Cities (Kennewick, Pasco, and Richland) in south-central Washington State, is one of the newest additions to the NWRS and is managed by the U.S. Fish and Wildlife Service (FWS) and the Department of Energy (DOE) (see Maps 1 and 2). Its national monument status is the result of a long series of events, culminating in numerous overlying current designations, including the national monument designation (see Chapter 3 for a discussion of these designations and distinctions).

The land comprising the Monument has an unusual and colorful provenance. The entry of the United States into World War II and the race to develop an atomic bomb led to a search for a suitable place to locate plutonium production and purification facilities. In 1943, the War Department (later to become the Department of Defense) went in search of a remote, easily defensible, geologically stable site, with plenty of cool water, abundant energy (from hydropower dams on the Columbia River), and a moderate climate, on which to build secret plutonium production reactors. The U.S. Army Corps of Engineers (ACOE) selected a site in Washington State near the isolated desert towns of White Bluffs and Hanford. The War Department then acquired the land through condemnation and purchase of private lands and withdrawal of public lands within the basin formed by Rattlesnake Mountain and the Saddle Mountains. The Atomic Energy Commission (AEC), a precursor to the DOE, then established and ran the Hanford Site (then known as the Hanford Engineering Works).

For more than forty years, the primary mission at the Hanford Site was the production of nuclear materials for national defense. During that time, management activities and development practices were driven by needs related to nuclear production, chemical processing, waste management, and research and development. The AEC, and later the DOE, developed infrastructure and facility complexes to accomplish this work in the central portion of the site, but large tracts of land used as protective buffer zones for safety and security purposes remained undisturbed. These buffer zones preserved a nationally significant biological and cultural resource setting in the Columbia Basin region, unique in that similar resources elsewhere in the Columbia Basin have been destroyed or replaced by development.

In the early 1970s, there was a reduced need for large safety and security buffer zones around the Hanford Site, and the DOE transferred management of portions of the "North" or "Wahluke Slope" (the area north of the Columbia River) to the FWS—through the creation of the Saddle Mountain National Wildlife Refuge—and to the Washington State Department of Fish and Wildlife (WDFW). By the late 1980s, the primary DOE mission had changed from defense materials production to environmental restoration, waste management, and science and technology research, further decreasing the need for a large land base. In 1997, the DOE transferred the administration of the Fitzner-Eberhardt Arid Lands Ecology Reserve (ALE) to the FWS. In 1999, the Wahluke Slope lands managed by the WDFW, known as the Wahluke

Wildlife and Recreation Area, were transferred to the FWS to be managed under DOE permit as part of the NWRS. The WDFW retained administration of the area around the Vernita Bridge under DOE permit to provide access for sport fishing on the Columbia River.

In the 1980s, concerns for protection of the Hanford Site's natural and cultural resource values grew, as did interest in consolidating management under one natural resource agency. In 1988, Congress directed the Secretary of the Interior and the Secretary of Energy to identify and evaluate the outstanding features of the Hanford Reach and its immediate environment—including fish, wildlife, geology, scenery, recreation, historic and cultural values—and recommend alternatives for their preservation. The resulting Department of the Interior (DOI) report, the *Hanford Reach of the Columbia River Comprehensive River Conservation Study and Environmental Impact Statement* (National Park Service 1994), identified the FWS as best suited to protect those values and the lands necessary to support them. After years of discussion and controversy, the question of protection was settled when President Clinton created the Monument (Proclamation 7319) through his powers under the American Antiquities Act.

The Monument is also unique in its complexity and its management; it is the only national monument managed by the DOE and one of only two managed by the FWS.[4] The Monument is superimposed over approximately 195,000 acres of the 586-square-mile DOE Hanford Site. The DOE currently administers approximately 29,000 acres of land within the Monument and retains land surface ownership or control on all acreage.[5] Approximately 165,000 acres are currently managed by the FWS through its authorities under the National Wildlife Refuge System Management Act (16 United States Code § 668dd–ee) and through agreements with the DOE.[6] The WDFW administers approximately 800 acres of the Monument through a permit with the DOE (see Maps 3 and 4). Other state and federal agencies and utility districts maintain rights-of-way or manage small tracts of land within the Monument boundaries.

Presidential Proclamation 7319 directs that the ". . . monument shall be managed by the U.S. Fish and Wildlife Service under existing agreements with the Department of Energy, except that the Department of Energy shall manage the lands within the monument that are not subject to management agreements with the [FWS], and in developing any management plans and rules and regulations governing the portions of the monument for which the Department of Energy has management responsibility, the Secretary of Energy shall consult with the Secretary of the

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[4] On June 15, 2006, President Bush established the nearly 140,000-square-mile Northwestern Hawaiian Islands Marine National Monument. The FWS manages portions of this newest national monument.

[5] The DOE retains administrative control pursuant to the Atomic Energy Act of 1954, as amended, and applicable public land orders.

[6] These Monument lands are administered as an "overlay refuge." Overlay refuges exist where the FWS manages lands for the benefit of fish and wildlife resources, but where it is not the primary holder in fee title of lands forming the refuge.

Interior." Thus, the FWS and DOE have joint management responsibility of the Monument. However, it was agreed that the FWS would be the lead agency in preparing this Comprehensive Conservation Plan (CCP) and associated environmental impact statement (EIS).

The FWS and DOE together fulfill several missions at the Hanford Site. The FWS is responsible for the protection and management of the Monument's resources and the management of people and their access to Monument lands under FWS control. The FWS also has the responsibility to protect threatened and endangered species, administer the Migratory Bird Treaty Act, and protect fish, wildlife and trust resources within and beyond the boundaries of the Monument. The DOE is responsible for protecting the resources of the Monument, managing energy research, and remediating wastes remaining from weapons material production. The DOE also administers agreements and permits with other entities, such as the Washington Department of Transportation (WSDOT), U.S. Bureau of Reclamation (BOR), South Columbia Basin Irrigation District (SCBID), Bonneville Power Administration (BPA), Energy Northwest, adjacent counties, and others to enable these entities to fulfill their missions in energy production, energy distribution, communications, transportation and irrigation. Because the DOE has primary jurisdiction, it retains approval authority over certain management aspects of the Monument. This includes approval of the final CCP/EIS and approval of access granted to tribes.

1.1 Purpose and Need

The FWS needs to establish a CCP to guide management of Monument resources, programs and visitors for the next fifteen years and likely beyond that. The National Wildlife Refuge System Improvement Act of 1997 (Improvement Act) requires that all national wildlife refuges be managed in accordance with an approved CCP by 2012. An approved CCP would and must provide guidance for management of the Monument consistent with the Presidential Proclamation that established it. Specifically, the FWS needs to adopt and implement a final CCP with the following management guidance.

- Protect and restore biological, cultural, geological and paleontological resources.
- Identify compatible activities and uses, with an emphasis upon wildlife-dependent public uses.
- Identify the overall need for, and distribution of, visitor facilities, including public access and transportation routes.
- Identify areas of the Monument open to the public, areas open by permit, and areas closed to protect natural and cultural resources and the cultural traditions of Native American tribes.

- Provide for the protection of the eligibility of the Hanford Reach of the Columbia River as a national wild and scenic river.

- Provide a basis for budget requests to support needs for Monument staffing, operations, maintenance and capital improvements.

- Provide a set of decisions that outline management direction and create a framework for future planning, decision-making, and coordination with other affected stakeholders.

1.2 Proposed Action

The FWS proposes to adopt and implement a CCP for the Monument. The CCP process has been lengthy due to the high level of public, agency and tribal involvement and the complex management issues associated with the Monument. (See Chapter 5 for a detailed explanation of the CCP process.) The involvement of so many interested parties, however, has led to a thorough, well-focused range of alternatives for future management of the Monument. All eight alternatives, (A, B, B-1, C, C-1, D, E and F) protect, to various levels, resources identified in the Monument Proclamation; provide for public use of the Monument; address major issues and relevant mandates; and are consistent with principles of sound natural and cultural resource management. Chapter 2 outlines the eight alternatives.

1.2.1 Final CCP Components

This document, while called a "final CCP" for the sake of clarity and brevity is actually much larger and more involved than what the actual final CCP will look like. This document looks at a broad range of management alternatives and their reasonably foreseeable impacts to the environment. The actual final document—the "final CCP"—will be comprised of various components from the final CCP/EIS. In other words, after this final CCP/EIS is issued, and a final decision on management is made through the signing of a Record of Decision (ROD), the appropriate components of the final CCP/EIS will be incorporated into a concise management plan devoid of the other alternatives, background information, environmental impacts, etc. This will be the document that managers will use to administer the Monument. The components that may be included in this final document include:

- The Monument's vision statement.

- Enough background information from Chapters 1 and 3 and the Appendices to provide a snapshot of the Monument and its resources.

- A description of the selected management alternative and the goals, objectives and implementation strategies from Chapter 2 directly related to the selected alternative.
- A description of monitoring and other implementation programs.
- Relevant maps.
- Compatibility determinations.
- A list of completed and needed step-down plans.
- A schedule for plan revision.

1.2.2 Environmentally Preferred Alternative

The concept of the "environmentally preferable alternative" is different from that of "preferred alternative," although in some cases one alternative may be both. The environmentally preferred alternative is generally the one that causes the least damage to the environment and best protects natural and cultural resources. However, as noted below, the FWS must balance many different parameters—and meet its mission and statutory requirements—in selecting a preferred alternative. Due to its focus on protection and the allocation of resources to restoration, Alternative B-1 is the environmentally preferred alternative.

1.2.3 Preferred Alternative

The preferred alternative is the alternative which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to environmental, social, economic, technical and other factors. All alternatives meet the primary purposes of the Monument Proclamation and the mission of the NWRS and therefore have the potential to be selected as a final management plan. The FWS has chosen Alternative C-1 as its preferred alternative (see Chapter 2 for a full description of the alternative). Alternative C-1 attempts to strike a balance between resource protection and the level of public use and access the public expects.

1.3 Planning Area

The geographic scope of decisions in this CCP/EIS includes all publicly owned lands and waters within the boundaries of the Monument and within the national wild and scenic river study area

(see Maps 3 and 4). All islands within the Hanford Reach of the Columbia River, both those within the Monument boundary and those managed by the FWS in close proximity, are also included in this CCP; these islands will be administered/managed by the Monument. Some areas immediately adjacent to the Monument are also discussed in this EIS if they will be affected by the plan or if they influence management or affect resources of the Monument.

Several different agencies have management jurisdiction over Monument lands and waters; the intent, therefore, is to produce a CCP that applies to all Monument lands. The FWS will work with these other jurisdictions to protect Monument resources consistent with the CCP. Following the release of this final CCP/EIS, each of the primary managing federal agencies could prepare their own ROD on this EIS to manage resources under their jurisdiction. The DOE, the other principal managing agency of the Monument, has indicated it may prepare its own ROD on this EIS.

1.4 Step-Down Plans

CCPs are intended to provide a framework for management direction. As such, they often take a broad view of a refuge, leaving finer details to other subsequent plans. Additional plans stemming from a CCP are known as step-down plans (FWS 2000, Refuge Manual 602 FW 4). The CCP provides the framework and priorities for management, and the step-down plans provide management detail. Step-down management plans allow the planning process to be tiered and broken into a manageable effort.

The use of the CCP as a broad planning umbrella is especially relevant for the Monument. The Monument is a large, complex land area that faces a multitude of complex issues and has a wide range of competing interests. This complexity, coupled with the newness of the Monument, the lack of an existing CCP to use as a basis, and a shortage of biological and cultural information, necessitates the development of numerous step-down plans.

The FWS considers this CCP to be a landscape-scale plan, whereby general management direction is set but details for the management of programs are left to be determined in subsequent plans. For example, this CCP determines which areas are generally suitable for the establishment of trails, but the exact location, design and uses of those trails will be determined in a step-down visitor services or trail plan.

Several resource areas and issues will be addressed in subsequent step-down plans. A few of these plans currently exist in some form, although the selection of a preferred management alternative may necessitate their revision. For example, the Wildland Fire Management Plan (2001) may need to be revised based on changes in visitor use patterns, new areas open, or additional land designations (e.g., the possible designation of the B Reactor as a national

historical site). The Invasive Plant Species Inventory and Management Plan (IPSIMP) was made for public review and comment at the same time as the draft CCP and will be finalized following signature of the CCP ROD. In addition to the IPSIMP and Wildland Fire Management Plan, existing, likely and possible step-down plans include, but are not limited to:

- Cultural Resources Management
- Fishing
- Habitat Management
- Hunting
- Interpretation and Education
- Integrated Pest Management (IPM)
- Landscape Design Standards/Aesthetics
- Law Enforcement and Emergency Response
- Resource (Wildlife, Habitat, Cultural Resources, Public Use) Monitoring
- Visitor Services

When these step-down plans are developed, the public will be invited to assist in their development, in most instances directly through public scoping and/or workshops (to the extent legally allowed), and in all instances through public review of the plans and all supporting National Environmental Policy Act (NEPA) documentation.

1.5 CCP Review, Amendment, and Revision

The CCP is intended to be a dynamic plan based on the concept of adaptive management. Consistent with this concept, the CCP will be reviewed annually to determine whether it requires amendment or revision. The FWS will document and make minor plan modifications whenever this review, or any other monitoring or evaluation process, suggests that changes are needed to achieve the Monument's purpose, vision and goals. Modifications will be coordinated with partners and subject to appropriate NEPA compliance.

More extensive revisions of the CCP will occur when significant new information becomes available, ecological conditions change, a significant boundary change occurs, or when the need for major changes has been identified during annual plan reviews. FWS guidelines state that a revision should occur every fifteen years, although this is subject to necessity. All plan revisions will follow the procedures outlined in FWS planning policies for preparing CCPs and will require NEPA compliance. When the CCP requires a major revision, the CCP process will start anew at the preplanning phase.

1.6 Legal and Policy Guidance

The FWS is the primary federal agency responsible for conserving and enhancing the nation's fish and wildlife populations and their habitats. Although the FWS shares this responsibility with other federal agencies; tribal, state and local governments; and private entities, the FWS has specific responsibilities for migratory birds, threatened and endangered species, and certain anadromous fish (e.g., lamprey, which is not listed as threatened and endangered). The FWS also has similar management responsibilities for refuge lands, the lands and waters of which it administers to support the conservation and enhancement of fish and wildlife.

The FWS manages approximately 165,000 acres of the Monument under permit from the DOE. The FWS-administered portion of the Monument is managed under the legal and policy guidelines of the NWRS. Guidance is provided by the Presidential Proclamation, as well as other FWS policy, federal laws, executive orders, and international treaties, including treaties with Native American tribes. A partial list of laws and executive orders that affect or may affect the Monument or the FWS's implementation of the CCP is provided in Appendix D.

1.6.1 Tribal Rights and Interests

The Presidential Proclamation regarding the Monument states: "Nothing in this proclamation shall enlarge or diminish the rights of any Indian tribe." The application of tribal treaty rights has been discussed at many levels during meetings with tribes as part of the CCP process. Although the tribes and the FWS discussed tribal treaty rights, the FWS believes that defining the application of treaty rights is outside the scope of this CCP. The FWS will continue meeting with area tribes independent of the CCP process to develop memorandums of understanding (MOUs) and other instruments that are respectful of the rights and needs of the tribes, in accordance with FWS tribal policies, and consistent with preserving the natural and cultural resources of the Monument.

There is a unique and distinctive relationship between the United States and Native American governments—as defined by treaties, statutes, court decisions, and the United States Constitution—that differentiates Native American sovereign governments from other interests and constituencies. Several tribes have historically occupied or used portions of the Monument. The Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and Nez Perce Tribe all have treaties negotiated with the United States government (see Appendix D). The Confederated Tribes of the Colville Reservation (CCT) are a federally recognized tribe, some of whose constituent tribes or bands are descendants of people who used the area. In addition, the Wanapum, which did not negotiate a treaty with the United States, also historically occupied and used this area and maintain traditional connections to the Monument to this day.

Through these treaties, the tribes retained certain lands for exclusive use (the four reservations) and also retained the rights to continue traditional activities outside the reservations. These reserved rights include the rights to fish at "usual and accustomed places"—the taking of fish applies to the Hanford Reach. Additional rights included those to hunt, gather foods and medicines, and pasture livestock on open and unclaimed lands.

Tribal access to those portions of the Monument managed by the FWS under DOE permit for gathering and other traditional practices is guided by the FWS Native American Policy. The FWS will seek to develop agreements with each tribe for addressing tribal access to areas for foods, collection of medicines and other resources, traditional practices, and other tribal concerns, subject to DOE approval. Tribal access to DOE-managed portions of the Monument is managed under DOE policy.

The existing FWS Native American Policy, Executive Order (EO) 13175, and legislation provides guidance for directing on-going consultation. The Native American Policy, in particular, assists the FWS in accomplishing its mission of resource protection while also guiding the federal government's interactions with tribes to:

> . . . assist Native Americans in protecting, conserving and utilizing their reserved guarantee of statutorily identified trust resources. The Service will consult with Native American governments on fish and wildlife resource matters of mutual interest and concern to keep Native American governments involved in such matters from initiation to completion of related Service activities. . . . The Service will continue to involve Native American governments in all Service actions that may affect cultural or religious interests, including archaeological sites. The Service is guided by such legislation as the American Indian Religious Freedom Act, the Native American Graves Protection Act, the National Historic Preservation Act, the Native American Graves Protection and Repatriation Act, and Archaeological Resources Protection Act.

1.6.2 Valid Existing Rights

Some federal lands underlying the Monument or within the area covered by this CCP (e.g., Columbia River islands) are owned by the Bureau of Land Management (BLM), BOR, or ACOE. In addition to acquiring private lands, the Hanford Site was created by withdrawing public land; the AEC entered into agreements with the BLM and BOR to obtain management responsibility for certain withdrawn and acquired lands held by these two agencies. According to a White House background paper on the Monument's creation, "these arrangements are not altered by the proclamation, but all agreements should be reviewed for consistency with the Monument" (Monument Proclamation White House Background Paper).

The mix of jurisdictions, management and uses of Monument lands are the basis for the valid existing rights described in the Monument Proclamation: "The establishment of this monument is subject to valid existing rights." This reflects the President's intention to honor rights that existed within the boundaries of the Monument prior to its establishment on June 9, 2000. Valid existing rights vary, but the details of each one are specified in the authorizing document. The exercise of such rights can, however, be managed to protect the purposes of the Monument.

The following sections describe six main categories of valid existing rights and discuss how they will be addressed in future management.

1.6.2.1 DOE Remediation and Restoration

As a result of decades of weapons material production and military use of the area, the Hanford Site is one of the largest National Priority List (NPL)[7] sites in the country. One of the current primary missions of the Richland Office of the DOE is cleanup and remediation of the Hanford Site. Under the Monument Proclamation, the Monument designation has no effect on the responsibility of the DOE for hazardous waste cleanup or restoration of natural resources. The DOE continues to be responsible for cleanup, restoration activities, security, safety and emergency preparedness. The DOE will manage lands within the Monument that are not subject to management agreements with the FWS under its existing authorities and consistent with the purposes of the Monument.

1.6.2.2 Mineral Rights (Including Oil and Gas)

The Monument Proclamation withdrew all federal lands and interests in lands within the Monument from entry, location, selection, sale, leasing, or other disposition under the public

[7] Sometimes referred to as "Superfund."

land laws. This includes, but is not limited to, withdrawal from location, entry and patent under the mining laws and withdrawal from disposition under all laws relating to mineral and geothermal leasing, other than by exchange that furthers the protective purposes of the Monument. Thus, the withdrawal prevents the location of new mining claims under the 1872 Mining Law and prevents the Secretary of the Interior from exercising discretion under the mineral leasing acts and related laws to lease or sell federal minerals within the boundaries of the Monument.

Within the Monument there is only one existing privately held mineral right. This mineral right, located on portions of three sections of land in the east end of the ALE (1,280 acres), is held by the Big Bend Alberta Mining Company. The AEC acquired the surface title to this acreage by condemnation in 1952, but the company retains its right to explore for oil and gas.[8]

1.6.2.3 Columbia Basin Reclamation Project and Columbia River Transmission System

The Presidential Proclamation states: "Nothing in this proclamation shall interfere with the operation and maintenance of existing facilities of the Columbia Basin Reclamation Project, the Federal Columbia River Transmission System, or other existing utility services that are located within the Monument. Existing Federal Columbia River Transmission System facilities located within the Monument may be replaced, modified, or expanded, and new facilities constructed within the Monument, as authorized by other applicable law. Such replacement, modification, expansion, or construction of new facilities shall be carried out in a manner consistent with proper care and management of the objects of this proclamation." Additionally, Columbia Basin Project irrigation canals, water return canals, and ponds are located within the Monument. The FWS will work closely with these entities to protect Monument resources and develop management agreements as appropriate.

1.6.2.4 State of Washington Wildlife Management

The FWS has primary jurisdiction of fish and wildlife on Monument lands as established through a variety of laws, policies and directives related to migratory and resident fish and wildlife resources on federal lands. However, fish and wildlife resources in the state of Washington belong to the residents of the state. The Monument Proclamation states: "Nothing is this proclamation shall be deemed to enlarge or diminish the jurisdiction of the State of

[8] The Big Bend Alberta Mining Company holds all the oil and mineral rights on the northeast 1/4 of Section 1 in Township 10N, Range 26E; Section 27; and all of Section 35 except the southwest 1/4 in Township 11N, Range 26E.

Washington with respect to fish and wildlife management." This is consistent with the Improvement Act, which states in part, "Nothing in this Act shall be construed as affecting the authority, jurisdiction, or responsibility of the several States to manage, control, or regulate fish and resident wildlife under State law or regulations in any area within the [NWRS]. Regulations permitting hunting or fishing of fish and resident wildlife within the [NWRS] shall be, to the extent practicable, consistent with State fish and wildlife laws, regulations, and management plans."

The Monument is part of the NWRS; federal management activity involving migratory birds and other wildlife residing on units of the NWRS is a federal function specifically authorized by Congress. It is therefore for the Secretary of Interior to determine whether units of the NWRS shall be open to public uses, such as hunting and fishing, and on what terms such access shall be granted. However, in recognition of the existing jurisdictional relationship between the states and the federal government, Congress has directed that, to the maximum extent practicable, such public uses shall be consistent with state laws and regulations (43 Code of Federal Regulations [CFR] 24.4). Consistent with the Improvement Act, the Director of the FWS will "interact, coordinate, cooperate and collaborate with state fish and wildlife agencies in a timely and effective manner on the acquisition and management of national wildlife refuges" (Director's Order Number 148).

1.6.2.5 Columbia River Use

Management of the Columbia River is a complex interaction of federal and state law, federal and state agencies, and national and international policies. Management of the Columbia River is outside the scope of this CCP. However, there are several specific points that must be recognized as the CCP is developed and implemented.

- The Columbia River is navigable. Therefore, water within the Columbia River is held in trust by the state of Washington under its hybrid appropriations system; withdrawals are subject to state law.

- The Presidential Proclamation did nothing to change ownership.

- River flows have been established through a host of other venues and processes, and altering flows is outside the scope of this CCP.

- The Proclamation " reserves in the portion of the Columbia River within the boundaries of the Monument, subject to valid existing rights and as of the date of the proclamation, sufficient water to fulfill the purposes for which the Monument is established."[9]

[9] The FWS has no current plan to file for water rights.

1.6.2.6 Communication Sites and Local Utilities

Prior to the establishment of the Monument, the DOE authorized the use of public lands for roads, underground cables, electrical transmission structures, communication facilities, and other utility-related features. Some of these authorizations may include valid existing rights. These authorizations, where they are determined to be a valid existing right, will be recognized on the Monument, and their uses will be allowed, subject to the terms and conditions of the authorizing document. While the FWS will not eliminate valid rights, the exercise of such rights may be managed to protect the purposes of the Monument. Where a use conflicts with the protection of Monument resources, and where legally possible, the FWS will work with rights holders to implement appropriate measures to protect Monument resources through the adjustment of the underlying authorization (leases, permits, easements, etc.). Where the FWS has jurisdiction over a use, a compatibility determination may be required (see the Glossary, Appendix A, for the definition of a compatibility determination). For uses specifically authorized for a period longer than ten years, the use is subject to a compatibility determination at the time of initial application and at the time a term expires and the FWS receives a request for renewal.

1.6.3 National Wildlife Refuge System Improvement Act

The Improvement Act amends the Refuge System Administration Act of 1966 by defining a unifying mission for all national wildlife refuges, including a new process for determining compatible uses on refuges and requiring that each refuge be managed under a CCP. The Improvement Act expressly states that wildlife conservation is the priority of NWRS lands and that the Secretary of the Interior shall ensure that the biological integrity, diversity and environmental health of refuge lands is maintained. Each refuge must be managed to fulfill the NWRS mission and the specific purposes for which the refuge was established. The first priority of each national wildlife refuge is to conserve, manage and, if needed, restore fish and wildlife populations and habitats according to its purpose.

The Improvement Act requires that a CCP be completed for each refuge by the year 2012, and that the public have an opportunity for active involvement in plan development and revision. It is FWS policy that CCPs are developed in an open public process; the agency is committed to securing public input throughout the process.

1.6.4 American Antiquities Act

The Monument was created under the authorities granted the President by the American Antiquities Act of 1906, which states ". . . the President of the United States is hereby authorized, in his discretion, to declare by public proclamation historic landmarks, historic and

prehistoric structures, and other objects of historic or scientific interest . . . to be national monuments, and may reserve as a part thereof parcels of land. . . ."

Although a national monument, in creating the Monument President Clinton noted that : "The [FWS] manages lands under its management jurisdiction pursuant to the National Wildlife Refuge System Administration Act . . ." (White House Background Paper). That is, the Monument was to be administered as a component of the NWRS. A July 26, 2000, memorandum from Interior Secretary Babbitt further clarified that the Monument was to be administered as a national wildlife refuge: "Pursuant to the terms of the management agreements [between the DOE and FWS] and the National Wildlife Refuge Administration Act, these areas are units of the National Wildlife Refuge System."

In short, although it is a national monument, the Monument is also a component of the NWRS; the provisions of both the NWRS and the American Antiquities Act apply. In the event of a conflict between the two, the more protective provision applies. Since the Monument is both a national monument and a national wildlife refuge, the resources covered by each designation must be protected.

1.6.5 National Wildlife Refuge System and Policies

The mission of the National Wildlife Refuge System is:

> To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. (16 USC § 668dd et seq.)

The NWRS has grown to include more than ninety-five million acres and nearly 550 national wildlife refuges. The NWRS is the largest collection of lands specifically managed for fish and wildlife conservation in the nation. The needs of wildlife and their habitats come first on refuges, in contrast to most other public lands which are managed for multiple uses.

The administration, management and growth of the NWRS are guided by the following goals.

- To fulfill a statutory duty to achieve refuge purpose(s) and further the NWRS mission.
- To conserve, restore where appropriate, and enhance all species of fish, wildlife and plants that are endangered or threatened with becoming endangered.
- To perpetuate migratory bird, interjurisdictional fish, and marine mammal populations.

- To conserve a diversity of fish, wildlife and plants.

- To conserve and restore, where appropriate, representative ecosystems of the United States, including the ecological processes characteristic of those ecosystems.

- To foster understanding and instill appreciation of native fish, wildlife and plants, and their conservation, by providing the public with safe, high-quality and compatible wildlife-dependent public use. Such use includes hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

1.6.6 Public Use of the Monument

The first priority of the NWRS is to protect the biological resources entrusted to the FWS and the irreplaceable cultural resources found within the NWRS. However, wherever possible and compatible with resource protection, a national wildlife refuge should be open and available to the public for its use and enjoyment. Consistent with the National Wildlife Refuge System Administration Act, the FWS makes a special effort to provide wildlife-dependent public use opportunities across the NWRS. Balancing these often-conflicting goals is accomplished through a variety of means, including the development of CCPs.

To determine what uses can be allowed on a national wildlife refuge, the FWS firsts determines whether the use is appropriate. For this CCP, Monument staff applied a series of questions/ standards to help the Monument Project Leader determine whether a use was appropriate (see Appendix H). If the activity was determined to be an appropriate use of the Monument, the FWS developed what are known as compatibility determinations (CDs). These CDs determine whether the proposed activity is compatible with the Monument's purposes and the mission of the NWRS. Only if the activity is determined compatible with resource protection by the Monument Project Leader, with concurrence by the Region 1 Chief of Refuges, may it be allowed to occur. The CDs for the Monument are presented in Appendix I.

1.6.7 Authority to Plan for DOE Lands in the Monument

The Monument Proclamation established the authority of the FWS to write a management plan for the Monument (Appendix C). As stated in the Presidential Proclamation for the Monument:

> The monument shall be managed by the U.S. Fish and Wildlife Service under existing agreements with the Department of Energy, except that the Department of Energy shall manage the lands within the monument that are not subject to management agreements with the Service, and in developing any management plans and rules and regulations governing the portions of the monument for which the Department of Energy has

> management responsibility, the Secretary of Energy shall consult with the Secretary of the Interior.
>
> As the Department of Energy and the U.S. Fish and Wildlife Service determine that lands within the monument managed by the Department of Energy become suitable for management by the U. S. Fish and Wildlife Service, the U.S. Fish and Wildlife Service will assume management by agreement with the Department of Energy. All agreements between the U.S. Fish and Wildlife Service and the Department of Energy shall be consistent with the provisions of this proclamation.

All lands included in the Monument are federal lands under the primary jurisdiction of the DOE. Under agreement with the DOE, the FWS manages the ALE (eastern portion of the Rattlesnake Unit) and most of the Monument lands north of the river—including the Wahluke, Ringold and Saddle Mountain Units—and the shorelines of the Columbia River Corridor Unit in Franklin and Grant Counties to the east of the Vernita Bridge.[10] The DOE manages the balance of the Monument, including the western end of the Rattlesnake Unit and the remainder of the Columbia River Corridor Unit (west of the Vernita Bridge in Grant County, all of the Benton County shoreline, and the Hanford Dune Field). The DOE intends to manage its portion of the Monument consistent with existing regulatory agreements regarding cleanup of the Hanford Site (Hanford Federal Facility Agreement and Consent Order),[11] the Hanford Comprehensive Land-Use Plan (DOE 1999, 64 Federal Register [FR] 61615), the Monument Proclamation (65 FR 37253).

1.6.7.1 Protection of Additional DOE Lands

The same day President Clinton created the Monument, he sent a memorandum to the Secretary of Energy, Bill Richardson, declaring that the DOE "manage the central area to protect these important values [shrub-steppe habitat and other objects of scientific and historic interest] where practical." The President further directed the Secretary of Energy "to consult with the Secretary of the Interior on how best to permanently protect these objects, including the possibility of adding lands to the monument as they are remediated."

1.6.8 DOE Goals, Existing Land Use Plan and Policies

It is DOE policy (DOE Land and Facility Use Policy, DOE P430.1 December 21, 1994b) to manage all of its land and facilities as valuable national resources. The DOE's stewardship is

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[10] Please refer to Chapter 2 for a description of the new management units.

[11] Adopted by the Washington Department of Ecology, U.S. Environmental Protection Agency, and DOE in 1989.

based on the principles of ecosystem management and sustainable development. The DOE integrates mission, ecological, social and cultural factors at each site in a comprehensive plan that guides land and facility use decisions. Each comprehensive plan considers the site's larger regional context and is developed with stakeholder participation. The DOE policy results in land and facility uses that support its critical missions and protect the environment.

At the Hanford Site, the DOE completed the *Final Comprehensive Land Use Plan Environmental Impact Statement* (CLUP) in 1999 with the assistance of nine cooperating agencies, including the FWS. The CLUP is subject to five-year reviews by the DOE, and it is still the active plan for DOE-controlled portions of the Hanford Site, including FWS-managed portions of the Monument. The CLUP will remain in effect until such time as jurisdiction is transferred to another entity or is superceded by the adoption of this CCP or another DOE plan.[12]

1.7 Monument Purpose

The Monument was established to protect "antiquities" and to set aside lands for scientific purposes. The Presidential Proclamation regarding the Monument defines the reasons the Monument was established and the purposes for which it is to be managed. The Monument Proclamation is unusual in its level of detail and is very specific as to those resources deemed nationally significant. The resources specifically mentioned include:

- A shrub-steppe ecosystem, including breeding populations of steppe and shrub-steppe dependent birds such as loggerhead shrikes, sage sparrows, sage thrashers, and ferruginous hawks.

- Water-related resources, including 46.5 miles of the 51-mile-long Hanford Reach of the Columbia River, fall Chinook salmon spawning areas, and sturgeon.

- A diversity of native plant and animal species, including rare and sensitive plant species such as Umtanum desert buckwheat and White Bluffs bladderpod; habitat for migratory birds, as well as resident species, including wintering habitat for bald eagles, white pelicans, and ducks; nesting sites for rare bird species, including prairie and peregrine falcons; mammals, including elk, beaver, badgers, and bobcats; and insect species new to science or not previously identified in the state of Washington.

- Microbiotic crusts.

[12] The DOE, as cooperating federal agency, will have the opportunity to prepare a ROD adopting CCP/EIS decisions for those Monument lands under its management.

- Significant geological and paleontological objects, such as the White Bluffs and Hanford Dune Field, and mammalian fossils of rhinoceros, camel, mastodon and others.

- Important archaeological and historic artifacts from more than 10,000 years of human occupation, including prehistoric pit houses, graves, spirit quest monuments, hunting camps, game drive complexes, quarries, hunting and kill sites, and more recent human activity such as homesteads and early towns.

The Monument Proclamation also sets forth specific management actions that are to be followed, establishing a basis for management of the Monument. In addition, it sets forth the following mechanisms for protection of the significant resources found in the Monument.

- Federal lands are withdrawn from disposition under public land laws. This includes all interests in these lands, such as future mining claims.

- Off-road vehicle use is prohibited.

- The ability to apply for water rights is established.

- Grazing is prohibited.

- The FWS and DOE (subject to certain provisions) are established as the managers of the Monument.

- A land management transfer mechanism from the DOE to the FWS is established.

- Clean-up and restoration activities are assured.

- Existing rights, including tribal rights, are protected.

1.8 Vison for the Hanford Reach National Monument

One of the first steps in writing specific management direction for any refuge is creation of a vision statement. A vision statement is a ". . . concise statement of what the planning unit should be, or what we hope to do, based primarily upon the [NWRS] mission and specific refuge purposes, and other mandates" (602 FW 1.6). At its core, the vision statement describes how the Monument should look in the future and outlines resource management and public use. It provides a sense of direction and something for which to strive.

The vision statement establishes the groundwork for the creation of management goals and objectives. Goals are the first step in identifying specific management actions; they identify and focus management priorities and provide a link between management actions, the Monument Proclamation, legal requirements, and FWS policies and procedures. Goals work towards realizing the Monument's vision and purposes, providing the framework for sound and defensible management decisions. Objectives are incremental steps taken to achieve a goal. They derive from goals and provide a foundation for determining implementation strategies, monitoring refuge accomplishments, and evaluating success. Objectives should be specific, measurable, achievable, results-oriented, and time-fixed.

The FWS solicited the assistance of the public, cooperating agencies, tribal governments, and the Hanford Reach National Monument Federal Planning Advisory Committee (FAC; described in Section 1.10.1) in developing its vision, goals and objectives. As the result of numerous meetings and a series of three public workshops, a vision statement, ten management goals, and an initial list of objectives were established. Below is the vision the Monument will follow for at least the next fifteen years. Goals and objectives can be found in Chapter 2, where they provide details for the alternatives under consideration.

The Monument's long-term vision:

> *The Hanford Reach National Monument is a biologically diverse landscape, embracing a remarkable natural and historic legacy. The Hanford Reach, the last free-flowing non-tidal stretch of the Columbia River, is the ribbon that weaves shrub-steppe and riverine communities together, defining an irreplaceable landscape—a place to discover the richness of life, to reflect upon history, and to experience nature in solitude.*
>
> *The Monument's diversity of plants and wildlife is critical to the biological integrity of the Columbia Basin. The unique combination of an expansive and increasingly rare shrub-steppe ecosystem, the free-flowing river, and the last major salmon spawning grounds in the Columbia River create a diverse and precious mosaic of habitats. The Monument is a refuge for a multitude of species, many new to science.*
>
> *The Monument is a natural gathering place to learn, experience, and celebrate cultures, a place where stories are protected and passed on. Its history of immigrant settlement and the dawning of the atomic era is acknowledged, as well as its continuing physical and spiritual sustenance for the Native Americans who have used the area and the people who came later. The Monument is a testimonial to the past and the sacrifices of our ancestors. The Monument is also a vision into the future where visitors, neighbors, and partners are valued and respected; natural and historic resources are protected; and all may come to experience the Monument and its magnificent resources.*

1.9 FWS Coordination With Other Governments, Agencies and Organizations

The CCP for the Monument is intended to meet coordination requirements of the Improvement Act and other pertinent laws, policies and directives. The associated EIS fulfills compliance with the NEPA. All require that the FWS actively seek public involvement and tribal input in the preparation of environmental documents. The NEPA also requires that the FWS seriously consider all reasonable alternatives, including the "No Action Alternative," which represents continuation of current conditions and management practices. The overall CCP process is guided by the Refuge Planning Chapter of FWS Refuge Manual 602 FW 3, 2000.

1.9.1 Hanford Reach National Monument Federal Planning Advisory Committee

Following the signing of the Monument Proclamation, the Secretary of the Interior established the FAC to provide advice to the FWS on a management plan for the newly established Monument. The initial FAC charter for a two-year period was approved in 2001, with thirteen members appointed to represent diverse stakeholder interests in the Monument planning process (see Appendix G). The FAC charter was renewed in 2003 for an additional two years. The 2003 charter expanded membership to nineteen positions; however, the new positions were not filled prior to the expiration of the FAC charter on January 10, 2005.

Although the FAC charter has expired, prior to its expiration the FAC was instrumental in developing the draft CCP. The FAC provided advice on the Monument's vision, the range of alternatives, management goals and objectives, the CCP process, and a multitude of controversial issues. The FWS also invited the FAC to provide input on what their preferred alternative might look like; the FAC's input is reflected in Alternative E.

1.9.2 Tribal Consultation

The FWS and DOE are required to consult with Native American tribal governments prior to taking any action with potential impact on American Indian nations. Meaningful and timely communication and coordination with tribes helps determine management concerns and identify opportunities and impacts related to traditional and cultural life ways and natural resources, as well as respects and preserves treaty and other reserved rights.

Coordination with the treaty and other tribes on the CCP began in August 2001 with an initial meeting with the CTUIR. In March 2002, the FWS sent a letter to each concerned tribe formally

inviting them to participate in the CCP process. Several subsequent meetings were held with technical staff from the CCT, CTUIR, Nez Perce Tribe, and Yakama Nation, as well as the Wanapum, during the planning process. Tribal representatives were invited to—and several tribes participated in—planning workshops and resource reviews held in 2002 and 2003.[13] Monument staff traveled to, and gave presentations to, the Yakama Nation, CTUIR, Nez Perce Tribe, and CCT, seeking tribal input and concerns and providing updates related to plan goals, objectives and alternatives. Several efforts were made to provide a presentation to the Wanapum; however, tribal emergencies led to their cancellation. A list of these meetings can be found in Chapter 5.

1.9.3 Cooperating Agencies/Consulting Tribal Governments

Coordination among participating agencies, tribes and other levels of government is a fundamental element of the CCP process. A team of eleven cooperating agencies and representatives from three tribes was established to obtain technical expertise and assistance in writing the CCP and EIS.[14] Chapter 5 provides additional details on coordination. The cooperating/consulting interests are:

- Adams County.
- Benton County.
- Bonneville Power Administration.
- Bureau of Reclamation.
- Confederated Tribes of the Umatilla Indian Reservation.
- Department of Energy.
- Grant County.
- Nez Perce Tribe.
- Richland (City).
- U.S. Army Corps of Engineers.
- Washington Department of Ecology.
- Washington Department of Fish and Wildlife.
- Washington Department of Natural Resources.
- Yakama Nation.

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[13] The FWS and DOE recognize that the participation of tribal staff at public meetings and workshops does not constitute government-to-government consultation with tribes. The public process is distinct and separate from the agencies' responsibility to have meaningful and timely dialogue with tribal leaders on matters that will affect tribal affairs or resources.

[14] The initial team comprised eight agencies and one consulting tribe in 2002; the other members joined as the process progressed.

1.9.4 Public Involvement and Scoping

Public involvement was given considerable attention in the Monument's CCP process. Public involvement began with a Notice of Intent published in the *Federal Register* on June 12, 2002, notifying the public of the start of the formal planning process. A series of four public scoping meetings—Mattawa, Seattle, Richland and Yakima, Washington—were held in August and September 2002 to gather comments on issues to be addressed in the CCP. A planning workbook was produced and distributed to aid participants in preparing comments, and a scoping report was prepared in early 2003. To date, Monument staff have given dozens of presentations to a variety of recreational, economic development, sport, civic, governmental, environmental and other groups. Tools used to encourage public involvement included public meetings, planning update newsletters, workbooks, workshops, presentations, web pages, and *Federal Register* notices. Chapter 5 provides additional details, including those related to the public review of the Draft CCP.

1.10 Issues, Concerns, and Opportunities

The planning team evaluated the issues and topics documented during the scoping and resource review processes. **Issues** are defined as matters of controversy, dispute, or general concern over resource management activities, the environment, or land uses. Issues are important because they identify topics to be addressed in the plan, pinpoint the types of information to gather, and help define alternatives for the plan. Numerous issues, concerns and opportunities were raised, and all are addressed in some manner in the CCP. It is the FWS's responsibility to focus planning and the EIS analysis on the major issues. Major issues typically suggest different actions or alternative solutions and are typically those within Monument jurisdiction. Major issues will influence the decisions proposed in the plan. The major issues, concerns and opportunities are presented in the sections that follow.

1.10.1 Biological Resources

How will the biological resources be managed, protected, enhanced and/or restored?

The Monument contains one of the last remaining large areas of native plant communities and habitats within the Columbia Basin. Unique to this area are remnant plant communities with intact microbiotic crusts that are inhabited by approximately 1,500 distinct species—forty-one of which are new to science—including many sagebrush-obligate and rare species (e.g., Umtanum desert buckwheat, White Bluffs bladderpod). Large mammals, such as elk and mule deer, inhabit areas of the Monument.

Shrub-steppe plant communities (e.g., bitterbrush/Indian ricegrass and big sagebrush/bluebunch wheatgrass) found in the Monument are regionally significant and are rapidly disappearing in eastern Washington. One of the primary threats to the diversity associated with native plant species and communities present in the Monument is the introduction and spread of non-native, invasive species (e.g., spotted knapweed). The primary means by which invasive species have and will continue to infest the Monument is through establishment following disturbances such as wildfire, road construction or maintenance, utility rights-of-way upkeep, and off-road travel. Wind and vehicles are the primary mechanisms of dispersal.

Because of the degradation of the shrub-steppe habitat, the natural fire interval has been significantly decreased. Increased fire frequency and the spread of a cheatgrass understory (an introduced species) will continue to increase the loss of the remnant habitat to catastrophic fires.

A major management issue regarding shrub-steppe is the restoration of communities on the Monument and connection with those on adjacent lands. Large intact areas of shrub-steppe habitat improve ecosystem functionality and provide improved support for shrub-steppe obligate species. Approximately 50% of Monument lands may require some degree of restoration activity to restore proper functioning conditions.

1.10.2 Fisheries

What actions can be taken to protect fisheries?

Fishery resources are abundant within the Hanford Reach, with the fall Chinook salmon stock as the most important fishery resource to commercial and recreational fishers and area tribes.[15] Salmon populations and their utilization of the Hanford Reach are well documented. Federally listed upper Columbia River steelhead, as well as hatchery steelhead, also utilize the Hanford Reach. Fall and summer Chinook, hatchery steelhead, sturgeon and mountain whitefish all provide economically valuable fisheries and subsistence fisheries for the tribes.

The health of fishery resources that use the Hanford Reach depends on water quality, quality of riparian habitat, and protection of critical spawning and rearing habitat. Much of the native in-river habitat remains intact for several valuable species. However, construction of dams on the Columbia River has resulted in significant losses of mainstem spawning habitat, which is the primary reason 80% of the existing mainstem Columbia River fall Chinook stock spawn and rear within the Hanford Reach.

[15] Fishing rights are among the most significant of all tribal treaty rights, especially with the Boldt decision recognizing the right of the tribes to 50% of the salmon return.

The fisheries resources can be improved through a number of measures, including restoring riparian habitat, designing river flows to benefit fish, assuring prudent harvest allocation, supplementing hatcheries, and reducing sources of contaminants from off-site sources. While the only measure directly within the scope of Monument management is riparian habitat, other objectives should support existing management forums and federal, state and Native American fisheries management goals, which are essential components of effective fisheries management of the Hanford Reach.

1.10.3 Cultural Resources

How will cultural resources be protected?

Cultural resources within and adjacent to the Monument are both extensive and diverse and were a significant contributor towards establishing the Monument. These resources include a cultural record of Native American use spanning more than 12,000 years, including evidence of use of arid lowlands for fishing, hunting, hunting camps, game drive complexes, and game processing sites. Early European settlement of the area is well documented and of significance regionally. The historic buildings and structures, including industrial and operational artifacts, associated with the Manhattan Project and the Cold War are extensive and internationally renowned.

Once lost, these resources can never be replaced, and there are numerous threats to cultural resources. Cultural material continues to be exposed by erosion. Biological restoration can affect cultural resources. Public access and use could also adversely affect culturally sensitive sites, resources currently used by Native American, and Native American traditional use of the area, through direct disruption, intrusion, fire, vandalism, looting, spread of weeds, etc.

One protection plan does not fit all sites and resources. Architectural resources may benefit from public visitation while archaeological resources may be more fragile or have sensitivity issues associated. Balancing use of the Monument with resource protection will be addressed through a subsequent step-down plan.

1.10.4 Geological and Paleontological Resources

How will geological and paleontological resources be protected?

There are numerous threats to the Monument's unique and irreplaceable geological and paleontological resources, such as illegal collection and illegal off-road vehicle use. Many other threats have collateral consequences to other resources. The slumping of the White Bluffs causes major adverse impacts on the geological and paleontological resources in both the bluffs and the river corridor. Fossil resources in landslides erode from the White Bluffs and sometimes

fall into the channel, altering stratigraphic sequence. Bluff slumping threatens salmon spawning beds, bird nesting habitat, riparian habitat zones, water quality, and the Monument's aesthetic/scenic resources. Increased erosion of Locke Island has resulted in degradation of the archaeological resources of the island, creating a substantial loss of local Native American cultural heritage. A restoration plan for sites with severe and unnatural erosion is needed.[16]

1.10.5 Contaminants

How will contamination issues be addressed?

Contaminants on and adjacent to the Monument originate from several sources, including past Hanford Site nuclear material production activities, past agricultural activities, current Hanford remediation activities, return waters from the Columbia Basin Irrigation Project, and a variety of past and present uses occurring upriver (e.g., mining, agriculture, municipal/industrial discharges).

Several legally mandated processes—such as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); state hazardous waste laws; the Clean Water Act; and the Resource Conservation and Recovery Act—are in place to address contaminant remediation and the accepted use of industrial and agricultural chemicals. The Monument designation does not affect the responsibility of the DOE and other responsible parties to comply with applicable environmental laws to remediate hazardous substances and restore natural resources on Monument lands and waters. However, opportunities may be available to benefit the Monument by working with local, state and federal agencies and tribes on various contaminant-related issues, such as cleanup of hazardous waste, review of permits, and the collection of information. Potential environmental impacts from clean-up activities are not directly addressed within this CCP; rather, current conditions, institutional controls, management actions, and agency roles and responsibilities are described and accounted for within the planning time frame.

In 1989, the EPA placed portions of the Hanford Site on the NPL under the CERCLA. Since then, most lands within the Monument boundaries have been removed from the NPL, except for the 1/4-mile-wide Benton County shoreline of the Columbia River and the nearby sand dunes. The south shoreline, administered by the DOE, with its nuclear reactors in and adjacent to the Monument, is the focus of accelerated cleanup efforts. Safety and security concerns related to

[16] Slumping of the White Bluffs is occurring due to excess irrigation water diverted to ponds and unlined canals behind the bluffs that is seeping down to the Ringold Formation (Bjornstad 2006a). Once water encounters the impermeable Ringold Formation it moves laterally toward the bluffs, where the water seeps out along the bluffs and slumping occurs. This activity is beyond the control of the FWS since a number of federal and state agencies need to agree on the problem and address it together.

contaminants and cleanup activities may require some of the south shoreline to remain closed to public access.

Within the CERCLA de-listed Monument lands (areas north of the river, the Rattlesnake Unit, and the area south and west of the Vernita Bridge in the Columbia River Corridor Unit), several small sites of concern have been identified by the FWS as having potential contaminant and/or safety concerns for which special management actions, including public access restrictions, may be required under the lead of the DOE.

Return flows from agricultural irrigation transport water into the Monument and the Columbia River. This agricultural drainage and run-off has created lakes, ponds, streams/ditches, and wetlands on the Monument. Contaminant concerns within that return flow may require restrictive management actions for public safety. Similarly, additional investigation and monitoring of natural resources in the Columbia River and its riparian zone may indicate the need for restrictive management actions resulting from contaminant-related effects.

A recent U.S. Environmental Protection Agency (EPA) advisory (EPA Advisory #4570) raised human health concerns related to PCB contaminants and consumption of fish taken from the lower Columbia River (well below the Hanford Reach). Other fish consumption advisories have also been issued, such as the 2003 state-wide bass consumption advisory due to increased mercury levels.

The Monument supports a number of Native American foods and medicines and contains sacred places important to tribal cultures. The tribes hope to safely use these resources in the future and require assurance that the environment is clean and healthy. Tribal and/or public access and consumption restrictions may be required in certain areas until potential threats are eliminated or reduced.

1.10.6 Elk Management

How will the elk population be managed on the Monument?

The need for elk population control/herd management has been discussed for several years among the FWS, WDFW, DOE, tribes, local governments, and private landowners, primarily to meet state population goals. While the WDFW's *Rattlesnake Hills Elk Management Plan* identifies a population goal of less than 350 elk, the herd has ranged from 450 to more than 800 animals over the last nine years. While effective in the short term, trapping on the Monument and relocation to suitable sites, combined with special and extended hunting seasons established by the WDFW on adjacent lands, has not reduced this herd to the target level. Damage to adjacent agricultural crops, with the resultant damage claims, has resulted in an increased interest in conducting active management of the herd in the Monument. Population control

measures may use both lethal and nonlethal methods, such as trapping and relocating; government culling; hazing; permitted and controlled hunting; and/or contraception. A single measure or a combination of measures may be implemented in coordination with landowners, DOE, WDFW, and/or tribes to reduce populations to a level that is consistent with WDFW management goals. Background information on elk is provided in Chapter 3.

1.10.7 Visitor Use

What recreation activities and interpretation and education programs are appropriate and where will they occur?

The Monument provides recreational and educational opportunities on the nation's last remaining non-tidal, free-flowing stretch of the Columbia River and in associated shrub-steppe settings. The Monument's outstanding biological and geological resources, panoramic scenery, and opportunities for solitude contribute to quality recreational opportunities. In addition to natural resources, educational opportunities arise from the Monument's wealth of cultural resources associated with Native American use, post-European settlement, the Manhattan Project, and the Cold War. The natural and cultural resources, including historical events with world-wide consequences, provide opportunities for people to visit and recreate in a setting that is not duplicated anywhere.

Traditional recreational activities include fishing, hunting, boating, wildlife and scenic viewing, hiking, horseback riding, and bicycling. Current recreation use is light to moderate, except during fall salmon fishing when river access points are heavily congested. Under permit from the DOE, the FWS allows the public to access about 35% of the Monument year-round for day use, although this would increase substantially under the preferred alternative to almost 57% of the Monument being opened at some point. The remaining Monument lands are managed under a special-use permit system that provides access only for approved educational and research purposes.

Visitor amenities are currently few. Visitor facilities consist of gravel and dirt roads, small parking areas, primitive boat ramps, and directional signing. There are a few commercial guide services offering fishing, hunting and sightseeing excursions.

Maintaining traditional recreation activities is important to many people. A number of people want expanded opportunities, such as camping, interpretation and education programs, and some people have requested improved facilities such as better roads, boat launches, trails and signing. A segment of the public wants more access to areas within the Monument that are currently closed to general public access.

An important consideration in determining the type and amount of visitor use activities is potential impacts on natural and cultural resources. Examples of recreation use impacts are wildlife and habitat disturbance, invasive species spread, removal of cultural artifacts, and human-caused wildfire. Determining which activities are appropriate for, and compatible with, the Monument; the best locations for these activities; and how the FWS can ensure adequate protection for Monument resources are just a few of the issues that must be addressed in balancing public use and access with protecting the resources of the Monument.

1.10.8 Access and Transportation

How will transportation be managed to provide access for public uses, management needs, and valid existing rights?

Transportation must be managed to provide access for management needs, valid existing rights, and public uses. Roads in particular often play a key role in providing recreational access. Studies in national parks indicate that most visitor use occurs within 1/4-mile of roads. The Monument has an extensive network of roads that was developed for different needs during different eras. Although most of these roads are unimproved, closed to the public, and rarely used even for administrative purposes, some are critical for management activities, such as utility maintenance and fire control. The road corridors unnecessary for management purposes and public use/access could be restored to a natural condition or converted to recreational trails. Other transportation corridors include the Columbia River and railroad infrastructure. Commercial guides are interested in the possibility of using boats and trains to bring visitors to the Monument. Decisions about transportation management should consider habitat impacts, historical significance, administrative needs, maintenance costs, safety and recreational needs.

1.10.9 Facilities and Infrastructure

What facilities and other infrastructure are needed and where?

Facilities for the Monument include all structures for visitors, administration and research. As a result of local community input and action, the CCP assumes a single, large-scale office/visitor center/museum is desirable and will be located outside the Monument boundaries. However, other facility-related decisions are necessary to manage the visitor use and research programs and to protect/manage the Monument's natural and cultural resources. Such decisions include determining the type and location of maintenance, visitor, research and administration facilities. For example, the observatory on the top of Rattlesnake Mountain is not part of the mission of

the FWS, and access to the facility is expensive to maintain; the future of that facility needs to be determined.[17]

1.10.10 FWS-Managed Lands

Which additional Monument lands are suitable and appropriate for FWS management as part of the NWRS?

There are approximately 29,000 acres of land within the Monument not currently managed by the FWS. This land and associated facilities are managed by other state and federal agencies, such as the WSDOT (Vernita Rest Area), WDFW (area north and west of the Vernita Bridge), and DOE (western end of the Rattlesnake unit, Columbia River Corridor Unit south and west of the Vernita Bridge, several Columbia River islands, the western shoreline of the Columbia River Corridor Unit, and the dune field). The Presidential Proclamation directs the Secretary of the Interior to manage the Monument through the FWS under existing authorities and agreements with the DOE. The FWS and DOE are expected to extend agreements to other lands included in the Monument that are not now managed by FWS.

1.10.11 Other Issues

Several issues were raised during the scoping process that are covered in this CCP but are not the focus of detailed analysis or not within the range of alternatives. Listed below are issues with actions that may be treated the same under all alternatives and/or addressed in the CCP goals, objectives or in subsequent step-down plans.

- Monitoring programs.
- Partnerships.
- Invasive species control.
- Selected existing structures.
- Research access.
- Wild and scenic river eligibility.
- Fire management.
- Operations and maintenance.
- Law enforcement.
- Emergencies, security safety actions.
- Connectivity of habitat with lands outside the Monument.

[17] The preferred alternative recommends that the DOE remove the observatory.

1.10.12 Issues Outside the Scope of the CCP

Many issues/topics were raised by the public, other agencies/governments, or non-governmental organizations that go beyond the scope of this CCP/EIS. Many of these are being handled in other planning, government-to-government, or NEPA analyses processes. Many are the primary responsibility of other agencies. Issues raised that are outside the scope of this CCP include:

- Determining the application of certain tribal treaty rights.
- Site design and development of the visitor center for the Monument.
- Transfer of primary jurisdiction of DOE lands.
- Payment in lieu of taxes to counties.
- Columbia River flows.
- Co-management of the Monument with tribes.
- Issues related to Hanford nuclear waste and other cleanup.
- B Reactor historic significance determination and management.[18]
- Cultural resources on DOE lands outside the Monument.
- Recovery plans for threatened and endangered species.
- Maintenance of a long-term federal planning advisory board for the Monument.

[18] The B Reactor is discussed in Chapter 3 (Section 3.20.6) as a "Special Management Consideration." Currently, the National Park Service is studying the B Reactor and other Manhattan Project sites to determine if they should be preserved, how they should be preserved (e.g., national park, national historic site), and who should manage them (e.g., National Park Service, local governments). If the B Reactor is designated as a historic site, both the designation and the subsequent management would impact the Monument. For example, interpretive sites might be established on the Monument, or access points (e.g., boat docks, road entrances) might be located on Monument lands. However, both the designation of, and management of, the B Reactor is outside the scope of the CCP and is the responsibility of other federal agencies, i.e., the National Park Service and the DOE.

Chapter 2

Management Alternatives, Goals, and Objectives

2.0 Introduction

Key to management of any national wildlife refuge is a set of management goals and objectives that are unique and specific to that particular refuge's purpose, i.e., the reason for its establishment. Ideally, these goals should be developed in coordination and cooperation with other governments, agencies, organizations and—of greatest importance—the public. The Monument was fortunate in that it had considerable assistance from all of these interests in development of management alternatives, goals and objectives. This assistance came in the form of cooperating agencies, consulting tribal governments, formal scoping, and public workshops. This is described in greater detail in Chapter 5.

2.1 Monument Purposes

The Monument Proclamation specifically lays out the purpose of the Monument—to protect a special landscape and the specific resources mentioned in the Monument Proclamation.

> *The Hanford Reach National Monument is a unique and biologically diverse landscape, encompassing an array of scientific and historic objects. This magnificent area contains an irreplaceable natural and historic legacy, preserved by unusual circumstances.*

Because the Monument is administered as a component of the NWRS, the legal mandates and policies that apply to any national wildlife refuge also apply to the Monument. The purposes of any national wildlife refuge are "specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a refuge, refuge unit, or refuge subunit" (National Wildlife Refuge System Administration Act). In this case, those would be the Antiquities Act, the Monument Proclamation, and the permit establishing the Saddle Mountain National Wildlife Refuge.[19]

As described in Chapter 1, national monuments are established to protect "antiquities" or to set aside lands for scientific purposes. Most presidential proclamations specifically define the reason(s) the particular national monument was established and the purposes for which it is to be managed. As noted elsewhere, the Hanford Reach National Monument Proclamation is unusual in its level of detail. Rather than noting only one or two significant resources, as most

[19] The Saddle Mountain Wildlife Refuge was created on November 30, 1971, through a permit issued to the FWS by the DOE. This approximately 31,000 acre area is located in the northwest corner of the Monument and is currently called the Saddle Mountain Unit. When the Monument was created, the Saddle Mountain National Wildlife Refuge was incorporated into the new national monument. Following completion of this CCP, this land base will be part of the new Wahluke Unit.

monument proclamations have historically done, this particular proclamation specific notes the various resources President Clinton deemed nationally significant. The Monument Proclamation specifically mentions:

- The shrub-steppe ecosystem.
- The fifty-one-mile-long Hanford Reach of the Columbia River.
- Fall Chinook salmon spawning areas.
- Sturgeon.
- A diversity of native plant and animal species.
- Rare and sensitive plant species, including Umtanum desert buckwheat and White Bluffs bladderpod.
- Microbiotic crusts.
- Breeding populations of steppe and shrub-steppe dependent birds, including loggerhead shrikes, sage sparrows, sage thrashers, and ferruginous hawks.
- Habitat for migratory birds, as well as resident species, including wintering habitat for bald eagles, white pelicans, and ducks.
- Nesting sites and habitat for rare bird species, including prairie falcons, and important perch sites for raptors such as peregrine falcons.
- Insect species new to science or not previously identified in the state of Washington.
- Significant geological and paleontological resources, such as the White Bluffs and Hanford Dune Field.
- Mammalian fossils of rhinoceros, camel, mastodon and others.
- Important archaeological and historic artifacts from more than 10,000 years of human activity, including prehistoric pit houses, graves, spirit quest monuments, hunting camps, game drive complexes, quarries, and hunting and kill sites, as well as more recent human activity, including homesteads and early towns.

The Monument Proclamation also goes further than most proclamations have historically gone in establishing specific management actions that are to be followed. It establishes a basis for management of the Monument, as well as several of the mechanisms for protection of the

significant resources found in the Monument. The following mechanisms are specifically outlined in the Monument Proclamation.

- Federal lands are withdrawn from disposition under public land laws. This includes all interests in these lands, such as future mining claims.
- Off-road vehicle use is prohibited.
- The ability to apply for water rights is established.
- Grazing is prohibited.
- The FWS, under permits and agreements with the DOE, and the DOE are established as the managers of the Monument.
- Clean-up and restoration activities are assured.
- Existing rights, including tribal rights, are protected.

2.2 Monument Goals

Establishing goals for how to manage the Monument is the first step in identifying specific management actions; goals identify and focus management priorities and provide a link between management actions, the Monument Proclamation, legal requirements, and FWS policies and procedures. Goals work towards realizing the Monument's vision (see Section 1.8) and purposes and provide the framework for sound and defensible management decisions. The management goals developed for the Monument, their implementation, and the management plan they fulfill will—must—honor valid existing rights and comply with FWS policies and procedures, the Proclamation, applicable laws, and court decisions.

The Monument's management goals were developed through the cooperation and assistance of many individuals, agencies, tribes and organizations and reflect the basis for a management plan that will benefit the public while protecting the Monument's resources. (See Chapter 5 for a description of the public process.) Following public workshops, internal development,[20] assistance from cooperating agencies and consulting governments, and the advice of the FAC, the FWS has identified ten management goals for the Monument.

[20] Internal development of goals included an analysis of the Monument's purposes and an examination of the laws and policies related to management of a national wildlife refuge. The development of goals and objectives included an examination of the life-history needs of high-priority species and those identified as a purpose of the Monument.

1) Conserve and restore the plants, animals and shrub-steppe and other upland habitats native to the Columbia Basin.

2) Conserve and restore the communities of fish and other aquatic and riparian-dependent plant and animal species native to the Monument.

3) Enhance Monument resources by establishing and maintaining connectivity with neighboring habitats.

4) Protect the distinctive geological and paleontological resources of the Monument.

5) Protect and acknowledge the Native American, settler, atomic and Cold War histories of the Monument, incorporating a balance of views, to ensure present and future generations recognize the significance of the area's past.

6) Compatible with resource protection, provide a rich variety of educational and interpretive opportunities for visitors to gain an appreciation, knowledge and understanding of the Monument.

7) Compatible with resource protection, provide access and opportunities for high-quality recreation.

8) Protect the natural visual character and promote the opportunity to experience solitude in the Monument.

9) Facilitate research compatible with resource protection, emphasizing research that contributes to management goals of the Monument.

10) Establish and maintain a cooperative fire management program that protects facilities, resources and neighbors and fulfills natural resource management objectives.

2.3 Goals Considered But Addressed By Other Means

In developing the final set of management goals for the Monument, numerous actions identified as potential goals were not included in the ten goals listed above in Section 2.2. Several of these potential goals were combined with other goals, some were determined to be objectives and are addressed as such, and others were determined to be strategies for implementing goals and will be carried forward in subsequent step-down plans. Still other potential goals were determined to be: 1) outside the scope of the CCP; 2) best addressed in subsequent step-down plans; or 3) outside the jurisdiction and responsibilities of the FWS.

Following this critical review process, three potential goals—associated with treaty rights, valid existing rights, and infrastructure—remained to be addressed. These actions were eventually removed as goals under this CCP. Explanation of the rationale for their removal from consideration as goals is merited and is provided in the following subsections.

2.3.1 Treaty Rights

The following action regarding treaty rights was considered as a potential goal.

> *Honor treaty rights in accordance with DOI and FWS Native American policy.*

By definition, a *goal* is something for which one strives but which might not be realized. Goals can be modified as necessary or as management priorities change. It is the position of the FWS that treaty rights must be honored; honoring treaty rights is not voluntary or subject to modification. Treaty rights are a mandate, and as such, surpass the definition of a goal. This is in keeping with the Monument Proclamation, which specifically states: "Nothing in this proclamation shall enlarge or diminish the rights of any Indian tribe." Therefore, although the action of honoring treaty rights is not considered a goal, the intent of the action will be fully honored under existing treaties, laws, rules and policies.

2.3.2 Valid Existing Rights; Cooperation with Other Jurisdictions, Organizations, and Neighbors

The following actions regarding valid existing rights were considered as a potential goal.

> *Foster, support and respect cooperative partnerships that preserve valid existing rights while protecting the purposes of the Monument. Recognize and cooperate with tribal, state and local governments and federal agencies in the discharge of statutory responsibilities. Enhance relationships and partnerships with community organizations and neighbors furthering management goals.*

The rationale for not identifying a specific goal related to valid existing rights is much the same as for treaty rights: The FWS must honor rights granted under law. The Monument Proclamation is explicit on this point: "The establishment of this monument is subject to valid existing rights." As such, the FWS will honor valid existing rights.

Likewise, the FWS must not interfere with the legal discharge of statutory responsibilities of other agencies. The FWS must comply with all legal responsibilities and will cooperate with others in their compliance with all relevant laws.

Finally, the FWS fully intends to "enhance relationships and partnerships with community organizations and neighbors furthering management goals." However, this is an ideal rather than a management goal, albeit an ideal that the FWS fully embraces. The intent of this ideal can best be realized through the implementation of the other, more definitive management goals identified above in Section 2.2. For example, one method of achieving Goal 1, which addresses restoring plants and animals, might be through developing a partnership with the WDFW on protecting adjacent upland habitats through a land conservancy.

2.3.3 Infrastructure

The following action regarding infrastructure was considered as a potential goal.

> *Provide infrastructure, operations, and maintenance capabilities that are in harmony with Monument purposes.*

This potential goal was not identified as a separate goal because infrastructure and maintenance are integral to each and every Monument goal, program and activity. The intent of this action is therefore inherent in all of the other goals.

2.4 Management Objectives

Objectives are incremental steps taken to achieve a goal. They are outcome-oriented and focus on what is to be achieved on the Monument. Objectives are derived from the Monument goals (see Section 2.2) and provide a foundation for determining strategies, monitoring accomplishments, and evaluating success. Otherwise stated, they are the foundation for "adaptive management," form the basis for management actions, and are key to effective management on the Monument.

There are five properties that pertain to all good objectives. To the extent possible, each objective should be specific, measurable, achievable, results-oriented, and time fixed (SMART). These properties are defined below.

- ***Specific.*** Clearly worded objectives avoid ambiguity; a clearly worded objective is easy to understand and difficult to misinterpret. Specificity results by identifying what the action is, who will do the action, when and where the action will be done, and why the action is being undertaken.

- ***Measurable.*** Objectives should contain a measurable element that can be readily monitored to determine success or failure.

- ***Achievable.*** Objectives, regardless of how measurable or clearly written, must be achievable.

- ***Results-oriented.*** Objectives should specify an end result.

- ***Time-fixed.*** Objectives should specify the time period during which they will be achieved.

In developing management objectives for the Monument, the same process and organizations were used as in developing management goals and alternatives (see Sections 2.2 and 2.5). The objectives developed were then used to assist in developing the alternatives, although the process was iterative, and the alternatives helped to refine the objectives. The objectives are defined in Section 2.10 following the discussion of alternatives, the proposed new management units, and how the alternatives would grossly be applied to those management units. The objectives provide the details for the alternatives and their implementation on the land.

2.5 Development of Alternatives

The alternatives development process was an iterative process that began while the planning team developed the Monument vision statement, goals and objectives. The core planning team generated a list of important issues related to the management of the Monument through a collaborative process involving FWS staff, tribes, cooperating agencies, the FAC, and local stakeholders. The general public provided assistance in identifying management issues through a series of scoping meetings that were conducted in Mattawa, Richland, Seattle and Yakima, Washington. All comments submitted through the scoping process were considered in developing the issues to be addressed in the CCP and the goals and objectives to address those issues. (See Chapter 5 for a detailed discussion of the scoping process.)

Once the list of management issues was generated, the planning team described the No Action Alternative (Alternative A). It was important to describe this alternative accurately as it serves as the baseline to which all other alternatives are compared.

Next, a wide range of management actions was developed that would address the identified issues and achieve one or more of the goals for the Monument. These actions were refined during several meetings with the planning team, cooperating agencies, and the FAC, as well as a series of three stakeholder workshops. The planning team then consolidated these actions into logical groupings to form the action alternatives. Many actions are common to more than one

alternative, but the actions included in each alternative reflect a common management approach, as described in detail below.

In developing the alternatives, the FWS made certain assumptions that were common to all alternatives. These common assumptions were:

- ***Landscape-level planning approach.*** The CCP would be developed using a landscape-level planning approach to create broad short- and long-term management guidelines. This approach defines the uses to occur within each area, delineates the areas open/closed to the public, and provides the reasons an area is opened or closed. The landscape-level approach provides few specific details. Instead, it sets the basis for subsequent step-down management plans, which will address site-specific management actions, including wildlife habitat management, invasive species control, cultural resource protection, visitor use, infrastructure development, and transportation systems.

- ***Identification of project sites.*** No exact project sites or developments described within the range of alternatives would be identified. Projects proposed within this plan are conceptual. For example, under Alternative D, trails would be developed on the Rattlesnake Unit (i.e., ALE/McGee Ranch); however, specific trail locations would not be identified and would depend on natural and cultural resource protection needs.

- ***Fire management.*** Fire management activities would conform to guidelines contained in FWS policy and the approved Fire Management Plan for the Monument.

- ***Treatment of invasive or noxious species.*** Treatment activities would conform to guidelines contained in FWS policy and an approved IPM, which is available for review simultaneous with this draft CCP.

- ***Research in the Monument.*** Research projects would be allowed in the Monument in accordance with valid existing rights provisions, FWS policy guidelines, and Special Use Permit (SUP) provisions.

- ***Regulatory compliance.*** Regardless of the alternative selected, the FWS would be required to follow all pertinent federal legislation, regulations, executive orders, and FWS policies regarding the protection and preservation of natural and cultural resources. The most pertinent laws and regulations pertaining to this management plan and potential operations within the Monument are addressed in Chapter 1. A more complete list of applicable legislation and regulations can be found in Appendices D and E.

- ***NEPA review.*** All proposed actions would be subject to review under the NEPA prior to implementation, and all actions would require a complete cultural resources review at the applicable level that could also be used to support NEPA review.

- ***Tribal consultation and coordination.*** All appropriate and necessary consultation with tribes would be undertaken prior to implementing any action. Two Executive Orders (Executive Order 13007, Sacred Sites, and Executive Order 13175, Tribal Consultation and Coordination), as well as the National Historic Preservation Act (NHPA), NEPA and Archaeological Resources Protection Act (ARPA), have specific references for coordination and consultation requirements.

2.6 Alternatives Considered But Eliminated From Further Consideration

The alternatives development process under the NEPA is designed to allow the planning team to consider a wide range of issues and feasible management actions. Actions and alternatives that are infeasible or unsafe, or that impact critical resources, interfere with Proclamation resources, or are incompatible with Monument goals may be considered but eliminated as unreasonable based on a number of variables. During the alternatives development process, the planning team considered the actions detailed below. All of these actions were ultimately eliminated for the reasons provided.

The planning team considered the appropriateness of providing for various recreational activities raised during scoping, including overnight backpacking, dog walking, field dog trials, geocaching, hang gliding, and paragliding. Based on policy guidance for the NWRS, these activities were found to be inappropriate and were dropped from further consideration (see Appendix H).

Equestrian uses were considered throughout the range of alternatives and eliminated from further consideration within the Rattlesnake and Columbia River Units due to sensitivity of resources within the units and the potential impacts of horseback riding on wildlife, soils, shrub-steppe habitat, noxious weed spread, and cultural resources. Equestrian use opportunities on trails are provided across the range of alternatives in the Ringold, Wahluke and Saddle Mountain Units.

The planning team considered the compatibility of allowing hunting of deer, elk, waterfowl and upland birds throughout the range of alternatives. Opportunities for these types of game are provided across the range of alternatives in the Ringold, Wahluke, Columbia River, and Saddle Mountain Units. The DOE has determined that hunting in the Rattlesnake Unit is not consistent with its current mission.[21]

[21] As the mission of the DOE changes, or as the current ownership situation changes, hunting on the Rattlesnake Unit may be desirable and possible for population management of species. To address this possibility, hunting is included in Alternative C for 42,000 acres of the Rattlesnake Unit to be analyzed in this EIS.

The planning team considered allowing the hunting of wildlife species other than deer, elk, waterfowl and upland game birds—such as cottontail rabbit, cougar, bobcat, coyote, fox, raccoon and crow—which are permitted by state law in other areas of Washington. These activities were not included in the range of alternatives because of conflicts with year-round public safety, resource protection, and existing hunting seasons.[22]

A recreational development plan for the south shore of the Columbia River was submitted during the scoping process. This plan called for the development of bicycle and foot trails, increased road access, and railroad development. This proposal was not included as a separate alternative because of security concerns expressed by the DOE; however, many components of the proposal were incorporated into several of the alternatives being considered.

A self-guided auto tour through the Rattlesnake Unit was considered. This option was eliminated from further consideration due to the sensitivity of resources in the Rattlesnake Unit, potential impacts on Monument resources, and the prohibitive costs of bringing existing roads up to auto tour route safety standards.

Lands contained within the former Saddle Mountain Unit have been closed to the public since 1943. Following the issuance of a permit from the AEC assigning a management role to the FWS in 1971, this area has remained closed to comply with a safety buffer zone established by the DOE for activities on the south side of the Columbia River. It is foreseeable that these lands may be opened to the public within the life of the CCP. Public scoping showed a desire to have these lands opened. Various levels of public use have been addressed through the range of alternatives, but a complete opening of all lands within this area was eliminated from further analysis due to conflicts with the protection of sensitive wildlife species and their habitats. Limited public access into these areas for recreational activities, including hiking, photography, wildlife observation, and hunting,[23] has been included in the analysis of all action alternatives.

Public scoping showed an interest in opening lakes on Saddle Mountain for fishing and waterfowl hunting. These lakes are currently administered by the BOR and are part of the SCBID Project water return system to the Columbia River. The cooperating agencies to this CCP have requested the lakes remain closed to fishing; therefore, this option was eliminated from further study and analysis. Waterfowl hunting was also removed from further

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[22] As noted earlier under the description for Alternative B-1, due to *The Fund For Animals et al. v. Dale Hall [FWS] et al.*, the Monument prepared a complete Sport Hunting Opening Package, which was signed by the FWS Regional Director on May 15, 2007. That document, while noting that sport hunting was desirable on the Monument and compatible with resource protection, defined which species could and could not be hunted and the rationale for these determinations.

[23] Only big game and upland species could be hunted—not waterfowl—and only on part of the area. At a minimum, the western end of the Wahluke Unit would remain closed to hunting as a sanctuary for wildlife under all alternatives, although other public uses could be allowed (see the unit descriptions later in this chapter).

consideration because the Saddle Mountain Lake is identified by the Oregon Department of Fish and Wildlife (ODFW), WDFW and FWS as a waterfowl sanctuary or "existing reserve" in the *Wintering Waterfowl Redistribution Plan* of October, 1983.[24]

2.7 Alternatives Carried Forward

The FWS initially developed a range of four alternatives—Alternatives A through D (which includes the No Action Alternative)—with the assistance of the public, Native American tribes, cooperating agencies, and the FAC. The FAC and the CTUIR each subsequently provided an additional alternative, bringing the number of alternatives considered in the draft CCP to six. Following the release of the draft CCP, and due to the Fund For Animals lawsuit and the subsequent decision to complete a Sport Hunting Package, an alternative was developed to consider a prohibition on hunting (Alternative B-1). Likewise, following the public comment period, an alternative was developed in consideration of the comments received—Alternative C-1—which is the preferred alternative in this final CCP.

Within each alternative are public uses and management actions that are common to all alternatives. The Monument uses common to all eight alternatives, including the No-Action Alternative, are:

- Every unit is open to permitted research.
- Every unit has the potential for FWS-lead tours and educational classes/events (by permit).
- Wildlife population control (by permit for non-FWS personnel) may be implemented on any unit.
- The FWS would work with partners to provide appropriate visitor use enhancements, such as waterfowl hunting and photography blinds, interpretive sites, and nature trails.
- Auto tour routes would likely be established on existing state and county roads.

The eight alternatives considered in this CCP—Alternatives A through F, B-1 and C-1—are described briefly below. Additional detail is provided in the identification and discussion of objectives in Section 2.10.

[24] The sanctuary includes a portion of the Columbia River from the wooden power lines at the Hanford Townsite west to the Vernita Bridge. The ODFW is currently developing an updated plan, which is still in draft at this time.

2.7.1 Alternative A: No Action

Alternative A assumes no change from existing management practices, although lands under permit to the FWS could change, and FWS management practices be extended to those lands. Current management practices would be continued in accordance with Monument Proclamation mandates to conserve and protect biological, geological, paleontological and cultural resources. Conservation activities would involve inventory and monitoring, habitat restoration, invasive species control, fire protection, fire rehabilitation, and maintenance of existing facilities. Land use designations that were in place when the Monument was established would be maintained.

Public access for recreational, interpretive and educational purposes would continue to be allowed year-round in designated areas but restricted in sensitive resource areas. Limited interpretive and educational programs would be presented on request, dependent on the availability of staff.

Because it represents no change from existing practices, Alternative A provides a baseline for evaluating impacts that would occur with implementation of the other alternatives.

2.7.2 Alternative B

Alternative B emphasizes the restoration of native plants and animals in upland, riparian and aquatic habitats. Compared to the other alternatives, Alternative B would provide the greatest emphasis on the conservation, protection and monitoring of the biological, geological, paleontological and cultural resources described in the Monument Proclamation. Increased opportunities for restoration-based research of the native landscape and habitat for species of concern would be promoted, and information sharing between partners and researchers would be encouraged.

Public access for day-use recreation, interpretation and education would continue to be allowed year-round in designated areas. Compared to the Alternatives A, C, C-1, D and E, Alternatives B (and B-1) would employ a greater degree of management controls and use restrictions to ensure resource protection. (Alternative F, with its permit system, would employ the greatest degree of control over visitors.)

Visitor facilities would be developed only in the least sensitive areas of the Monument and only after a comprehensive inventory of Monument resources is conducted and sensitive areas are identified in the area under consideration.

Interpretation and education programs would be provided; however, these programs would serve fewer people than under Alternatives C, C-1, D, E and F.

2.7.3 Alternative B-1

Alternative B-1 is identical to Alternative B, except no hunting would be allowed anywhere on the Monument. This alternative was developed due to a lawsuit filed by the Fund For Animals.

As a result of that lawsuit (*The Fund For Animals et al. v. Dale Hall [FWS] et al.*), alleging noncompliance with the National Environmental Policy Act (NEPA) in opening thirty-seven national wildlife refuges to hunting, the U.S. District Court for the District of Columbia granted the plaintiff's motion for summary judgment (August 31, 2006), agreeing that the FWS did not adequately consider the cumulative impacts of opening those refuges to hunting. In October of 2006, the FWS asked the Court not to enjoin the hunt programs while the FWS proceeded to address the NEPA deficiencies in the original hunting packages. In addition, the FWS informed the court that by May 30, 2007, it would also correct NEPA deficiencies for national wildlife refuges opened to hunting since the lawsuit was filed.

For the Monument, it was decided that a complete Sport Hunting Opening Package should be prepared for the existing hunt on the Wahluke Unit.[25, 26] Although this CCP addresses hunting on the Monument, it addresses the long-term future of hunting; the Sport Hunting Opening Package addresses the immediate future of hunting until such time as this CCP can be finalized and a Record of Decision (ROD) signed.

Through the Sport Hunting Opening Package, the Monument addressed the issues raised in the Court's order, issues arising from decisions made in 1999 to maintain the hunting programs established by the Washington Department of Fish and Wildlife (WDFW). The Sport Hunting Opening Package addressed these issues by looking at two alternatives—a continuation of hunting as it currently exists and a complete closure; a third alternative was considered but rejected.[27, 28]

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[25] Absent such a document, hunting on the Monument for the 2007-2008 seasons could have been closed.

[26] The Sport Hunting Opening Package and the accompanying documents were signed by the FWS Regional Director on May 15, 2007.

[27] Following a public review, the FWS chose the No-Action Alternative, signed a Finding of No Significant Impact, and is continuing hunting under existing conditions until this CCP is finalized and an ROD signed.

[28] The option of opening the entire land base north of the river, including those areas currently closed to recreational hunting, was considered but rejected for several reasons:

1) This option was considered in development of the Draft CCP. However, it was determined that a portion of the area should remain closed to hunting to serve as a refuge to game and to provide the reservoir for harvestable populations.

2) The WDFW retains a closure of the area to waterfowl hunting as a sanctuary. Opening the area at this

As a result of the Sport Hunting Opening Package determining that the elimination of hunting was within a reasonable range of alternatives, it was decided that the CCP should also include no hunting within its range of alternatives. The most logical manner in which to include no hunting as an option was to include it within one of the existing alternatives most restrictive of hunting. As Alternative A from both the Sport Hunting Opening Package and this CCP are identical and represent the No-Action Alternative—and the cessation of hunting by the FWS would require an FWS 'action' as opposed to a continuation of the current situation—it was not logical to include it within Alternative A. Alternative B represented the action alternative in the draft CCP most restrictive of hunting, so it was decided that Alternative B would serve as the base for inclusion of no hunting in the CCP, resulting in a new Alternative, B-1.

Like Alternative B, Alternative B-1 emphasizes the restoration of native plants and animals in upland, riparian and aquatic habitats. Likewise, Alternatives B and B-1would provide the greatest emphasis on the conservation, protection and monitoring of the biological, geological, paleontological and cultural resources described in the Monument Proclamation. Alternative B-1 goes one step further in protection of resources in that recreational/sport hunting of wildlife would be prohibited, although hunting could be allowed when needed to control wildlife populations, both to manage for a healthy population and to protect other resources from damage.

2.7.4 Alternative C

Alternative C[29] concentrates on protecting and conserving the biological, geological, paleontological and cultural resources described in the Monument Proclamation by creating and maintaining extensive areas within the Monument that are free of facility development. This would serve conservation, restoration, protection and recreation purposes by maintaining large natural landscapes, protecting sensitive resources, and providing opportunities for solitude.

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time, at least during the time frame of the closure, would not be in keeping with the spirit of the WDFW waterfowl plan. At the point where a final management plan is identified through the CCP process, the FWS and DOE will have to work closely with the WDFW to carefully implement any changes in the hunting program in the area currently closed.

3) The area will remain closed for several more years due to DOE safety concerns associated with Hanford Site cleanup and remediation. Certainly it will remain closed to all uses during the period until the final management alternative is chosen through the CCP process. As noted above, at that point, the possible implementation of hunting in the area will be addressed through a revision of this Sport Hunting Plan. The issue is moot for this version of the Sport Hunting Plan.

[29] Alternative C borrows a concept employed by the National Park Service in many of its new management plans—the "Heart of the Park."

The facilities and access points that would be provided would be concentrated together to minimize overall impacts to the Monument and to provide economies of scale in management and maintenance. Public access points and recreational facilities would be planned and developed along highways and in perimeter areas of the Monument. Certain existing facilities and infrastructure currently present within the Monument would be relocated. Vehicle access into the interior of the Monument would be limited; however, much of the Monument would be open to foot and other non-motorized access.

Facilities, such as the boat-in campsites along the Hanford Reach provided for in this alternative, would be developed after inventories of resources are conducted and sensitive areas are identified in the area under consideration.

Interpretation and education programs would serve more people than under Alternatives A, B and F, but fewer than under Alternatives D and E.

2.7.5 Alternative C-1

Alternative C-1 is the result of public comments on the draft CCP. Most comments received did not want extremes in public use, either it being too extensive or too tightly controlled.

Like Alternative C, Alternative C-1 concentrates on protecting and conserving the biological, geological, paleontological and cultural resources described in the Monument Proclamation by creating and maintaining extensive areas within the Monument that are free of facility development. However, unlike Alternative C, Alternative C-1 does not go as far in maintaining these open areas, nor does it significantly remove existing facilities to create open areas like Alternative C does (e.g., Alternative C-1 does not close the White Bluffs Boat Launch).

On the other hand, like Alternative C, Alternative C-1 will concentrate new facilities and access points to minimize impacts to the Monument and to provide economies of scale in management and maintenance. Vehicle access into the interior of the Monument would be limited primarily to what it is currently; however, much of the Monument would be open to non-motorized access.

Facilities, such as the boat-in campsites along the Hanford Reach provided for in this alternative, would be developed after inventories of resources are conducted and sensitive areas are identified in the area under consideration.

Interpretation and education programs would serve greater numbers of people than Alternatives A, B, B-1 and F, but fewer than Alternatives C, D and E.

2.7.6 Alternative D

Alternative D provides the greatest degree of public access, recreational opportunities, and facilities development. The conservation, protection and monitoring of the natural and cultural resources described in the Monument Proclamation would still be the primary priority; however, more time, effort and resources would be devoted to public use than in the other alternatives, likely decreasing the resources and attention available to restoration activities. Resource inventories, identification of sensitive areas, and restoration activities would be concentrated in the areas of highest public use. Resource protection, restoration research, and monitoring would focus on the impacts created from recreational activities.

Public access sites and facilities would be developed throughout the Monument to a greater extent than under Alternatives A, B, B-1, C, C-1 and F, but access would still be restricted from the most biologically and culturally sensitive areas. Visitor facilities would include improved boat launches, auto tour routes, and campgrounds.

Interpretation and education programs would be greater than in any other alternative.

2.7.7 Alternative E

Alternative E was formulated by the FAC during a June 16-17, 2004, workshop and provides an alternate public use emphasis to that of Alternative D.

Alternative E also provides a high degree of public access and facilities development. It does this through the combination of elements from Alternatives C and D. The underlying openspace concept of Alternative C is maintained through the concentration of facilities in perimeter areas of the Monument; however, access and areas open to the public more closely resemble Alternative D. Again, the conservation, protection and monitoring of the biological, geological, paleontological, and cultural resources described in the Monument Proclamation is the top priority, but as in Alternative D, substantial effort and resources would be devoted to public use, likely decreasing the resources and attention available to restoration activities.

Resource inventories, identification of sensitive areas, and restoration activities would be concentrated in the areas of highest public use. Resource protection, restoration research, and monitoring would focus on the impacts created from recreational activities.

Public access points and facilities would be developed in perimeter areas of the Monument and to a greater extent than under Alternatives A, B, B-1 and F; access would be restricted from the most sensitive areas. Visitor facilities would include improved boat launches and campgrounds.

Interpretation and education programs would serve a high number of people, although not as many as Alternative D.

2.7.8 Alternative F

The CTUIR developed this alternative using Alternative B as the basis for management emphasis and public access. Public use would be controlled through a permit system, with some areas requiring use fees to help fund Monument programs. Permits would have the additional benefit of enhancing evacuation efforts in the event of an emergency on the Hanford Site. Permits may also act as a deterrent to vandalism and the looting of natural and cultural resources.

While similar to Alternative B, Alternative F provides for slightly more areas open to public access. The one significant difference is the addition of a public access permit system, with the possible establishment of fee areas.

Interpretation and education programs would be provided, but would serve fewer people than under Alternatives C, C-1, D and E.

2.8 Public Use Zones Defined

To implement management goals and objectives under each alternative, it was important to first define the level of public access and use that could occur in an area while still protecting Monument resources. The following subsections describe the access levels used in the CCP. These public access levels are used in the description of the proposed new management units (Section 2.9) and on the alternatives maps (Maps 7-14).

2.8.1 Open Zone

The public may access open zones year-round with no SUP (although a daily use permit would be necessary under Alternative F). Primary recreation opportunities generally include hunting, fishing, wildlife observation, photography, environmental education and interpretation, hiking and equestrian use. Open areas may include specific activity restrictions, seasonal closures, and year-round closures for public safety or resource protection needs. For example, bicycling is restricted to designated routes only, and hiking is not allowed in rare plant habitats.

2.8.2 Open, Controlled Zone

The public may access open, controlled zones year-round with no SUP (other than permits required under Alternative F); however, these areas have a greater degree of management presence and use restrictions than open zones due to resource sensitivity and concerns. Some activities are confined to designated sites, some sites are closed seasonally, and some activities are not allowed for public safety or resource protection needs. For example, hiking may be seasonally restricted to designated routes or disallowed, and sensitive avian nesting areas are seasonally closed to all access.

2.8.3 Designated Use Zone

The public may access designated use zones year-round with no SUP,[30] but uses are restricted to designated sites, routes, trails, or roads. For example, camping is allowed only in designated sites, boats may be launched only at designated sites, vehicles may park only in designated areas, and hikers must stay on trails.

2.8.4 Closed Zone

Closed zones are established for specific public safety or resource protection needs. Any access requires an approved SUP. For example, the Rattlesnake Unit's Research Natural Area (RNA) is a closed zone to protect sensitive natural and cultural resources,[31] irrigation canal roads are closed for public safety purposes, and much of the Columbia River south shore is closed for security and public safety purposes while DOE carries out its missions.

2.9 Alternatives as Related to Management Units

The Monument is presently divided into six management units, which existed prior to establishment of the Monument in 2000 (see Map 5). The unit boundaries follow preexisting

[30] Permits are required under Alternative F, and specific activities or specific sites might require a permit. For example, a permit obtained through a reservation system might be required for camping at floatboat sites.

[31] Closed zones could have smaller, included designated use zones. For example, the Rattlesnake Unit is considered a closed zone under all alternatives. However, in Alternatives C, C-1, D and E, a hiking trail in the Rattlesnake Unit could be established. Use would be strictly limited to hiking, wildlife observation, photography and other activities that could be conducted from the trail corridor.

lines such as roads, the Columbia River, and county boundaries; they were based primarily on DOE operational needs rather than natural resource needs. The FWS has identified the need to redefine the Monument into five new management units that are based primarily on ecological values rather than geographical, historical, or political boundaries; however, easily identifiable features were used to identify the boundaries to the extent possible (see Map 6, New Units, and Maps 7 through 14, Alternatives). The new units reflect a culmination of ideas and input received from the FAC, cooperating agencies, and the public, as well as the combined expertise of Monument staff. The five new, alternate units are described below.

2.9.1 Ringold Management Unit

2.9.1.1 Existing Units

The Ringold Unit will include what is now the southern-most portion of the Wahluke Unit along the Columbia River on the Monument's east side.

2.9.1.2 Area

The Ringold Unit will encompass lands within the Monument from the Ringold Fish Hatchery (WDFW) north and west to a point where the bluffs meet the river, approximately 1/2 mile below the northern locked gate on Ringold Road. The unit will include lands from the high water mark of the Columbia River to lands below the rim of the bluffs bounding the unit on the north and east.

2.9.1.3 Size

The Ringold Unit will encompass 3,120 acres.

2.9.1.4 Open/Closed

2.9.1.4.1 Alternative B

The Ringold area has been used by the public for more than thirty years. The Ringold Unit would continue to be open to the public year-round from two hours before sunrise to two hours after sunset, with limited seasonal closures and use restrictions to protect sensitive resources and

minimize chances of wildland fires during periods of high fire danger. Vehicle access would be controlled through the automatic gate located 1/2 mile north of the Ringold Fish Hatchery.

2.9.1.4.2 Alternative B-1

The area open to public access of some form is the same as Alternative B.

2.9.1.4.3 Alternative C

The area open to public access of some form is the same as Alternative B.

2.9.1.4.4 Alternative C-1

The area open to public access of some form is the same as Alternative B.

2.9.1.4.5 Alternative D

The area open to public access of some form is the same as Alternative B.

2.9.1.4.6 Alternative E

The area open to public access of some form is the same as Alternative B.

2.9.1.4.7 Alternative F

The area open to public access of some form is the same as Alternative B, except permits would be required to enter the area. The exact manner of issuing permits and where they would be obtained would need to be determined. Vehicle access would be controlled through the automatic gate located 1/2 mile north of the Ringold Fish Hatchery.

2.9.1.4.8 Other Potential Changes

Under Alternatives B, B-1, C, C-1, D, E and F, two of the existing eight parking lots would be closed.

2.9.1.5 Rationale for Ringold Unit Boundaries

Plant associations in the Ringold Unit have been heavily impacted by past management activities, including homesteading and farming, grazing, fire and irrigation development. Most plant communities in the unit are in a low successional stage, are heavily infested by non-native invasive species, and/or are monocultures created by past wildlife habitat management actions. Although some habitats still exist that support a wide variety of wildlife species, extensive restoration, with significant effort and resources over a long period, would be required to revitalize affected plant communities to a fully functional state of native shrub-steppe habitat. These lands would rate low on the priority scale for restoration activities under each of the established alternatives. Ecologically, this unit is low in biologic integrity, contains a relatively low percentage of sensitive resource values, and can sustain a higher level of public use without compromising resource quality.

There are sensitive cultural sites within the area that require protection; however, impacts on these resources can be avoided or minimized with proper management.

Fire suppression and law enforcement are both comparatively easy to administer in this unit. Law enforcement is aided by the unit being narrow and easily accessible by road and water. Fire suppression is aided by the presence of good roads (access and fire breaks) and the river, which acts as a natural firebreak. Both activities are hindered by the long response times needed to reach that side of the Monument. However, given the nature of the unit, the availability of other response units, and the quality of access, this would be an appropriate area to concentrate use.

2.9.2 Wahluke Management Unit

2.9.2.1 Existing Units

The new Wahluke Unit will include lands currently within the (existing) Wahluke and Saddle Mountain Units south of State Route 24.

2.9.2.2 Area

The Wahluke Unit will encompass those lands within the Monument boundary south of State Route 24 to within 1/4 mile of the Columbia River and to the northern boundary of the Ringold Unit.[32] The eastern half of the unit includes all lands south of State Route 24 in the present day Wahluke Unit from within 1/4 mile of the Columbia River to the eastern Monument boundary and north of the Ringold Unit boundary. The western half of this unit will encompass all lands within the existing Saddle Mountain Unit south of State Route 24 to within 1/4 mile of the Columbia River.[33]

2.9.2.3 Size

The Wahluke Unit will encompass 57,807 acres (29,486 acres currently open; 28,321 acres to potentially be opened pending DOE release of areas currently closed for security and public safety reasons).

2.9.2.4 Open/Closed

2.9.2.4.1 Alternative B

The eastern half of this unit and approximately 25% of the western half would be open to the public year-round from two hours before sunrise to two hours after sunset, with seasonal closures and use restrictions to protect sensitive resources and minimize chances of wildland fires during periods of high fire danger. Vehicle access would be controlled through the automatic gate located at mile marker 63.2 on State Route 24. Public use and access would be allowed throughout open areas of the unit during seasonal openings and on designated areas and established roads and trail systems the rest of the year. Public use in the western half of the unit would be phased in to allow time for infrastructure development, visitor education, and rehabilitation of previously disturbed travel corridors, and to direct uses away from historic cross-country travel patterns. The presence of sensitive plant communities, wildlife habitats, dune areas, and cultural resource sites could require temporary or permanent seasonal or year-round use closures, especially prior to proper infrastructure development.

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[32] The Columbia River and a 1/4-mile corridor on either side of the river—except within the Ringold Unit—would comprise the Columbia River Unit, as described below.

[33] Public use on lands currently in the Saddle Mountain Unit could not occur until the DOE suspends present day safety and security restrictions.

2.9.2.4.2 Alternative B-1

The area open to public access of some form is the same as Alternative B.

2.9.2.4.3 Alternative C

Alternative C includes opening the entire unit to public access in some form. The western end of the area would retain a "hunting exclosure" where many/most public uses might be allowed, but where hunting would not be. This is in order to create an area of sanctuary north of the river.

2.9.2.4.4 Alternative C-1

The area open to public access is the same as Alternative C, although the methods of ingress would be different (e.g., Alternative C-1 leaves the road to the Saddle Mountains open).

2.9.2.4.5 Alternative D

The area open to public access of some form is the same as Alternative C, although the activities allowed may vary depending upon resource protection needs.

2.9.2.4.6 Alternative E

The area open to public access of some form is the same as Alternative D, with the exception that there is no hunting exclosure on the western end.

2.9.2.4.7 Alternative F

The area open to public access of some form is the same as Alternative B, except there would be no hunting sanctuary on the western end of the unit, and permits would be required for all access. A visitor contact station would be located at the State Route 24 gate.

2.9.2.4.8 Other Potential Changes

Under Alternative B, the WB-10 Ponds would be considered for removal (the artificial dike removed) for public safety (contaminants) and resource protection if needed.[34]

2.9.2.5 Rationale for Wahluke Unit Boundaries

This unit has been delineated because of its similar and important ecological characteristics (soils, flora/fauna), paleontological and geological characteristics, and cultural/historical diversity. This unit contains some of the last remaining intact shrub-steppe habitat in the Saddle Mountain Range in the Columbia Basin. The area contains dune soil/plant associations that are more biologically diverse than shrub-steppe communities on surrounding lands; these associations are maintained through wind patterns, continual dune movement, and natural geological erosion from the White Bluffs. This unit also has artificial wetlands in the form of ponds and waste ways created by the South Columbia Basin Irrigation Project; this wetland system provides valuable habitat for migratory waterfowl and shorebirds that visit and nest on the Columbia River.

This unit has a wide range of historic public use and access. The area within the current Saddle Mountain Unit has many unique plant communities and wildlife habitats and has been closed to the public since its creation in 1971. Public use of open lands has been seasonal in nature.

A recent intensive vegetation inventory has shown that past disturbance activities (i.e., wildland fire, farming, site conversion through irrigation projects, and land management activities) have significantly altered the biodiversity of these plant communities and habitats. Extensive public use could further threaten these areas through disturbance to native plant communities and sensitive wildlife habitats, increased distribution of non-native invasive plant species, and an increased risk of wildland fire. (Wildland fire poses the greatest threat to ecological integrity in the shrub-steppe ecosystem.) Intensive public use management through designated access points, obligatory trails and road systems, and seasonal use restrictions is necessary to ensure resource protection. These lands would rate moderate on the priority scale for restoration activities under each of the established alternatives.

Fire suppression and law enforcement, while not easy, are possible within this unit. Law enforcement is aided by the unit being crisscrossed with service roads and ready access from State Route 24. Fire suppression is aided by the presence of service roads (access and fire breaks) and by the river, which acts as a natural firebreak. Both activities are hindered by the very long response times needed to reach that side of the Monument. However, given the nature

[34] Removal of the WB-10 Ponds could initiate future/additional NEPA evaluations and would, by necessity, require the involvement and concurrence of the BOR.

of the natural and cultural resources on this unit, the difficulty in law enforcement and fire suppression is acceptable.

2.9.3 Saddle Mountain Management Unit

2.9.3.1 Existing Units

The new Saddle Mountain Unit will include lands that are currently within the (existing) Wahluke and Saddle Mountain Units north of State Route 24.

2.9.3.2 Area

The Saddle Mountain Unit will encompass those lands within the Monument boundary north of State Route 24 to the northern boundary of the Monument.

2.9.3.3 Size

The Saddle Mountain Unit will encompass 24,055 acres.

2.9.3.4 Open/Closed

2.9.3.4.1 Alternative B

The Saddle Mountain Unit would be open to the public year-round from two hours before sunrise to two hours after sunset—except for the tops of the Saddle Mountains due to the presence of a potential Traditional Cultural Property (TCP), where public access would be closed— with limited seasonal closures and use restrictions to protect sensitive resources (e.g., migratory bird species such as burrowing owls) and to minimize chances of wildland fires during periods of high fire danger. Vehicle access would be provided through existing access located at mile 60.1 on State Route 24; any additional access throughout the unit would be through established road systems.

2.9.3.4.2 Alternative B-1

Access would be the same as under Alternative B.

2.9.3.4.3 Alternative C

The Saddle Mountain Unit would be open to the public year-round from two hours before sunrise to two hours after sunset, with limited seasonal closures and use restrictions to protect sensitive resources (e.g., migratory bird species such as burrowing owls) and minimize chances of wildland fire events during periods of high fire danger. There would be no vehicle access into the unit.

2.9.3.4.4 Alternative C-1

Access would be similar to Alternative B, except the top of the Saddle Mountains would remain open, albeit as an open controlled area, and the existing road will continue to be open as it currently is.

2.9.3.4.5 Alternative D

The Saddle Mountain Unit would be open to the public year-round from two hours before sunrise to two hours after sunset. Limited seasonal closures and use restrictions to protect sensitive resources (e.g., migratory bird species such as burrowing owls) and to minimize chances of wildland fire events during periods of high fire danger may be necessary. Vehicle access would be provided through existing access located at mile marker 60.1 on State Route 24; any additional access throughout the unit would be through established road systems.

2.9.3.4.6 Alternative E

The area open to public access of some form would be the same as under Alternative C-1, which is the same as Alternative B, except access to cross-country travel across the Saddle Mountain summit would be controlled to protect sensitive resources.

2.9.3.4.7 Alternative F

The Saddle Mountain Unit would be open to the public year-round from two hours before sunrise to two hours after sunset, with limited seasonal closures and use restrictions to protect

sensitive resources (e.g., migratory bird species such as burrowing owls) and to minimize chances of wildland fire events during periods of high fire danger. Vehicle access would be restricted to the existing parking area located at mile marker 60.1 on State Route 24; additional access throughout the unit would be by permitted pedestrian traffic. Permits would be required for all access.

2.9.3.5 Rationale for Saddle Mountain Unit Boundaries

The Saddle Mountain Unit is ecologically different from both the Ringold and Wahluke Units; it has not historically been used as extensively as the Ringold Unit, and it is not as biologically diverse as the Wahluke Unit because of degradation from past homesteading activities, land management (e.g., military uses), and fire events. However, in the western third of this unit, some areas of high-quality shrub-steppe habitat persist, and the area has shrub overstory components and soils that may be conducive to recovery efforts of endangered species (e.g., pygmy rabbits); the area also has species of interest or concern that are present due to some remaining intact vegetative habitat components. Some use restrictions may be necessary in this area to protect these resources.

Management of biological resources would be different in the Saddle Mountain Unit than in the Ringold or Wahluke Units for restoration activities. The Saddle Mountain Unit would rate moderate on the priority scale for restoration activities under each of the established alternatives. This area would be second in priority for restoration activities in the Monument (the Rattlesnake Unit would be the highest priority).

The Saddle Mountains also contain several other significant Monument resources that will have to be protected through careful planning and visitor management. For example, the Saddle Mountains are potentially a TCP with cairns, lithic quarries, and other artifacts important to Native American peoples. There are also deposits of petrified wood. Collecting is a concern, as is the possible need to rehabilitate diggings.

There may be a broader range of compatible public uses activities within this unit than is available in other open units. The flat areas in the Saddle Mountain Unit contain a relatively low percentage of sensitive resource values and can sustain a higher level of public use without compromising resource quality. Cross-country hiking in areas of non-sensitive plant communities that are presently dominated by cheatgrass poses little threat of site degradation and habitat/ecological integrity loss in the spring, fall and winter months.

Fire suppression and law enforcement are not easily accomplished in this unit. Fire suppression is difficult due to the lack of natural firebreaks and scarcity of service roads. Law enforcement is also hindered by the lack of roads, although this is somewhat alleviated by access from State Route 24 running parallel to the unit. Both activities are hindered by the very long response

times needed to reach that side of the Monument. While not an ideal situation for these management activities, it is possible to allow Monument-compatible uses on this unit.

2.9.4 Columbia River Management Unit

2.9.4.1 Existing Units

The Columbia River Unit will comprise the current Riverlands and Vernita Bridge Units and the majority of the (existing) River Corridor Unit.

2.9.4.2 Area

The Columbia River Unit will encompass a forty-six-mile segment of the Hanford Reach of the Columbia River and those lands within the Monument boundary within 1/4 mile on either shore of the Columbia River above the mean high water mark, except in the Ringold Unit where the boundary is to the high water mark.[35] The Columbia River Unit will also include: 1) the Hanford Dune Field across from the Ringold Unit; 2) the existing Vernita Bridge Unit; and 3) the existing Riverlands Unit.

2.9.4.3 Size

The Columbia River Unit will be 29,951 acres—29,667 acres within the Monument and 284 acres of islands outside which are currently part of the McNary National Wildlife Refuge.

2.9.4.4 Open/Closed

2.9.4.4.1 Alternative B

Primary access to this unit is by boat on the Columbia River, originating at several undeveloped boat launches within the Monument and at developed launches downstream of the Monument. The Columbia River Unit would be open to access at designated locations only.

[35] Lands located along the Columbia River within Benton County and some within Grant County would not be available for proposed public uses until current safety and security restrictions are suspended by the DOE.

2.9.4.4.2 Alternative B-1

Access would be the same as under Alternative B.

2.9.4.4.3 Alternative C

Primary access to this unit is by boat on the Columbia River, originating at several undeveloped boat launches within the Monument and at developed launches downstream of the Monument. Access to most of the north shore in the Columbia River Unit would be in designated areas only, with the exception of the area north and west of the Vernita Bridge, which would be open. The south shore west of the Vernita Bridge would be closed; east of the bridge, the shore would be open in designated areas, subject to DOE approval and release. The access road to the White Bluffs Boat Launch would be closed well back from the river.

2.9.4.4.4 Alternative C-1

Access would be similar to Alternative C, with two significant differences: 1) The White Bluffs Boat Launch and the road leading to it would remain open;[36] and 2) there would be no access to the Hanford Dune Field.

2.9.4.4.5 Alternative D

Primary access to this unit is by boat on the Columbia River, originating at several developed and undeveloped boat launches within the Monument and at developed launches downstream of the Monument. Most of the north shore in the Columbia River Unit would be open to controlled access in designated areas, with the exception of the area north and west of the Vernita Bridge, which would be open. The south shore west of the Vernita Bridge would be closed; east of the bridge, the shore would be open to controlled access in designated areas only, subject to DOE approval and release.

2.9.4.4.6 Alternative E

Primary access to this unit is by boat on the Columbia River, originating at several developed and undeveloped boat launches within the Monument and at developed launches downstream

[36] Under this alternative, there would be a need to establish a capacity limit at the White Bluffs Boat Launch in oder to protect natural and cultural resources and to ensure a quality visitor experience.

of the Monument. Most of the north shore in the Columbia River Unit would be open to controlled access in designated areas, with the exception of the area north and west of the Vernita Bridge, which would be open. The south shore west of the Vernita Bridge would be open to controlled access; east of the bridge, the shore would be open to controlled access in designated areas only, subject to DOE approval and release. The eastern half of the sand dunes would be open to controlled access and the west half would be closed.

2.9.4.4.7 Alternative F

Primary access to this unit is by boat on the Columbia River, originating at several developed and undeveloped boat launches within the Monument and at developed launches downstream of the Monument. Most of the north shore in the Columbia River Unit would be closed, except at designated locations. Most of the south shore east and west of the Vernita Bridge would be closed, with the exception of a public dock at the Vernita Rest Area. Permits would be required for all access via or to the Monument.

2.9.4.4.8 Other Potential Changes

Under Alternative C, the White Bluffs Boat Launch would be closed. Under Alternative E, the White Bluffs Boat Launch would be closed to motorized boats, but open to human-powered craft.

2.9.4.5 Rationale for Columbia River Unit Boundaries[37]

The Columbia River Unit is ecologically and culturally unique due to influences of the Columbia River, a wealth of resources, past use by Native American peoples, geologic formations, and resilient plant communities. Riverine and riparian communities have been shaped by river flows and other geologic processes, homesteading and historic commerce activities. Eighty percent of fall Chinook salmon returning to Northwest streams spawn within the Hanford Reach. This area has a long and rich history of Native American occupation and use and is culturally significant to tribes throughout the region; more than two-thirds of the known cultural sites on the Monument are in this unit. Protection of cultural sites, nesting rookeries, migration stopover sites, wildlife sanctuaries, culturally significant plant communities, riparian vegetation, shoreline integrity, riverine habitats, and rare plants is imperative. Lands in the Columbia River Unit

[37] Islands within the Columbia River Corridor Unit are an exceptional resource and, although part of the unit, are discussed separately. See Section 2.9.6 for a description of island closures and the rationale for protection of these unique, ecologically important resources.

would rate moderate to high on the priority scale for restoration activities under each of the established alternatives.

Apart from the uniqueness of the wildlife and plant communities in the Columbia River Corridor Unit, public use of this unit is also dramatically different. This unit currently experiences the highest public use of all units in the Monument because of the fisheries resources in the Columbia River. Recreation is either water-based or primarily dependent upon water-related resources. Unique regulations and management will be necessary for this unit; balancing protection with public use will require special management in this unit.

Finally, the boundaries for this unit coincide with the DOI's finding that the Hanford Reach is both eligible and suitable for designation as a component of the National Wild and Scenic Rivers System (NWSRS). The FWS is responsible for managing resources within this unit in accordance with the river's wild and scenic eligibility.

Fire suppression and law enforcement are at the same time both enhanced and difficult in this unit. Law enforcement is possible from the river, and there are numerous (potential) service roads leading to the corridor. Fire suppression is aided by the presence of access roads and the river acting as a natural firebreak. On the south side of the river, strong DOE enforcement and fire units are and will continue to be present. But both management activities are hindered by the very long response times needed to reach the north side of the river. However, it is possible to allow Monument-compatible uses on this unit, and in light of the fact that the FWS does not control surface use on the river, there is little choice but for the FWS to plan for law enforcement and fire suppression.

2.9.5 Rattlesnake Management Unit

2.9.5.1 Existing Units

The Rattlesnake Unit will include the current Fitzner/Eberhardt Arid Lands Ecology Reserve and McGee Ranch Units.

2.9.5.2 Area

The Rattlesnake Unit will encompass those lands within the Monument boundary within the ALE and McGee Ranch Units.

2.9.5.3 Area

The Rattlesnake Unit will encompass 81,070 acres.

2.9.5.4 Open/Closed

2.9.5.4.1 Alternative B

The Rattlesnake Unit would be open for access by permit or FWS-led trips only. Existing permitted research and environmental education activities would continue, with seasonal use restrictions to protect sensitive resources and minimize chances of wildland fire events during periods of high fire danger.

2.9.5.4.2 Alternative B-1

Access would be the same as in Alternative B.

2.9.5.4.3 Alternative C

As in Alternative B, the area would be closed to public access with the exception of the possible establishment of a hiking trail.

2.9.5.4.4 Alternative C-1

Access would be the same as Alternative C.

2.9.5.4.5 Alternative D

As in Alternative C, the area would be closed to public access, except for the possible establishment of two or more hiking trails.

2.9.5.4.6 Alternative E

Alternative E is the same as Alternative D.

2.9.5.4.7 Alternative F

As in Alternative B, the area would be closed to public access.

2.9.5.5 Rationale for Rattlesnake Unit Boundaries

The Rattlesnake Unit has been delineated because of its similar ecological characteristics (soils, flora/fauna), paleontological and geological characteristics, and cultural/historical diversity and uniqueness. The lands within the Rattlesnake Unit are a rarity within the Columbia Basin; the ALE and McGee Ranch represent one of the largest remaining intact shrub-steppe habitats left within the Columbia Basin eco-region. While these lands have been impacted by catastrophic fire events, this land base has not been significantly disturbed by humans for more than sixty years, and the area has remained a prime example of successional recovery and the importance of shrub-steppe plant community in the interior Columbia Basin. Shrub-steppe associations here are more biologically diverse than shrub-steppe communities on surrounding lands. Biological diversity studies conducted in the Monument have documented more than 1,500 unique species to this area, more than forty-three of which are new to science. This unit contains a rare plant population found nowhere else on the planet—Umtanum desert buckwheat. However, this buckwheat is susceptible to elimination from any form of disturbance during any time of the year. The area includes a mixture of lower successional communities as well as recovering bunchgrass/sage communities. Fire and cheatgrass invasion threaten the ecological diversity of this area. Lands in this unit would rate high on the priority scale for restoration activities under each of the established alternatives.

The rarity of large blocks of shrub-steppe habitat has led, in part, to the Monument's recognized importance as a scientific research site; the ALE is a designated RNA.

This unit is also rich in cultural resources and contains some of the earliest known sites in the Monument. Rattlesnake Mountain, Yakima Ridge, and Umtanum Ridge are culturally significant properties; Rattlesnake Mountain is treated as a TCP, although it has not yet been formally designated as such.[38] There are culturally significant plant communities of types still used by area Native American peoples.

Management in this unit will focus almost exclusively on preservation and restoration and will be influenced by special factors. For example, the ALE's designation as an RNA will likely bring with it certain management parameters. Extensive public use activities would threaten resources within the Rattlesnake Unit through destruction of microbiotic crusts, disturbance of

[38] The DOE has completed a National Register Determination of Eligibility for *Laliik* (Rattlesnake Mountain) to identify its potential as a TCP, determining that it is eligible under National Register criteria. The Washington State Historic Preservation Office has concurred with this determination.

native plant communities and sensitive wildlife habitats, spreading of non-native invasive plant species, and increased risk of wildland fire. Wildland fire, increased through public access, poses the greatest threat to the ecological integrity of the shrub-steppe ecosystem. Some public use might be compatible with resource protection goals if positioned, administered and monitored properly. However, if public access were provided, intensive management through designated access points, trails and road systems, as well as seasonal use restrictions, would be necessary to ensure resource protection.

Fire suppression and law enforcement are difficult in this unit. There are few natural firebreaks, and access is sparse in some areas of the unit.

2.9.6 Columbia River Islands

Although islands in the Columbia River often contain resources similar to those on the rest of the Monument, the islands are inextricably linked to the water surrounding them and thus are included in the Columbia River Unit. The islands being addressed by this CCP are located in and immediately adjacent to the Monument (see Map 15). There are thirteen islands that are currently part of the Monument (Hanford Islands). In addition, there are six islands that are currently part of the McNary National Wildlife Refuge (McNary Islands, river mile 341 to 351). Of the McNary Islands, three are within the Monument proclamation boundaries, and the other three are immediately adjacent to the Monument. All nineteen islands will be managed as part of the Columbia River Management Unit; management of the McNary Islands would be assigned to the Monument.[39] There are several reasons to transfer jurisdiction of islands to one refuge: 1) Law enforcement personnel from the Monument patrolling the river will also cover the islands; 2) enforcement/compliance patrols by other jurisdictions (e.g., resource patrols by the Wanapum) benefit by having to interface with only one FWS office (this would also apply to other matters); 3) money would be more efficiently used because of the proximity to the Monument and resource similarity. Finally—and of greatest importance—the islands are closely linked with Monument resources.[40]

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[39] In Section 3.21.5.4 in Chapter 3, there are twenty-one islands described. The lower two islands are not included within this CCP because they are owned by other entities. But they are described in this CCP because they directly contribute to the wildlife diversity of the Hanford Reach.

[40] Since the release of the draft CCP, management of the Monument and McNary National Wildlife Refuge—as well as that of Cold Springs, Columbia, Conboy, McKay, Toppenish and Umatilla NWRs—has been combined into the Mid-Columbia River National Wildlife Refuge Complex. This renders the management question somewhat moot, although planning for those islands remains within this CCP.

2.9.6.1 Open/Closed

Because of high biological and cultural resource sensitivity, the islands under control of the FWS are closed above the high water mark.[41, 42] Islands managed by the DOE are already closed.

2.10 Alternatives & Management Objectives

In accordance with the CCP Process Policy (602 FW 3), alternatives include different sets of management objectives and strategies to achieve them. In addition, the CCP policy also requires a narrative (rationale) to support each objective, along with strategies to achieve the objective.[43] The following pages provide specifics on management objectives across the ten goals (Section 2.2) and eight alternatives (Section 2.5), as well as summaries of some of the key implications of the alternatives as they stand now.

As stated above, there are some underlying assumptions common to all alternatives. Common assumptions are listed below.

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[41] The Washington Department of Natural Resources holds primary jurisdiction below the ordinary high water mark, and access to lands below the high water mark is subject to their regulations and policies.

[42] Columbia River islands provide critical nesting and brood areas for waterbirds, waterfowl and colonial shorebirds; fawning areas for deer; potential roosting sites for bald eagles; and foraging and resting areas for a wide range of raptors, passerines, wading birds, and mammals. The islands are a migratory stopover for shorebirds heading to breeding sites to the north (spring migration) and overwintering locations to the south (fall migration). Island 19 (locally known as Third Island) has historically had an extensive bank swallow nesting colony, which is highly susceptible to crushing of the excavated nests; Locke Island also has a swallow colony. Islands 18 and 20 have large multi-species waterbird rookeries, including the only known egret nests on Island 18. Island 2 supports a sizeable heron rookery. Island 15 is consistently a foraging site for large numbers of pelicans.

Islands in the Columbia River also harbor an irreplaceable wealth of cultural resources from extensive use by Native Americans over the millennia. The archaeological remains of residences, processing and gathering camps, and other use areas can be found on numerous islands. For archeologists, the islands in this stretch of the river are renowned for the diversity of scientific data they have provided. Several islands are included in the Hanford North, Locke Island, Savage Island and Wooded Island Archeological Districts (National Register of Historic Sites) and the Coyote Rapids, Wahluke and Wooded Island Archeological Districts (Washington Heritage Register Sites). Several islands contain irreplaceable resources and sensitive site information significant to extant Native American groups in the area who continue to practice traditional life ways. (See Section 3.21.5 for additional details on islands.)

[43] Strategies are management techniques to achieve a management objective. In similarity with the attributes (SMART criteria) of the objectives, management strategies were identified from available scientific literature and/or the collective best professional judgment of Monument staff and other resource management experts.

- Every unit is open to permitted research.
- Every unit has the potential for FWS-lead tours and educational classes/events (by permit).
- The FWS would work with partners to provide visitor use enhancements where appropriate, such as waterfowl hunting and photography blinds, interpretive sites, and nature trails.
- Wildlife population control may be used on any unit.
- Auto-tour routes will likely be established on existing state and county roads.

It should be noted that the indicated numbers that follow (acres, miles, facilities, etc.) are targets and, in most instances, indicate a maximum. Actual accomplishments in any given time frame may vary according to funding, available staff, outside factors, public needs, etc.

2.10.1 Actions Common To All Alternatives

Following each objective identified and defined in the pages to follow is the FWS rationale for the objective(s). In some instances, strategies for implementing the objective(s) are also defined.

2.10.1.1 Objective C-1: Government-To-Government Consultation

Establish a regular schedule of government-to-government meetings with Native American Tribes.

Rationale

Four federally recognized Native American tribes (CCT, CTUIR, Nez Perce Tribe, Yakama Nation), as well as the Wanapum People, have used the lands comprising the Monument since time immemorial. Their culture, including much of their religion, is tied to the land and its resources. By law, the FWS is required to consult with the tribes on matters that impact either the tribes or the resources that they depend upon. Apart from the legal need for consultation, staff and management of the Monument strongly believe in ongoing consultation with the tribes. As such, the FWS should establish a regular schedule of meetings with the tribes, both to inform the tribes of Monument activities and to seek their input on matters that impact the tribes.

2.10.1.2 Objective C-2 and Objective C-3: Partnerships

Recognize and cooperate with tribal, state and local governments, and federal agencies in the discharge of statutory responsibilities.

Enhance relationships and partnerships with community organizations and neighbors furthering management goals.

Rationale

If viewed from overhead, it is readily apparent that the Monument is an island surrounded by man's alterations of the landscape. For the most part, the Monument is bounded by agricultural fields. However, even this landscape is rapidly changing. The small cities and communities that dot the landscape are experiencing one of the highest expansion rates in the country. All of this leads to the inevitable conclusion that the Monument must recognize these outside influences and its role as part of the larger community of eastern Washington. It is imperative that the Monument be a 'good neighbor,' working with the other agencies, governments, economies, businesses and people to protect and preserve a portion of the shrub-steppe ecosystem that once blanketed the Columbia Basin.

2.10.1.3 Objective C-4, Objective C-5 and Objective C-6: Valid Existing Rights

Foster, support and respect cooperative partnerships that preserve valid existing rights while protecting the purposes of the Monument.

Hold annual meetings with valid existing rights holders to discuss common issues.

Within one year of the CCP being adopted, evaluate operations and maintenance procedures of valid existing rights holders and begin to implement agreed changes to ensure protection of Monument resources.

Rationale

The staff and management on the Monument are committed to being a functioning, vibrant part of the community. Part of that good-neighbor policy is cooperating with those agencies, organizations and individuals that hold valid existing rights to operate on the Monument, rights which were guaranteed in the Monument Proclamation. Ensuring that these rights are exercised in a manner which benefits the holder while protecting the natural, cultural, aesthetic and

recreational resources of the Monument will be one of the challenges facing the Monument. Meeting this challenge begins with establishing—continuing—open communication with holders of existing rights.

2.10.1.4 Objective C-7: Citizen Involvement

Within the first year of the CCP being signed, begin to develop an ever-evolving program to involve area residents, businesses and organizations in the management and protection of the Monument.

Rationale

Many opportunities for volunteers currently exist, and many more will be created as Monument facilities are developed and restoration efforts continue. With limited staffing, the Monument would benefit by establishing a volunteer base that demonstrates the ability to assist with education programs, special events, and habitat improvement projects. A volunteer coordinator must be identified, and outreach to the local community seeking volunteers would need to be organized.

While the large majority of Monument visitors follow rules and regulations, a very small minority of visitors do not. A Monument Watch program could enhance the law enforcement program by providing a forum for local landowners and regular Monument visitors who may observe inappropriate or illicit behavior on the Monument. A Monument Watch program would reduce the number of violators through increased surveillance, benefitting natural and cultural resources, taxpayers investment in visitor facilities, and visitor experiences.

Strategies

There are numerous strategies that might be implemented to involve others in assisting with protection of the Monument. While the implementation and timing of any one of these strategies—or entire programs, such as the Monument Watch described below—may vary according to the alternative chosen, all are feasible over the life of the CCP. Strategies to consider include:

- Developing a volunteer program to facilitate assistance with resource protection and environmental education efforts.

- Chartering a "Friends of Hanford Reach" and recruiting new members that have the skills to assist with environmental education and interpretation programs.

- Producing and distributing a seasonal volunteer newsletter.
- Creating and distributing informational materials, forms, releases, etc., on volunteer opportunities.
- Highlighting volunteer activities on the Monument web site.
- Identifying a staff member to serve as the volunteer coordinator.
- Working in coordination with the WDFW and local law enforcement officers and developing guidelines for a Monument Watch program, modeled after the community Neighborhood Watch program.
- Developing an outreach plan for the Monument Watch program, targeting neighboring landowners and communities, user groups, and Monument visitors.

2.10.1.5 Objective C-8: Staffing

Within the life of the CCP, recruit a professional staff to fully implement the CCP, fulfill the Monument Proclamation, and protect the outstanding natural, cultural, aesthetic and recreational resources of the Monument.

Rationale

Managing a national monument requires a significant variety and depth of personnel, as is reflected by the extent of this CCP. The specific needs—i.e., blend of disciplines and functions—will vary with the final management alternative chosen. Table 2.1 below and on the following page outlines the different personnel needs for each alternative. It also points out the year following signature of the CCP that the staff person would need to be added to fully implement the CCP as envisioned; delays beyond that would likely mean that the objective would not be fully implemented or completed within the life of this CCP.

Table 2.1. Monument Staffing Needed To Fully Implement Alternatives.

Position	P/T[1]	Grade	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Fill	Year	Fill	Year	Fill	Year	Fill	Year	Fill	Year	Fill	Year
Project Leader	P	GS-14	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Deputy Project Leader	P	GS-13	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
ROS	P	GS-9	✓	0	✓	1	✓	1	✓	2	✓	2	✓	1
Supervisory Biologist	P	GS-12	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Wildlife Biologist	P	GS-11	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Wildlife Biologist	P	GS-11			✓	3	✓	3	✓	2	✓	3	✓	3
Wildlife Biologist	P	GS-9	✓	0	✓	5	✓	5					✓	5
Fisheries Biologist	P	GS-11			✓	5	✓	5			✓	5	✓	5
Biological Tech	T	GS-5	✓	0	✓	3	✓	3	✓	2	✓	3	✓	3
Biological Tech	T	GS-5			✓	5	✓	5			✓	5	✓	5
Archeologist	P	GS-12	✓	4	✓	0	✓	0	✓	0	✓	0	✓	0
Historian	P	GS-9			✓	4	✓	0	✓	0	✓	0	✓	4
Geologist	P	GS-9			✓	7	✓	7			✓	7	✓	7
Tribal Coordinator	P	GS-11			✓	3							✓	3
Cultural Resources Tech	P	GS-9	✓	5	✓	0	✓	0	✓	0	✓	0	✓	0
Cultural Resources Tech	T	GS-7			✓	1							✓	1
Supervisory ORP	P	GS-12	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
ORP	P	GS-11	✓	1	✓	1	✓	1	✓	1	✓	1	✓	1
ORP	P	GS-9					✓	3	✓	3	✓	3		
ORP	T	GS-9							✓	6				
Education Specialist	P	GS-12			✓	2	✓	2	✓	0	✓	2	✓	2
Interpreter	P	GS-9					✓	2	✓	2	✓	2		
Interpreter	T	GS-7							✓	4				
Supervisory Maintenance	P	WG-10	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Maintenance Worker	P	WG-9			✓	0	✓	0	✓	0	✓	0	✓	0
Maintenance Worker	T	WG-7	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Maintenance Worker	T	WG-5	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Maintenance Worker	T	WG-5							✓	0				
Administrative Officer	P	GS-11	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Automation Clerk	P	GS-9			✓	0	✓	0	✓	0	✓	0	✓	0

Position	P/T[1]	Grade	Alt. A		Alt. B		Alt. C		Alt. D		Alt. E		Alt. F	
			Fill	Year	Fill	Year	Fill	Year	Fill	Year	Fill	Year	Fill	Year
Automation Clerk	P	GS-5	✓	0	✓	2	✓	2	✓	2	✓	2	✓	2
Automation Clerk	T	GS-5	✓	0	✓	4	✓	4	✓	4	✓	4	✓	4
Purchasing Agent	P	GS-9			✓	0	✓	0	✓	0	✓	0	✓	0
Law Enforcement Officer	P	GS-11			✓	0	✓	0	✓	0	✓	0	✓	0
Law Enforcement Officer	P	GS-9	✓	0	✓	1	✓	1	✓	1	✓	1	✓	1
Law Enforcement Officer	P	GS-9							✓	3	✓	3	✓	3
Fire Management Officer	P	GS-12	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Asst. FMO	P	GS-11			✓	1	✓	1	✓	1	✓	1	✓	1
Supervisory Range Tech	P	GS-8	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Supervisory Range Tech	P	GS-8			✓	1	✓	1	✓	1	✓	1	✓	1
Crew Leader	P	GS-8	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Crew Leader	P	GS-7			✓	0	✓	0	✓	0	✓	0	✓	0
Range Tech	T	GS-5	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Range Tech	T	GS-5	✓	0	✓	1	✓	1	✓	1	✓	1	✓	1
Range Tech	T	GS-5			✓	1	✓	1	✓	1	✓	1	✓	1
Range Tech	T	GS-5			✓	1	✓	1	✓	1	✓	1	✓	1
Contaminants Specialist	P	GS-12	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Volunteer Coordinator	P	GS-9			✓	2	✓	2	✓	2	✓	2	✓	2
LMRD	P	GS-13	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Planner	P	GS-12	✓	0	✓	0	✓	0	✓	0	✓	0		
GIS Specialist	P	GS-11			✓	1	✓	1	✓	1	✓	1	✓	1
Total Positions			26		45		45		45		45		45	

[1] P = Permanent, T = Term

2.10.1.6 Objective C-9: Wildlife Population Control

Within the life of the CCP, manage, control, or remove populations that threaten or affect Monument resources, public safety, or private property.

Rationale

As populations expand, some species may cause adverse effects on habitat biodiversity, habitat connectivity, and plant community stability; facilitate the expansion of non-native invasive species; become a nuisance to the general public; increase threats to public safety; and/or affect privately owned lands and agricultural crops. Adverse effects can also include displacement and predation of other wildlife species, as well as disease transmission.

Strategies

Control of wildlife populations would be conducted as needed on the basis of scientific resource management data. Wildlife population control efforts may use both non-lethal and lethal methods. Control methods would be used to reduce populations to a level consistent with species management objectives and in a manner that controls target populations without impairing Monument resources.

Population control methods may take several forms. In many instances, no single population control tool will fully achieve population targets, so a variety of tools must be available to provide resource agencies with the flexibility to reach desired population targets or male/female ratios. These methods are discussed below. As the exact need or use of any of these methods is unknowable at this junction, any implementation may require additional NEPA review.

Biological Control. *Biological control* typically involves the introduction or re-introduction of one species that is either a predator of the target species, is a disease organism, or competes with the target species so as to control its numbers. Natural predation, described below, is one form of biological control. Outside of insect species, it is often difficult, if not impossible, to find a biological control that does not impact other, non-target species.

Chemical Control. *Chemical control* involves the use of chemicals, usually some form of pesticide, to kill or sterilize individual animals. Few chemicals are species specific, however, so it is often extremely difficult to implement chemical control in an open landscape. Repellants are also a form of chemical control and can be effective on a small scale.

Contraception. *Contraception* manages populations through the latest contraceptive technologies to safely prevent reproduction for as long as possible and with minimal treatments per animal. Although these methodologies are humane, they can be very expensive to administer and may be ineffective for some species.

Controlled Hunting. *Controlled hunting* entails a limited number of permitted hunters under the direct control of FWS personnel—and in coordination with the DOE, WDFW, Native American tribes, and sports groups—organized into hunting teams outside the normal hunting season to achieve population control objectives or to take animals that are causing damage.

Fencing/Physical Barriers. *Fencing*, while being very effective on a single species, of course impacts other, non-target species. Fencing also has the disadvantage of being extremely expensive for large, wide-ranging species such as elk. Other physical barriers, such as 'beaver deceivers' or Thurber baffles can be effective for specific locations and/or on specific species.

Government Culling. *Government culling* entails shooting or trapping targeted species by trained government personnel. Use of trained personnel can accomplish population control measures while protecting other natural resource values. This method has the benefit of requiring few agency personnel to administer.

Habitat Manipulation. *Habitat manipulation* involves altering the habitat requirements of one or more lifecycle stages of the target species in order to reduce its population. However, few species have habitat requirements so unique to that species that unintended impacts to other species can be avoided.

Hazing. *Hazing* uses aircraft and ground-based personnel to move problem wildlife using herding techniques. Hazing has proven to be effective in moving animals from areas where they are creating problems or damage.

Natural Predation. *Natural predation* to control population numbers, insofar as it is possible, is desirable and would be encouraged under all alternatives. Some predators are protected by special rules on FWS-administered lands and are not hunted in order to maintain a balanced predator/prey relationship.

Trap and Relocate. *Trap and relocate* involves the live capture, removal and relocation of target species. A variety of techniques exist that are effective under different specific conditions.

- *Drive trapping* entails the herding of larger ungulates by aircraft into corrals for subsequent relocation.

- *Live traps* may be used for capture and transport of small to medium-sized animals.

- *Helicopter net gunning* uses contract helicopter services and experienced net gunners and ground crews. The helicopter locates a target animal, and an experienced net gunner shoots a large net over the animal. Net gunning has the least effect on soils and vegetation, is a highly mobile technique, but is expensive for population control. However, benefits for the protection of Monument resources may offset initial costs.

2.10.2 Goal 1: Conserve and restore the plants, animals and shrub-steppe and other upland habitats native to the Columbia Basin.

2.10.2.1 Objective 1-1: Protect High-Quality/Sensitive Shrub-steppe Plant Communities

Throughout the life of the CCP, 86,057 acres of existing high-quality, functional shrub-steppe plant communities (native plant species assemblages) will be protected and/or maintained. These areas are characterized by 10-25% native shrub cover (e.g., sagebrush species, spiny hopsage, antelope bitterbrush, winterfat, black greasewood), at least 20% native grass cover as the dominant species in the understory, and a low incidence (less than 20% cover) of non-native species. A mosaic of successional stages will be maintained while retaining structure, function and condition within these sensitive communities. Priority areas for maintaining plant communities will be identified based upon the following factors:

- *Areas that are important habitat for resident and migratory wildlife species, or areas that have known records of use by sensitive wildlife such as sage grouse, sage sparrows, loggerhead shrikes, sagebrush lizards, sagebrush voles, and ferruginous hawks.*

- *Areas that are large ($\geq$200 acres), that represent unique habitat features, or that are of exceptional habitat quality.*

- *Areas that are adjacent to one another to increase landscape connectivity.*

- *Areas that contain plant communities representing the foundation shrub-steppe plant communities of the Columbia Basin—communities that have been diminished throughout their range due to past and present land management practices (e.g., grazing, urbanization, agricultural development, wildfire), including those plant communities identified as "element occurrences" by the Washington Natural Heritage Program (WNHP) and serve as representations of native plant communities in relatively undisturbed (historic) condition.*[44]

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[44] From the WNHP:

The condition is determined by the relative importance of native versus non-native species, extent and nature of human-caused disturbance, and how well the occurrence represents the ecosystem type definition. Viability is determined by size of the area and landscape setting. Minimum criteria for an occurrence of an ecosystem:

1) Native plants dominate the site: tree layers composed of only native species.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	9,568	Same as Alt. A.						
Rattlesnake	50,505							
Ringold	1,074							
Saddle Mountain	3,490							
Wahluke	21,420							
Total	***86,057***							

Rationale and Strategies

Plant communities—a term referring to the generally recognizable assemblages of plant species that occur in patterns across landscapes—are important and useful indicators of biodiversity, as they form the biotic component of the habitat used by most other organisms. Different types of plant communities, and even different successional stages of a single plant community, provide distinctly different habitats. Conservation of the full range of native plant communities is therefore of fundamental importance for the conservation of regional biodiversity. Many of the rare and declining shrub-steppe dependent species in the lower Columbia Basin Ecoregion rely for part or all of their life cycle on particular shrub-steppe plant communities.

The Monument contains both large expanses of common communities in good ecological condition and examples of less common ones that are not well protected elsewhere in the region. Many of the existing plant communities have been ranked as either: 1) important locally or state-wide; or 2) globally significant because of their rarity or due to factors making them very vulnerable to extirpation and extinction.

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2) Little or insignificant disturbance to vegetation by logging, conversion to agriculture, heavy grazing, residential development, or other human extractive activities that alter the ecosystem processes.

3) Large enough for minimal viability and ecological function: at least 100 acres for forests in the montane provinces and at least four average tree heights wide at its narrowest width, at least 20 acres for forest in the Puget Lowlands, and at least 10 acres for native grasslands.

The degree to which these criteria are applied to a site depends on characteristics of the particular ecosystem types present. Some ecosystem types are found almost exclusively as small patches, perhaps in areas smaller than in criterion 3. In this case, meeting criteria 1 and 2 would be sufficient. Large but moderately disturbed ecosystems representative of types that have been altered throughout their range because of various land uses may need only meet criteria 1 and 3.

The Monument contains many endemic plant communities and species that have been lost or significantly reduced throughout all or a significant portion of their range. Nearly everywhere else, livestock grazing, urbanization and agricultural conversion have fragmented native shrub-steppe or drastically reduced its extent and quality.

Sensitive plant communities have been defined as those that: 1) are foundation plant communities within the Columbia Basin Ecoregion and have been identified as either state ranked, globally rare, or ecologically significant within western shrub-steppe environments; 2) have been significantly diminished throughout their range due to past and present management actions (e.g., grazing, agricultural development, urbanization, wildfire) and serve as important habitat for resident and migratory wildlife species; and 3) could be significantly damaged or lost through major disturbances (i.e., wildfire) and require some additional protection considerations within the CCP. This loss would be significant within the context of regionally important plant communities for the long-term survival of wildlife species and potential reintroduction sites for listed species.

In addition to those areas identified as "element occurrences" by the WNHP, the Monument has identified sensitive plant communities through vegetation mapping efforts. These communities are defined by a high abundance and diversity of native plants, a low incidence of non-native species, and records of use by sensitive wildlife species characteristic of shrub-steppe habitats. Significant disturbance within these plant communities would lead to the rapid spread of non-native invasive species that would further threaten their ecological integrity and importance for effective wildlife habitat.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Minimize any ground disturbing activities and management activities that disturb the soil surface.	✓	✓	✓	✓	✓	✓	✓	✓
Revegetate with native plant species materials in areas where ground disturbing activities cannot be avoided (see shrub-steppe restoration objective).	✓	✓	✓	✓	✓	✓	✓	✓
Control the effects of noxious weeds and non-native invasive species within these plant communities by continuing to inventory and control non-native plant species according to the IPSIMP (2003).	✓	✓	✓	✓	✓	✓	✓	✓
Prevent wildland fire, when possible, and limit size of wildland fires. Use Minimum Impact Suppression Techniques (MIST) and resource advisors on scene to limit impacts to sensitive plant communities. (Refer to the Fire Management Plan).	✓	✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Implement emergency stabilization and rehabilitation actions within three years of wildland fire impacts, including soil stabilization, cultural resource protection, non-native invasive species control, native seeding and planting, effectiveness monitoring, and threatened and endangered species stabilization actions, to maintain and improve perennial bunchgrass communities.	✓	✓	✓	✓	✓	✓	✓	✓
Conduct periodic (every five to seven years) monitoring of high-quality vegetative communities in permanent monitoring plots established by a Biodiversity Inventory and the Biological Resources Management Plan.		✓	✓	✓	✓			✓
Install monitoring plots in those plant communities where permanent monitoring plots currently are not established to track potential changes.		✓	✓	✓	✓			✓
Continue to document, map and refine current GIS data base on vegetation condition on the Monument.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.2.2 Objective 1-2: Protect Dense Sagebrush Areas

Throughout the life of the CCP, maintain ≥10,000 acres of existing dense stands of sagebrush shrub cover in patches of at least 400 acres in size and characterized by an average of a 10-30% cover of sagebrush and sagebrush height >20 inches, a native herbaceous cover of >10%, and an open ground cover of >10%.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	3,000	Same as Alt A.						
Rattlesnake	6,500							
Ringold	50							
Saddle Mountain	5,065							
Wahluke	19,534							
Total	***34,149***[1]							

[1] The total acres of mapped Wyoming big sagebrush may not meet the criteria listed in the objective above.

Rationale and Strategies

The increasingly rapid and widespread degradation, fragmentation, or total loss of sagebrush ecosystems throughout western North America presents a grave challenge to natural resource agencies charged with their management and restoration. Sagebrush once covered roughly 156 million acres in western North America, but very little now exists undisturbed or unaltered from its condition prior to Eurasian settlement. Perhaps 50-60% of the native sagebrush steppe now has either exotic annual grasses in the understory or has been converted completely to non-native annual grasslands. Sagebrush habitats are among the most imperiled ecosystems in North America (Knick et. al. 2003).

Shrub-steppe, often characterized by sagebrush as the dominant shrub, is a priority habitat for conservation as identified by the WDFW. Sagebrush provides essential wildlife habitat for sagebrush-obligate species; sagebrush is either a food source or provides nesting, resting, thermal and/or escape cover for a wide variety of native wildlife. Several species are dependent on dense stands of sagebrush for nest sites, food and cover. In order to maintain populations of sagebrush obligate species (i.e., sage grouse, sage sparrows, pygmy rabbits, black-tailed jackrabbits, loggerhead shrikes, Brewer's sparrows, striped whipsnakes, etc.), sagebrush communities should be maintained in relatively undisturbed condition and fragmentation should be avoided. Large patches of sagebrush ($\geq$400 acres) are required by some species for successful reproduction (e.g., sage sparrows). Management activities that increase cheatgrass and other exotic species that increase the risk of wildfire also should be avoided.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Prevent wildland fire, when possible, and limit size of wildland fires. Use MIST and resource advisors on scene to limit impacts to mature sagebrush areas.	✓	✓	✓	✓	✓	✓	✓	✓
Continue to inventory and control non-native plant species according to the IPSIMP (2003).	✓	✓	✓	✓	✓	✓	✓	✓
Replant sagebrush seedlings in areas affected by disturbance (see shrub-steppe restoration objective) to replace sage areas lost to fire or other disturbance.		✓	✓	✓	✓			✓
Continue to document, map and refine current GIS data base on vegetation condition on the Monument.		✓	✓	✓	✓			✓
Establish permanent vegetation monitoring plots within two years of CCP being approved and collect baseline data (e.g., percent of cover) in areas of dense sagebrush cover. Revisit plots to track changes every five years.		✓	✓	✓	✓			✓

2.10.2.3 Objective 1-3: Shrub-steppe Restoration

Throughout the life of the CCP, conduct restoration efforts annually on 2,000 to 6,000 acres within shrub-steppe habitats that have been degraded by historic uses (e.g., settlers, military, grazing), wildfire events, maintenance-related project work, Hanford Site mitigation, and invasive species in order to retain and restore stable functioning ecosystems that support diverse biotic communities. Restore a mosaic of shrub-steppe plant communities and seral stages that support shrub-steppe dependent species (e.g., loggerhead shrikes, sage sparrows, sage thrashers, ferruginous hawks, sagebrush voles). Priority areas for shrub-steppe restoration will be identified based upon the following factors:

- *Areas affected by wildfire.*
- *Areas affected by ground disturbing activities required for operations and maintenance by the FWS or other agencies that have valid existing rights on Monument lands.*[45]
- *Areas where restoration activities will have the potential to be successful—based on soil characteristics, elevation, aspect, presence of remnant native species and essential shrub-steppe components (e.g., microbiotic crust)—and effective wildlife habitat vegetation types.*
- *Areas where restoration can improve habitat for, and use by, high-priority shrub-steppe dependent wildlife species, especially those that are endangered, threatened, rare, sensitive (e.g., prairie falcons, Washington ground squirrels, pygmy rabbit), indicator (e.g., sagebrush voles), and/or sagebrush-obligate (e.g., sage grouse, sage sparrows) species.*
- *Areas that have been treated for invasive plant species, where priority is given to those areas close to valuable biological resources.*
- *Areas that occur between areas of high-quality habitats or vegetation communities where restoration activities could reduce habitat fragmentation and increase habitat connectivity on and/or adjacent to Monument lands.*[46]
- *Areas highly affected by non-native plant species (i.e., cheatgrass) with low native plant species abundance and diversity (areas where cheatgrass exceeds 20% total vegetative cover).*

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[45] Other agencies may have responsibilities to mitigate habitat disturbed through their management activities.

[46] This may include being away from public access in order to allow restoration to be undisturbed, or could include a short-term closure to public access.

- *Areas that appear to have a diverse shrub component in the overstory, but have an understory with low native diversity and/or an understory that is affected by invasive species.*

- *Areas affected by previous land uses—such as old farm fields, plowed areas, grazed areas, and areas of former miliary activity—that currently have a low abundance and diversity of native plant species (as long as these areas are not part of historical sites).*

<table>
<tr><th rowspan="2">Unit</th><th colspan="8">Alternatives</th></tr>
<tr><th>A</th><th>B</th><th>B-1</th><th>C</th><th>C-1</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Columbia River</td><td rowspan="5">Restore areas impacted by major distur-bances as resources permit.</td><td colspan="7" rowspan="5">Restore lands degraded by historic uses, wildfires, project work, Hanford site mitigation, and invasive species management. Total acres treated varies each year by unit.</td></tr>
<tr><td>Rattlesnake</td></tr>
<tr><td>Ringold</td></tr>
<tr><td>Saddle Mountain</td></tr>
<tr><td>Wahluke</td></tr>
<tr><td>Total (Acres Annually)</td><td>Varies</td><td>Up to 6,000</td><td>Up to 6,000</td><td>Up to 4,000</td><td>Up to 3,000</td><td>Up to 2,000</td><td>Up to 2,000</td><td>Up to 6,000</td></tr>
</table>

Rationale and Strategies

A total of 727 species, representing 90 families of vascular plants, have been recorded on the Hanford Site (Sackschewsky and Downs 2001). This represents an incredible diversity of plant life. Of this total, 179 are non-native species that have colonized and established in the area. The existing natural plant communities have been altered by Euro-American activities, resulting in the proliferation of non-native species. Cheatgrass is the dominant non-native species. It is an aggressive colonizer and has become well-established across the Hanford Site (Rickard and Rogers 1983). Hanford Site plants are adapted to low annual precipitation (6.8 inches), low water-holding capacity of the rooting substrate (sand), dry summers, and cold winters—situations that are ideal for cheatgrass.

Range fires that historically burned through the area during the dry summers eliminate fire-intolerant species (e.g., big sagebrush) and allow more opportunistic and fire-resistant species a chance to become established. Recovery of burned areas is a slow process, and it requires many years before areas naturally reestablish the natural component of vegetation and associated animal life. Recovery of many areas affected by wildfire would not generally occur in the absence of active management to restore native plant species.

Restoration of shrub-steppe habitat is a top priority of the Monument. Providing the full range of options and management techniques for restoration is in the best interest of the Monument's natural resources. Likewise, leaving all management options and techniques open for the treatment of invasive plant species and noxious weeds is best for the protection Monument's resources.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Implement emergency stabilization and rehabilitation actions within three years of wildland fire impacts, including soil stabilization, cultural resource protection, non-native invasive species control, native seeding and planting, effectiveness monitoring, and threatened and endangered (T&E) and sensitive species stabilization actions.	✓	✓	✓	✓	✓	✓	✓	✓
Each year, initiate active planting and seeding restoration activities on priority plant communities to improve cover and distribution of native understory and overstory species. Consider the needs of priority wildlife species, including sage sparrows, sage grouse, burrowing owls, pygmy rabbits, ground squirrels, and long-billed curlews.		✓	✓	✓	✓	✓	✓	✓
Initiate actions on non-native invasive species populations (i.e., cheatgrass, diffuse knapweed) that threaten the biological integrity of shrub-steppe habitats according to the IPSIMP (2003).	✓	✓	✓	✓	✓	✓	✓	✓
Reestablish native grass communities through controlling non-natives (i.e., cheatgrass) and conducting aerial, drill and/or broadcast seeding using native seeds.		✓	✓	✓	✓			✓
Collect native seeds for restoration projects from Monument sources to ensure ecological compatibility and increase the success of re-vegetation.[47]		✓	✓	✓	✓			✓
Expand native seed availability by contracting with local seed producers to multiply seed stocks collected from the Monument.		✓	✓	✓	✓			✓
Use native seed to produce native seedling plants for outplanting with native plant nurseries.	✓	✓	✓	✓	✓	✓	✓	✓

[47] All seed used to re-vegetate would at least be "source identified" as being from the Columbia Basin.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Develop a Monument native plant nursery in cooperation with other partners to provide native plant materials for restoration actions.		✓	✓	✓	✓	✓	✓	✓
Use prescribed fire to reduce hazardous fuel accumulations that contribute to destructive wildland fire events (e.g., tumbleweed accumulations).	✓	✓	✓	✓	✓	✓	✓	✓
Use prescribed fire to assist in non-native invasive species control and restoration activities in shrub-steppe plant communities.		✓	✓	✓	✓			✓

2.10.2.4 Objective 1-4: Protect Native Perennial Grasslands

Throughout the life of the CCP, maintain 47,759 acres of existing high-quality, functional grassland plant communities (native plant species assemblages). High-quality grasslands are characterized by >15% native bunchgrass species with >60% total grass cover,<10% cover of native shrubs, and <40% cover of non-native annual grasses, such as cheatgrass.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	1,419	Same as Alt. A.						
Rattlesnake	37,352							
Ringold	2,441							
Saddle Mountain	3,259							
Wahluke	3,288							
Total	***47,759***							

Rationale and Strategies

The Monument contains many endemic plant communities and species that have been lost or significantly reduced throughout all or a significant portion of their range. Native grasslands of the Columbia Basin Ecoregion have experienced more than an 85% decline since European settlement and have been described as an "endangered ecosystem" (Noss 1995). Many plant

communities have been ranked as important—either locally or state-wide—or globally significant because of their rarity, or due to other factors that make them vulnerable to extirpation and/or extinction. These communities have been significantly diminished throughout their range due to catastrophic wildfire events and past/present management actions (e.g., grazing, agricultural development, urbanization). They serve as important habitat for resident and migratory wildlife species and could be significantly damaged or lost through major disturbances (e.g., wildfire), thereby warranting additional protection considerations within the CCP. This loss would be significant within the context of regionally important plant communities for maintaining healthy, sustainable wildlife populations. These plant communities may serve as potential reintroduction sites for federally and Washington State listed species. Additionally, significant disturbance within these plant communities would lead to the rapid spread of non-native invasive species that would further threaten their ecological integrity and importance as effective wildlife habitat.

The large expanses of native bunchgrass on the Monument are a unique habitat and provide foraging, nesting and resting areas for a number of native species. Bunchgrass habitat is used for foraging by a variety of raptors, including Swainson's hawks, golden eagles, prairie falcons, short-eared owls, red-tailed hawks, ferruginous hawks, sharp-shinned hawks, and rough-legged hawks, among others. Meadowlarks, horned larks, and grasshopper sparrows are some of the ground-nesting birds that are commonly found in bunchgrass habitat on the Monument. Burrowing owls and northern harriers have been documented nesting and feeding in bunchgrass habitat. Long-billed curlews also prefer grassland habitats for nesting and foraging.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Minimize any ground disturbing activities and management activities that disturb the soil surface.	✓	✓	✓	✓	✓	✓	✓	✓
Revegetate with native plant species materials in areas where ground disturbing activities cannot be avoided (see the shrub-steppe restoration objective).	✓	✓	✓	✓	✓	✓	✓	✓
Implement emergency stabilization and rehabilitation actions within three years of wildland fire impacts, including soil stabilization, cultural resource protection, non-native invasive species control, native seeding and planting, effectiveness monitoring, and T&E species stabilization actions to maintain and improve perennial bunchgrass communities.	✓	✓	✓	✓	✓	✓	✓	✓
Initiate IPM actions on non-native invasive species populations that threaten the ecological integrity of grassland habitats.	✓	✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Install monitoring plots in those plant communities where permanent monitoring plots currently are not established to track potential changes.		✓	✓	✓	✓			✓
Use prescribed fire to reduce hazardous fuel accumulations that contribute to destructive wildland fire events (e.g., tumbleweed accumulations).	✓	✓	✓	✓	✓	✓	✓	✓

2.10.2.5 Objective 1-5: Protect Native Short Grasslands

Throughout the life of the CCP, maintain up to 23,584 acres of the existing functional short grassland plant communities (native plant species assemblages). Short grasslands are characterized by a cover of ≥20% native bunchgrass and forbs, with grass height <16 inches, a <10 % cover of native shrubs, and open ground ≥20%. The highest priorities for maintenance of short grass habitat are in areas where soil types allow for burrow development (for burrowing owl habitat).

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	4,454[1] (Existing)	Same as Alt. A.						
Rattlesnake	4,281							
Ringold	1,652							
Saddle Mountain	9,275							
Wahluke	3,922							
Total	***23,584***							

[1] The total acres of currently mapped short grass areas may not meet the criteria for conditions identified in the objective; see the grassland restoration objective.

Rationale and Strategies

This objective is closely tied to the objective for perennial grassland (steppe) habitat, and much of the rationale would be the same for perennial grassland and short grassland habitat areas.

It is necessary to identify areas that maintain grass heights less than 16" for several species of concern. Many of the short grass areas are used more frequently by horned larks, long-billed curlews, and burrowing owls for feeding, nesting and rearing. These areas are also used for foraging by Swainson's hawks, ferruginous hawks, short-eared owls, golden eagles, northern harriers, and rough-legged hawks. Short grass areas are often preferred by these species for their openness. The openness/visibility in this habitat makes finding and capturing prey easier and may allow for certain species to spot and avoid predators more easily.

Short grass habitats provide a unique component of the vegetative community. On the Monument, short grass areas tend to be the most vulnerable to invasion by cheatgrass, and therefore there are few areas of short stature grasslands that are in pristine condition. However, because these areas provide critical habitat for several species of concern, maintaining habitat areas in short grass is an important component of providing adequate habitat for all species of concern on the Monument. When short grass communities are invaded by taller stature plants, including native shrubs, (but also non-native plants such as Russian thistle, diffuse or Russian knapweed, or black locust), they become less suitable habitat for many species that prefer short-grass habitat. Taller stature plants make it more difficult for certain species to forage, or provide perch sites and hiding cover for predators, making the openness of short grass less hospitable. It is important, therefore, to maintain short grass areas within the larger grassland habitat management objective for the Monument.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Use prescribed fire, if necessary, or carefully manage wildland fires to promote short grass acreage within grassland habitat types.	✓	✓	✓	✓	✓	✓	✓	✓
Continue to inventory and control non-native plant species according to IPSIMP (2003) to control taller stature plants (i.e., tumbleweeds).	✓	✓	✓	✓	✓	✓	✓	✓
Evaluate habitat use versus availability, habitat preference, and species habitat needs and productivity for species that prefer short grass (burrowing owls, long-billed curlews, grassland nesting birds).	✓	✓	✓	✓	✓	✓	✓	✓
Continue to document, map and refine the current GIS database on vegetation conditions on the Monument.	✓	✓	✓	✓	✓	✓	✓	✓
Install monitoring plots in those plant communities where permanent monitoring plots currently are not established to track potential changes.		✓	✓	✓	✓			✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Revegetate short-grass habitats with native plant species materials in areas where ground disturbing activities have occurred.		✓	✓	✓	✓			✓

2.10.2.6 Objective 1-6: Native Grassland Restoration

On Monument lands within grassland habitat degraded by historic uses (e.g., settlers, military, grazing), wildfire events, maintenance-related project work, Hanford Site mitigation, and invasive species, annually conduct management activities on up to 320 acres for long-term restoration of the appropriate mosaic of grassland plant communities and seral stages (including short grass areas <16" in height) that support grassland dependent species (e.g., grasshopper sparrows, ferruginous hawks, burrowing owls, long-billed curlews). Priority areas for grassland restoration will be identified based upon the same criteria presented for shrub-steppe restoration objective (above) and:

- *Areas where restoration can improve habitat for, and use by, high-priority grassland-dependent wildlife species, especially those that are endangered, threatened, rare, sensitive (e.g., burrowing owls, long-billed curlews, ferruginous hawks), indicator (e.g., horned larks) and/or grassland obligate (e.g., grasshopper sparrows).*

Unit	Alternatives							
	A	B[1]	B-1[1]	C	C-1	D	E	F
Columbia River	Implement after major disturbance events as resources permit.	140	Same as Alt. B.	Same as Alt. B.	Same as Alt. A.	Same as Alt. A.	Same as Alt. A.	Same as Alt. B.
Rattlesnake		2,700						
Ringold		240						
Saddle Mountain		825						
Wahluke		825						
Total		***4,730***[2]						

[1] The acres shown are in addition to those of restoration from major disturbances.
[2] The acreage figure represents a 10% increase in cover of native grasslands over what is currently documented in Monument vegetation mapping efforts. This is over the anticipated life of the CCP (15 years).

Rationale and Strategies

Native grasslands of the Columbia Basin Ecoregion have experienced more than an 85% decline since European settlement and have been described as an "endangered ecosystem" (Noss 1995). The large expanses of native bunchgrass on the Monument are a unique habitat and provide foraging, nesting and resting areas for a variety of raptors, including Swainson's hawks, golden eagles, prairie falcons, short-eared owls, red-tailed hawks, ferruginous hawks, sharp-shinned hawks, and rough-legged hawks, among others. Meadowlarks, horned larks, and grasshopper sparrows, are some of the ground-nesting birds that are commonly found in bunchgrass habitat on the Monument. Burrowing owls and northern harriers have also been documented nesting and feeding in bunchgrass habitat. Long-billed curlews also prefer grassland habitats for nesting and foraging.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Each year, initiate active planting and seeding restoration activities on priority plant communities to improve cover and the distribution of native understory and overstory species. Consider the needs of priority wildlife species such as burrowing owls, long-billed curlews, grasshopper sparrows, ferruginous hawks, and northern harriers.		✓	✓	✓	✓			✓
Implement emergency stabilization and rehabilitation actions within three years of wildland fire impacts, including soil stabilization, cultural resource protection, non-native invasive species control, native seeding and planting, effectiveness monitoring, and T&E species stabilization actions.	✓	✓	✓	✓	✓	✓	✓	✓
Initiate IPM actions on non-native invasive species populations (e.g., cheatgrass, diffuse knapweed) that threaten ecological integrity of grassland (steppe) habitats.	✓	✓	✓	✓	✓	✓	✓	✓
Reestablish native grass communities by controlling non-natives (e.g., cheatgrass) and conducting aerial, drill and/or broadcast seeding using native seeds.		✓	✓	✓	✓			✓
Collect native seeds for restoration projects from Monument sources to ensure ecological compatibility and increase the success of re-vegetation.		✓	✓	✓	✓			✓
Expand native seed availability by contracting with local seed producers to multiply seed stocks collected from the Monument.		✓	✓	✓	✓			✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Use native seed to produce native seedling plants, using native plant nurseries, for restoration activities.	✓	✓	✓	✓	✓	✓	✓	✓
Develop a Monument native plant nursery in cooperation with other partners to provide native plant materials for restoration actions.		✓	✓	✓	✓	✓	✓	✓
Use prescribed fire to reduce hazardous fuel accumulations that contribute to destructive wildland fire events (e.g., tumbleweed accumulations).	✓	✓	✓	✓	✓	✓	✓	✓
Use prescribed fire to assist in non-native invasive species control and restoration activities in shrub-steppe plant communities.		✓	✓	✓	✓			✓

2.10.2.7 Objective 1-7: Protect Unique/Rare Habitats

Throughout the life of the CCP, protect and maintain ~2,500 acres of unique habitats (e.g., cliffs, caves, bluffs, talus, rock outcroppings, dunes).[48]

<table>
<tr><th rowspan="2">Unit</th><th colspan="8">Alternatives</th></tr>
<tr><th>A</th><th>B</th><th>B-1</th><th>C</th><th>C-1</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Columbia River</td><td rowspan="5">Protect and maintain unique habitats, inventory and monitor as projects allow.</td><td colspan="7" rowspan="5">Conduct inventories, monitoring and research that promotes the protection and conservation of rare/unique habitats and the species they support.</td></tr>
<tr><td>Rattlesnake</td></tr>
<tr><td>Ringold</td></tr>
<tr><td>Saddle Mountain</td></tr>
<tr><td>Wahluke</td></tr>
</table>

Rationale and Strategies

Unique/rare habitats on the Monument include bluffs, cliffs and dunes. In addition, while not rare within the Columbia Basin, the White Bluffs, Umtanum Ridge, Gable Mountain, Rattlesnake Mountain, and Saddle Mountains include rock outcrops that occur infrequently on

[48] Lithosols are discussed in Objective 1-12.

the Hanford Site. Plant communities dominated by buckwheat and Sandberg's bluegrass most often occupy these basalt outcrops.

Bluffs provide perching, nesting and escape habitat for several bird species on the Monument. The White Bluffs and Umtanum Ridge provide nesting habitat for prairie falcons, red-tailed hawks, cliff swallows, bank swallows, and rough-winged swallows. In the past, Canada geese have used the lower elevations of the White Bluffs for nesting and brooding. Bald eagles use the White Bluffs for roosting. Bluff areas provide habitat for sensitive species (i.e., peregrine falcons) that otherwise may be subject to impacts from frequent or repeated disturbance. Raptors like ferruginous and Swainson's hawks often use cliffs or rock outcrops for breeding.

Dune habitat on the Monument is unique in its association with the surrounding shrub-steppe vegetation type. The uniqueness of the dunes is noted in its vegetation component as well as the geologic formation. Snow buckwheat and Sandberg's bluegrass/cheatgrass communities dominate the large dune areas. Dune fields provide habitat for mule deer, burrowing owls, and coyotes, as well as many transient species, and are very important for maintaining large populations of sagebrush lizards on the Monument.

Specialized habitats on the Monument have not been systematically inventoried. Potentially, these areas have a higher incidence of use by wildlife and greater proportion of rare plants when compared to their general availability on the landscape.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Control public use and access to special habitat areas to reduce or minimize impacts.	✓	✓	✓	✓	✓	✓	✓	✓
Develop partnerships to research and monitor erosion in special habitat area (especially bluffs). Develop management recommendations based on the research.		✓	✓	✓	✓	✓	✓	✓
Continue to inventory and control non-native plant species according to the IPSIMP (2003).	✓	✓	✓	✓	✓	✓	✓	✓
Continue to collect global positioning system (GPS) data and continue to add information to spatial databases in the GIS system to document special habitat areas on the Monument.	✓	✓	✓	✓	✓	✓	✓	✓
Continue to document wildlife species occurrences and important sites associated with specialized habitats (raptor nests, bat roosts, etc.) using GPS to update and add information to the GIS database.	✓	✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Identify wildlife resources that need further inventory, monitoring, and/or research. Focus on bats, herptiles and breeding birds.		✓	✓	✓	✓	✓	✓	✓
Document and monitor rare plants (see the rare plant objective).		✓	✓	✓	✓			✓

2.10.2.8 Objective 1-8: Protect Rare Plant Populations

Throughout the life of the CCP, maintain and, where possible, expand the populations of endangered, rare and sensitive plant taxa.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Protect existing rare plant popula-tions.	Monitor, protect, stabilize and expand by 10%.		Monitor, protect, stabilize and expand by 5%.		Monitor, protect and stabilize.		Same as Alt. B.
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

The Hanford Site is clearly one of the premier sites in the Columbia Basin Ecoregion for rare plants. A total of 127 populations/occurrences of thirty rare plant taxa are now documented on the Hanford Site. Survey efforts during 1994 and 1995 identified seven rare plant species associated with the riverine emergent wetlands found at various places along the Hanford Reach (Caplow 2003, Caplow and Beck 1996, Soll and Soper 1996). This is a tremendous amount of rare plants—both in terms of species richness and abundance—to occur in an area the size of the Hanford Site (see Chapter 3).

Rare plant populations are vulnerable to direct physical destruction of plants and to loss and degradation of habitat. It is likely that both the thirty rare plant taxa and the seventeen unusual taxa on the Hanford Site were previously more widespread in the lower Columbia Basin. Since 1943, however, the lower Columbia Basin has undergone significant shifts in land use.

Population growth, large-scale irrigation projects, conversion of shrub-steppe to orchards and fields, continued livestock grazing, and increases in noxious weeds have significantly reduced and/or degraded available habitat for many plants of conservation concern throughout the lower Columbia Basin. Riverine emergent wetlands, and their associated rare plant species, have been severely reduced along the Columbia River system, which has been mostly impounded by hydroelectric dams (Caplow and Beck 1996, Downs et al. 1993). As these trends continue, the importance of the Hanford Site, an island of biodiversity, will be essential for the conservation of these species.

Botanical inventory should be an on-going process, as rare plant populations change over time. Little is known about the biology, ecology and appropriate management for the thirty currently identified taxa of rare plants of the Hanford Site. Many of these species are diminutive desert annuals that present unique challenges for effective protection and management. Other species are extremely rare endemics that could face extinction without proper monitoring and management to maintain or enhance the viability of their populations. A priority for inventory, monitoring, protection and management of these species should be based on the rarity and threats to these plant populations. Recommendations from the biodiversity inventory and the 1999 and 2003 analysis should guide future work on rare plants (Soll et al. 1999).

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Continue on-going partnerships for monitoring of Umtanum desert buckwheat, White Bluffs bladder-pod, and persistent sepal yellowcress.	✓	✓	✓	✓	✓	✓	✓	✓
Conduct additional inventories in areas not yet surveyed for rare plant species.		✓	✓	✓	✓			✓
Continue to inventory and control non-native plant species using IMP techniques according to the IPSIMP (2003).	✓	✓	✓	✓	✓	✓	✓	✓
Consider rare plant locations and conduct site specific surveys when planning management and recreation activities, public access, and other actions.	✓	✓	✓	✓	✓	✓	✓	✓
Prevent wildland fire, when possible, and limit size of wildland fires. Use MIST and resource advisors on scene to limit impacts to rare plant populations.	✓	✓	✓	✓	✓	✓	✓	✓
Develop propagation techniques for the most rare species to be prepared for reintroduction if populations go below thresholds to be designed.		✓	✓	✓	✓			✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Support partnerships and grants for research, monitoring and further inventory of rare plants. The following additional species should be given a high priority for monitoring: rosy calyptridium, loeflingia, white eatonella, desert evening primrose, and Hoover's desert parsley.	✓	✓	✓	✓	✓	✓	✓	✓
Actively seek additional funding through partnerships and grants to research and monitor rare plant populations.		✓	✓	✓	✓			✓
Continue to collect GPS data and continue to add information to spatial databases in the GIS system to track locations of rare plant species on the Monument.	✓	✓	✓	✓	✓	✓	✓	✓
Continue to support efforts to re-introduce northern wormwood in appropriate habitats.		✓	✓	✓	✓			✓

2.10.2.9 Objective 1-9: Protect Microbotic Crust[49]

Throughout the life of the CCP, protect and, where possible, expand microbiotic crusts and associated species (mosses, lichens, fungi, algae, liverworts, cyanobacteria, etc.), providing for a mosaic of microbiotic communities in various seral stages.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Limited project specific inventories.	Inventory/protect/research/expand where feasible.				Conserve and protect.		Same as Alt. B.
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

[49] Also referred to as biological soil crust and cryptogamic crust.

Rationale and Strategies

Protection of relic (undisturbed) sites as ecological reference areas is important, as these sites provide baseline comparisons for ecological potential and future scientific research. The Monument is a classic example of a relic site that can provide important information on biological soil crusts. However, on the Monument, no complete inventory of crusts has been conducted. Past studies have identified some of the common species that exist in the soil crust, but more inventorying and monitoring needs to be conducted to generate complete maps of where crust exists, its current condition, and its relationship to different vegetative communities.

Microbiotic crust is extremely sensitive to disturbance and can take decades or longer to recover. While total protection from disturbance is often the easiest way to maintain or improve biological soil crusts, this is not often possible.[50] Proactive management is needed to prevent unnaturally large and/or frequent fires in areas where fuel build-up or annual grass invasions have occurred. Such management actions may include preventing annual plant invasions through the IPSIMP, prescribing fire to prevent fuel build-up, and/or restricting public use activities to roads and trails. Once a site has burned, evaluation is needed to determine whether recovery will occur naturally or if revegetation is needed. Many burned sites, particularly those in the Great Basin and Intermountain Regions, require revegetation with native plant species to stop exotic plant invasion, and most techniques require some soil surface disturbance. These restoration strategies are required to limit the irreversible dominance by invasive species (such as cheatgrass), which prevents the return of well-developed biological soil crusts. Once revegetated, protection from grazing and recreational use is often necessary for recovery of the biological soil crust and the vascular plant community. Recovery in these areas can be further facilitated by use of minimal till or no-till drills or other seeding methods that minimize soil surface disturbance and compaction. Emphasis should be placed on restoring the native plant community using local ecotypes, if available.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Minimize any ground disturbing activities and management activities that disturb microbiotic crusts.	✓	✓	✓	✓	✓	✓	✓	✓
Conduct additional inventories in areas not yet surveyed for microbiotic crusts and in seasons when crust species are likely to be visible.		✓	✓	✓	✓			✓
Collect GPS data and develop information and spatial databases in the GIS system to track locations and condition of microbiotic crusts on the Monument.		✓	✓	✓	✓			✓

[50] There are many factors to consider in the management of soil communities, including disturbance type, intensity, timing, frequency, duration and/or extent.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Continue to inventory and control non-native plant species according to the IPSIMP (2003).	✓	✓	✓	✓	✓	✓	✓	✓
Consider microbiotic crust locations and conduct site specific surveys when planning management or recreation activities, public access, and other actions.	✓	✓	✓	✓	✓	✓	✓	✓
Support partnerships and grants for third-party research, monitoring and further inventory of microbiotic crust on Monument lands.	✓	✓	✓	✓	✓	✓	✓	✓
Actively seek funding, grants and partnerships to conduct research, monitoring and further inventory of microbiotic crust on Monument lands.	✓	✓	✓	✓	✓	✓	✓	✓
Establish partnerships with private, academic and other agencies to develop restoration techniques and processes for microbiotic crust restoration.		✓	✓	✓	✓			✓
Prevent wildland fire, when possible, and limit the size of wildland fires. Use MIST and advisors on scene to limit impacts to microbiotic crusts.	✓	✓	✓	✓	✓	✓	✓	✓
Develop techniques for propagation of crust species to be prepared for re-introduction in areas impacted by major disturbances.		✓	✓	✓	✓			✓

2.10.2.10 Objective 1-10: Inventory and Monitor Federally Listed Threatened and Endangered, Rare, and Sensitive Species

During the life of the CCP, conduct inventorying and monitoring and identify management-oriented research to promote the conservation, restoration and adaptive management of high-priority wildlife species on the Monument, especially those that are T&E, rare, sensitive (e.g., bald eagles, prairie falcons, Washington ground squirrels), indicator (e.g., sagebrush voles) and/or sagebrush-obligate (e.g., sage grouse, sage sparrows).

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Inventory and monitor T&E, rare and sensitive species as projects allow.	Conduct systematic inventories, monitoring and research that promotes conservation and restoration initiatives for T&E, rare and sensitive species.						
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Based upon the breadth of wildlife and habitat management activities on the Monument, there is a myriad of associated monitoring activities that could be conducted by the biological staff. Inventory and monitoring of listed and sensitive wildlife species in critical to conserving the biological integrity of the Monument. Monitoring can be used to identify trends and to adapt management actions when information indicates a change is required. Inventorying and monitoring is required to assess the effects of management actions, to both prevent any adverse effects to wildlife species and to assess whether Monument objectives are being met. Inventorying and monitoring will be used to develop quantitative measures to evaluate the Monument's progress in meeting goals and objectives.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Evaluate existing research and monitoring data for wildlife to identify scientific information gaps and priority research needs within one year of the CCP being approved.		✓	✓	✓	✓	✓	✓	✓
Based upon identified gaps in scientific information, conduct habitat inventories to fill information gaps within two to five years of the CCP being approved.		✓	✓					✓
Based upon identified gaps in scientific information, conduct habitat inventories, focusing on areas where facilities and public use are concentrated.	✓			✓	✓	✓	✓	

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Based upon the identified priority species, prepare an inventory and monitoring plan, associated with the development of a Habitat Management Plan, utilizing standardized protocols that are reasonable and practical considering current and future biological staffing. Priority species will be identified through the Monument Proclamation, bird conservation plans (Partners In Flight, shorebird, and waterfowl plans), FWS trust resources, T&E recovery plans, fishery management plans, and others.	✓	✓	✓	✓	✓	✓	✓	✓
Prepare an inventory and monitoring plan for high-priority species and habitats to evaluate and refine restoration and management activities.		✓	✓	✓	✓			✓
Incorporate geo-referenced monitoring data (birds, mammals, fish, and invertebrates) into GIS map coverages. Base future management decisions (e.g., sagebrush restoration, IPM, fire suppression) upon spatial analyses of monitoring data considering vegetation, soils and wildlife.	✓	✓	✓	✓	✓	✓	✓	✓
Create a relational database system to store and manage monitoring data. Where applicable, utilize the NWRS Refuge Lands GIS database to store information regarding wildlife and habitat management actions (management prescriptions) along with the monitoring data.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.2.11 Objective 1-11: Restoration of Lithosol Habitat

On Monument lands along ridge lines (e.g., Rattlesnake Mountain) degraded by historic uses (e.g., settlers, military, grazing, DOE operations and facilities), wildfire events, and invasive species, restore to the extent possible native bunchgrasses, forbs, mosses and lichens that support lithosol-associated species (e.g., short-horned lizard., rosy balsamroot).

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	0	Same as Alt. A.						
Rattlesnake	200							
Ringold	0							
Saddle Mountain	40							
Wahluke	0							
Total	***240***							

Rationale and Strategies

The crest of Rattlesnake Mountain supports high-quality, low-growing lithosol communities on its shallow, rocky soil. Likewise, the highest rare plant densities occur on ridge lines within the Monument. Existing facilities on many of the ridge lines present ongoing hazards to wildlife that use these areas. Facilities include power transmission lines; roads; commercial telecommunications facilities such as antennae, satellite dishes, and structures; old buildings from the Manhattan Project era; an observatory; and weather monitoring equipment. The facilities attract non-native species (e.g., European starlings, Norway rats) which can impact local populations of native wildlife that occur on the ridge lines, either through competition for resources, nesting sites, and food resources, or by direct predation (e.g., rats eat bird eggs). Further, guy wires and tall structures present a collision hazard to birds during daily activities and during migration. Birds frequently use the ridge lines due to thermal air currents and wind availability. Finally, tall structures can provide perch sites for predators that may not normally occur on ridge lines. Structures that can be used as perch sites by predators (even if not actually used by predators) may still cause certain species to avoid these areas (e.g., sage grouse). Restoring these areas is important for protecting the biological integrity of the Monument.

Additionally, objectives related to the cultural resources and traditions and visual resources of the Monument are directly associated with this objective to restore the lithosol communities of prominent ridge lines.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Require revegetation with native plants characteristic of lithosol communities.	✓	✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Collect native seed from lithosol/ridge-line areas to ensure ecological compatibility and increase success of revegetation.		✓	✓	✓	✓			✓
Work with the DOE to decommission and demolish all facilities not subject to valid existing rights on Rattlesnake Mountain, excluding the observatory (see the next strategy), to restore lithosol habitat (see also Cultural Resources Goal 5 and Aesthetics Goal 8).	✓	✓	✓	✓	✓	✓	✓	✓
Remove the observatory.[51]		✓	✓	✓	✓			✓

2.10.2.12 Objective 1-12: Integrated Pest Management

Implement the IPSIMP to address treatment methods, inventorying and monitoring for existing invasive plants, and minimize new non-native introductions and conditions that favor their establishment and spread. Annually treat 5,000-18,000 acres on the Monument infested with noxious, invasive and/or non-native species throughout the life of the CCP.

<table>
<tr><th rowspan="2">Unit</th><th colspan="8">Alternatives</th></tr>
<tr><th>A</th><th>B</th><th>B-1</th><th>C</th><th>C-1</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Columbia River</td><td rowspan="5">Conduct pest manage-ment in the highest priority areas (IPM plan), and along corridors as resources permit.</td><td colspan="7" rowspan="5">Systematically conduct integrated pest management and additional survey and mapping work across Monument lands. Total acres treated varies each year by unit.</td></tr>
<tr><td>Rattlesnake</td></tr>
<tr><td>Ringold</td></tr>
<tr><td>Saddle Mountain</td></tr>
<tr><td>Wahluke</td></tr>
<tr><td>Total</td><td>~5,000 acres.</td><td>Up to 18,000 acres.</td><td>Up to 18,000 acres.</td><td>Up to 13,000 acres.</td><td>Up to 12,000 acres.</td><td>Up to 11,000 acres.</td><td>Up to 12,000 acres.</td><td>Up to 18,000 acres.</td></tr>
</table>

[51] The FWS does not have the authority to remove the observatory. Instead the FWS will recommend to the DOE that the observatory be removed.

Rationale and Strategies

Non-native invasive plant species pose one of the most serious threats to the biological integrity and diversity, as well as the scenic values, for which the Monument was established and for which the entire Hanford Site is well known (Soll et al. 1999). Invasive and noxious alien plant species compete against, and reduce habitat available for, rare plant taxa and native plant species in general. Invasive and noxious plants alter ecosystem structure and function, disrupt food chains and other ecosystem characteristics vital to wildlife, and dramatically alter key ecosystem processes, such as hydrology, productivity, nutrient cycling, and the fire regime (Randall 1996, Brooks and Pyke 2001, Mack et al. 2000).

Shrub-steppe ecosystems, such as that represented on the Monument, are highly susceptible to infestation by invasive plant species, especially when disturbed (DiTomaso 2000). The Monument's large size (195,000 acres), as well as the large number of documented or potential invasive plant species, present significant challenges to management of Monument resources. Past and present land use practices—such as farming, ranching, military activities, road building, quarrying and riverflow management—have helped to create conditions favorable for the establishment of many invasive plant species on Monument lands and throughout the Columbia Basin. The introduction and spread of invasive plant species is enhanced by the existence of disturbed lands and corridors (Mack et al. 2000). Potential corridors for the migration of invasive species into and within the Monument include:

- Forty-seven miles of the Columbia River.
- Forty-seven miles of active irrigation canals and wasteways and more than 1,000 acres of associated impoundments.
- More than fifty miles of state highway and more than 180 miles of paved and unpaved secondary roads in widely varying condition.
- More than twenty miles of power line corridors and associated access roads.

Certain trends may make invasive species even more of a problem in the future than they are at present. New invasive species may be expected to arrive within the coming years as technology and commerce continue to reduce barriers to plant migrations (McNeely 2001, Mack et al. 2000). At the same time, increased public use, recurrent wildfires, power line development and maintenance, the slumping of the White Bluffs, and other disturbances continually create new habitats for invasive species to colonize.

IPM employs a practical, economical and scientifically based combination of biological, physical, cultural and chemical control methods. IPM emphasizes exploration of a variety of methods in order to identify a method, or combination of methods, that is effective and reduces

or eliminates the need for chemical pesticides. IPM is a balanced approach that considers hazard to the environment, efficacy, costs and vulnerability of the pest.

Strategy[1]	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Continue to identify, inventory, prioritize, treat, and monitor non-native, invasive plant species according to IPSIMP (2003).[1]	✓	✓	✓	✓	✓	✓	✓	✓
Promptly initiate non-native invasive plant species treatments through emergency stabilization and rehabilitation actions following wildland fires and other major land disturbances.	✓	✓	✓	✓	✓	✓	✓	✓
Utilize GPS technology to map treatments, conduct effectiveness monitoring, and map new weed infestations as discovered.	✓	✓	✓	✓	✓	✓	✓	✓
Ensure non-native invasive treatments are followed by native plantings, where practical, to restore native cover and maintain long-term noxious and invasive plant control.		✓	✓	✓	✓			✓
[1] Information and strategies are further detailed and identified in the IPSIMP, which was open for public review during the review of the draft CCP and is available at hanfordreach.fws.gov/documents/weed-plan.pdf.								

2.10.2.13 Objective 1-13: Elk Management

Over the life of the CCP, where feasible and compatible with Monument purposes, coordinate with the DOE, WDFW and area tribes to implement actions that will assist in achieving and maintaining herd objectives and population goals for the Rattlesnake Hills Elk Herd.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Conduct cooperative surveys; participate in elk forums/ workgroups; communicate with landowners.	In cooperation with the DOE, WDFW and area tribes, monitor the Rattlesnake Hills Elk Herd as well as develop and implement a long-term elk management plan in support of the objectives and based upon best available science. Implement management strategies as needed to assist with herd management objectives.						
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

The FWS has been actively monitoring the Rattlesnake Hills Elk Herd population since 2001. Recent inventories (winter 2007 post-harvest) estimate the herd to be approximately 639 animals (an approximate 56:67 sex ratio of bulls to cows), with an average over the last four years of 632 elk. This is above the WDFW's post-harvest goal of 350 animals identified in the Rattlesnake Hills Elk Herd Management Plan. The Monument has committed to assist the WDFW in reducing the herd until that herd goal is met. At that time, the target will be re-evaluated for its appropriateness within the context of a long-term elk management plan.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Coordinate with the WDFW to develop the goals for desired future condition of the herd (sex ratios, productivity, etc.).	✓	✓	✓	✓	✓	✓	✓	✓
Work with the DOE and WDFW to allow hunting for elk on up to 42,000 acres of the Rattlesnake Unit as a method of population control.				✓				
Initiate studies to evaluate potential impacts to Monument resources associated with elk use at various populations levels.		✓	✓	✓	✓			✓
Conduct, in partnership with the WDFW, annual monitoring of the elk herd to determine herd size and composition.	✓	✓	✓	✓	✓	✓	✓	✓
Meet annually with neighboring landowners.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.3 Goal 2: Conserve and restore the communities of fish and other aquatic and riparian-dependent plant and animal species native to the Hanford Reach National Monument.

2.10.3.1 Objective 2-1: Fish and Aquatic Habitat

For the life of the CCP, and to the extent possible, protect and maintain riffles, gravel bars, oxbow ponds, and backwater sloughs that provide important habitat for native fish; especially spawning and rearing areas for fall Chinook salmon, white sturgeon, and steelhead in the

Hanford Reach of the Columbia River. Protect and maintain habitat areas for other aquatic species (e.g., mussels, invertebrates) that represent the characteristic native faunal communities of the Columbia River.

<table>
<tr><th rowspan="2">Unit</th><th colspan="8">Alternatives</th></tr>
<tr><th>A</th><th>B</th><th>B-1</th><th>C</th><th>C-1</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Columbia River</td><td rowspan="5">As projects allow, cooperate with other agencies to protect fish and aquatic habitat.</td><td colspan="8" rowspan="5">Protect and maintain fish and other native aquatic fauna and their associated aquatic habitats along the Hanford Reach of the Columbia River.</td></tr>
<tr><td>Rattlesnake</td></tr>
<tr><td>Ringold</td></tr>
<tr><td>Saddle Mountain</td></tr>
<tr><td>Wahluke</td></tr>
</table>

Rationale and Strategies

The Hanford Reach encompasses the last non-tidal, free-flowing segment of the Columbia River in the United States. However, water flow is regulated by upstream dams for production of hydropower, resulting in potential daily water fluctuations of up to twelve feet. Water flows and flow management affect fish habitat for spawning and rearing in the Hanford Reach. Both seasonal and daily flow fluctuations have impacts on fisheries in the Hanford Reach. Fluctuations have resulted in stranding or entrapment and mortality of juvenile anadromous and resident fish species (see Section 3.10.1.5). Fluctuations may also contribute to siltation and degrade habitat for fish in a variety of ways. Forty-four species of fish have been documented in the Hanford Reach, including salmonid stocks. Specifically, 80% of all mainstem Columbia River spawning fall Chinook salmon breed in the Hanford Reach. This economically and culturally significant stock is a principle component of the international Pacific Salmon Treaty between the United States and Canada. Upper Columbia River spring Chinook salmon, as well as middle and upper Columbia River steelhead (which are a federally listed species), use the Hanford Reach during migration. Additionally, breeding populations of white surgeon inhabit the Hanford Reach. Although there are multiple jurisdictions and management agencies along this portion of the Columbia River, the Monument has a responsibility to maintain the Hanford Reach under the Wild and Scenic Rivers Act, Improvement Act, Fish and Wildlife Coordination Act, and other legislation and regulations to the extent possible.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Develop partnerships with other agencies that have interest and jurisdiction on the Columbia River for fish habitat and fisheries management. Partnerships may include ACOE, BOR, BPA, CRITFC, DOE, FWS-Fisheries, FWS-Ecological Services, Grant County PUD, NOAA-Fisheries, WDFW, WDNR, and other agencies and entities.	✓	✓	✓	✓	✓	✓	✓	✓
Continue to cooperate with other agencies and follow monitoring efforts to document and quantify fall Chinook salmon spawning and rearing in the Hanford Reach.	✓	✓	✓	✓	✓	✓	✓	✓
Develop partnerships to monitor white sturgeon and to identify and protect important spawning areas in the Hanford Reach. Continue to work with the FWS Columbia River Fisheries Office on documentation and evaluation of habitat for sturgeon using a 2-D hydrodynamic model of the Hanford Reach.	✓	✓	✓	✓	✓	✓	✓	✓
Foster partnerships to protect important spawning areas for fall Chinook salmon. Continue work with the FWS Columbia River Fisheries Office on documentation and evaluation of spawning areas for fall Chinook. Attempt to quantify the effects of water level manipulation and variation from hydropower generation on resident and anadromous fish habitat and aquatic invertebrates. Quantify the mortality of juvenile fall Chinook salmon from stranding and entrapment that results from water level fluctuations.	✓	✓	✓	✓	✓	✓	✓	✓
Continue to develop partnerships to conduct inventories, monitoring and research related to: water fluctuation effects on sedimentation of backwater areas; impacts to wildlife including nesting aquatic migratory birds (e.g., herons, gulls, Canada geese, land birds), other native fishes (e.g., Pacific lamprey, sand roller, prickly sculpin), and mammals (e.g., deer, mink, beaver, otter); and impacts to rare plants (e.g., persistentsepal yellowcress).	✓	✓	✓	✓	✓	✓	✓	✓
Continue to develop partnerships to collect further information and support additional research on native fishes and use of specialized habitats in the river.	✓	✓	✓	✓	✓	✓	✓	✓
Continue to inventory and control non-native plant species according to the IPSIMP, (especially tamarisk, phragmites, purple loosestrife, and black locust).	✓	✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Continue to develop partnerships to additional inventories on native species of concern within the Columbia River (e.g., mussels, bivalves, macro-invertebrates).	✓	✓	✓	✓	✓	✓	✓	✓

2.10.3.2 Objective 2-2: Islands

Protect and, where appropriate and possible, restore high-quality habitats (i.e., cobble, cobble with sparse grass, dune, shrub, scattered trees) to provide habitat for migratory and resident birds, rare plants, mammals and amphibians.

<table>
<tr><th rowspan="2">Unit</th><th colspan="8">Alternatives</th></tr>
<tr><th>A</th><th>B</th><th>B-1</th><th>C</th><th>C-1</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Columbia River</td><td rowspan="5"></td><td colspan="4" rowspan="5">Restore twenty acres of island habitat annually.</td><td colspan="2" rowspan="5">Restore ten acres of island habitat annually.</td><td rowspan="5">Same as Alt. B.</td></tr>
<tr><td>Rattlesnake</td></tr>
<tr><td>Ringold</td></tr>
<tr><td>Saddle Mountain</td></tr>
<tr><td>Wahluke</td></tr>
</table>

Rationale and Strategies

There are nineteen islands located in the Columbia River upstream of Richland, Washington, that are included within the scope of this plan. This includes six islands currently managed by the McNary National Wildlife Refuge.

Islands vary in soil type and vegetation and range from narrow cobble beaches to extensive dune habitats, further increasing habitat complexity in the River Corridor Unit. Characteristic shoreline vegetation on the islands includes willow, poplar, Russian olive, and mulberry.[52] Plant species occurring on the island interior include buckwheat, lupine, mugwort, thickspike wheatgrass, giant wildrye, yarrow and cheatgrass. Several areas along the south shore and

[52] Before regulation of river flows by dams, trees were not found along river shoreline habitat, with the exception of small willows.

islands of the river support significant occurrences of Columbia Basin low-elevation riparian wetlands. Although not all of these sites are pristine, such wetlands are of statewide conservation importance as most comparable sites have been permanently flooded by reservoirs.

Islands provide important nesting and foraging habitat and escape cover for many species of migratory and resident birds, including waterfowl (e.g., ducks and geese), migratory water birds (e.g., grebes and loons), colonial water birds (e.g., herons and egrets), shorebirds (e.g., sandpipers), and songbirds (e.g., sparrows). Islands, bluffs and sandbars along the Hanford Reach are important for a variety of nesting birds, including swallows, falcons, owls, geese, gulls, terns and water birds, as well as wintering habitat for a variety of species. Mule and white-tailed deer also use the islands during fawning as protection from coyotes. During the fall and winter, ducks (mallards, pintails, ring-necked, canvas backs, buffleheads, goldeneyes) and Canada geese rest on the shorelines and islands along the Hanford Reach. Maintaining the integrity and native diversity of the islands is important for managing the unique natural resources of the Monument.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Develop partnerships to research, monitor and develop management recommendations to address slumping, siltation of cobble, and erosion of islands.		✓	✓	✓	✓			✓
Maintain early successional habitat and cobble on islands, where possible, using a variety of techniques such as mowing or prescribed fire.	✓					✓	✓	
Continue to inventory and control non-native plant species using IPM strategies according to the IPSIMP.	✓	✓	✓	✓	✓	✓	✓	✓
Continue to partner with others to monitor rare plant populations on islands (see the Rare Plants objective).	✓	✓	✓	✓	✓	✓	✓	✓
Continue to partner with others to re-introduce rare plants on islands (see Rare Plants objective).		✓	✓	✓	✓	✓	✓	✓
Inventory and monitor species of concern (colonial nesting species, heron colonies, shorebirds, waterfowl, bald eagles) on the islands and within the riverine/riparian zone (see the Riverine Wetlands and Riparian Areas objective).	✓	✓	✓	✓	✓	✓	✓	✓
Identify strategies to maintain diverse plant associations to protect island integrity, reduce siltation, and provide a wide-range of riverine habitat that benefits many wildlife species.		✓	✓	✓	✓	✓	✓	✓

2.10.3.3 Objective 2-3: Irrigation Run-off Aquatic Habitats

In appropriate areas surrounding irrigation wasteways and artificial seeps (e.g., Saddle Mountian Lake, WB-10 ponds): 1) enhance riparian habitat characterized by a mosaic of native shrubby thickets with patches of deciduous trees and grass/forb-dominated plants; and 2) enhance emergent wetland habitat characterized by native bullrush, cattails and wetland emergent species.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Wahluke	Conduct cooperative projects with other agencies.	Annually planned restoration.				Same as Alt. A.		Same as Alt. B.

Rationale and Strategies

There are no natural springs or lakes on the Wahluke Slope; however, irrigation run-off has created several large, artificial wetlands that diversify the habitats available to wildlife in this area. Although artificial, they can provide valuable wildlife habitat, especially for amphibians, birds and bats in an otherwise arid landscape. This artificial "community type" includes lake shores, riparian and wetlands on the Wahluke Slope that have been converted from shrub-steppe due to accumulated run-off from off-site irrigated agriculture.[53] These communities are typically dominated by non-native species such as tamarisk and Russian olive, but also support native willows, common cattail, and black cottonwood.

The SCBID maintains the irrigation return canals that create and supply water to Saddle Mountain Lake and the WB-10 Ponds. The BOR maintains a valid existing right to operate these water systems. Because this water will likely remain a feature on the Monument over the life of this CCP, and because there is currently established riparian and wetland vegetation in this area, the best use of this area is to improve the currently established riparian and wetland habitat. Non-native species (Russian olive, phragmites, tamarisk, carp, etc.) should be removed and replaced with riparian and wetland plant species native to the Columbia Basin.

[53] The majority of impacted shrub-steppe habitat on the Monument is just south and five miles south of State Route 24 on the eastern end of the site and around Saddle Mountain Lake on the western end.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Control carp populations that impact wetland submergent and emergent vegetation and important waterfowl habitat; implement methods to prevent carp from entering the intake that supplies irrigation return flows.		✓	✓	✓	✓			✓
Continue to inventory and control non-native plant species according to the IPSIMP—especially phragmites, tamarisk, and purple loosestrife—and replace with native species (willow, currant, etc.).	✓	✓	✓	✓	✓	✓	✓	✓
Evaluate habitat conditions for sensitive resources (e.g., nesting aquatic birds such as grebes).		✓	✓	✓	✓	✓	✓	✓
Make habitat improvements to benefit aquatic birds if necessary.	✓	✓	✓	✓	✓	✓	✓	✓
Evaluate habitat conditions for waterfowl, particularly wintering waterfowl, and make habitat improvements if necessary.		✓	✓	✓	✓			✓

2.10.3.4 Objective 2-4: Natural Springs, Seeps and Vernal Pools

Throughout the life of the CCP, protect, and where possible, enhance all natural springs, seeps and vernal pool areas on the Monument by maintaining high-quality native vegetation and allowing natural processes to function.

<table>
<tr><th rowspan="2">Unit</th><th colspan="8">Alternatives</th></tr>
<tr><th>A</th><th>B</th><th>B-1</th><th>C</th><th>C-1</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Columbia River</td><td rowspan="5">Protect natural spring areas.</td><td colspan="7" rowspan="5">Protect and enhance all natural springs, seeps and vernal pools.</td></tr>
<tr><td>Rattlesnake</td></tr>
<tr><td>Ringold</td></tr>
<tr><td>Saddle Mountain</td></tr>
<tr><td>Wahluke</td></tr>
</table>

Rationale and Strategies

Several springs are found on the slopes of the Rattlesnake Hills along the western edge of the Monument (DOE 1988). Rattlesnake and Snively Springs form small surface streams; water discharged from Rattlesnake Springs flows down Dry Creek for about 1.6 miles before disappearing into the ground. While these springs are small, they are an extremely valuable resource, providing water sources for a variety of wildlife in arid portions of the Monument and allowing the growth of trees for songbird and raptor use as nest sites, sanctuary and foraging perches. The 24 Command Fire of 2000 negatively impacted many shrubs and trees associated with streams and springs on the ALE; however, these species are recovering rapidly. Small interrupted streams, such as those flowing from Rattlesnake and Snively Springs, contain diverse biotic communities and are extremely productive (Cushing and Wolf 1984). The riparian community surrounding springs are characterized by diverse shrubs and trees that include a substantial component of, or dominance by, willows. Desert springs support extensive riparian areas that provide breeding habitat for flycatchers, warblers, orioles and other neo-tropical migrants (e.g., Bullock's oriole, yellow warbler, yellow breasted chat).

The Nature Conservancy (TNC) of Washington, in its Biodiversity Inventory and Analysis of the Hanford Site 1997 Annual Report (Hall 1998), documented an alkaline spring and vernal pools at the east end of Umtanum Ridge. Biologically and ecologically interesting, three previously undocumented clusters of approximately twenty vernal pools have been noted. Vernal pools in Washington are little known or studied, and their occurrence on Hanford is significant. Additional inventorying and documentation of vernal pool areas is also important due to their uniqueness both regionally and within the state. Each cluster contains one or more rare plant species. Maintaining these unique vegetation communities and the habitat that they provide is critical to Monument management.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Conduct additional inventories, monitoring and research of vegetative communities and wildlife associated with natural springs.		✓	✓	✓	✓	✓	✓	✓
Conduct additional inventories in areas not yet surveyed for vernal pools and associated unique species.		✓	✓	✓	✓			✓
Continue to inventory and control non-native plant species according to the IPSIMP.	✓	✓	✓	✓	✓	✓	✓	✓
Carefully manage public access into areas with natural springs, seeps, or vernal pools.	✓	✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Prevent wildland fire, when possible, and limit size of wildland fires. Use MIST and resource advisors on scene to limit impacts to natural springs.	✓	✓	✓	✓	✓	✓	✓	✓
Monitor water quality in springs in order to maintain the character of the spring areas.		✓	✓	✓	✓	✓	✓	✓
Monitor the springs' relationship to wildlife use (e.g., deer browse, elk use) to determine if wildlife populations are affecting succession in the springs and to determine if any management action (restoration, exclosures, etc.) are necessary to protect character of springs, seeps, or vernal pools.	✓	✓	✓	✓	✓	✓	✓	✓
If necessary, conduct restoration (native plantings) in areas where disturbance has altered the natural succession of riparian vegetation around springs and seeps.		✓	✓	✓	✓			✓

2.10.3.5 Objective 2-5: Seasonal Wetlands

During the life of the CCP, create and maintain approximately 320 acres of seasonal wetland on the Ringold Unit, characterized by 20% cover of annual moist-soil species, 15% cover of native emergents for migratory and aquatic birds, and flooded with ≤18 inches of water from October to March.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Ringold				Restore 320 acres.[1]				

[1] Contingent upon having partnership and funding from outside of the agency.

Rationale and Strategies

Extensive hillside seepage of both natural springs and irrigation water occurs within the Ringold Unit in the southeast portion of the Monument adjacent to the WDFW Ringold National Fish Hatchery. As this perennial supply provides a continuous source of water to some established wetland vegetation in this area, improvement of existing wetland areas would increase the quality and quantity of wildlife habitat. The former wetland impoundment on the Ringold Unit

adjacent to the agricultural field on the Columbia River no longer functions as a result of a washed out levee. Because water levels cannot be maintained in this wetland, it has been infested by invasive species (e.g., knapweed). If restored, this wetland has the capability to provide habitat that supports Monument Proclamation species, including migrating and wintering aquatic migratory birds.

Specifically, the Monument Proclamation identifies management for the following waterfowl species that could benefit from this restoration effort—mallards, green-winged teal, pintails, goldeneyes, gadwalls, and buffleheads. Restoration of the wetland area would be an effective way to control the invasive species that have infested this disturbed site. Constructing a series of dikes and ponds would allow for manipulation of the water levels to provide a range of seasonal and permanent ponds for a variety of wildlife species.

Because this is a small area, and restoration costs could be restrictive under most alternatives, this development may receive a lower priority than other shrub-steppe habitat restoration needs. However, if partnerships were created to conduct this work, and funding was available, it may become a more feasible priority.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Seek public and private support by developing partnerships with, for example, Ducks Unlimited, Intermountain West Joint Venture, WDFW, BOR, SCBID, county weed boards, and Pheasants Forever to restore this area to wetland habitat.				✓	✓	✓	✓	
Design water control structures to restore the wetland and permit the passage and/or avoid entrapment of anadromous and other native fish species.				✓	✓	✓	✓	
Repair and/or install water control structures, construct water control dikes, and contour the land area to restore the wetland.				✓	✓	✓	✓	
Work with the BOR to obtain rights to use return flows (March to October) to manage the wetland.				✓	✓	✓	✓	

2.10.3.6 Objective 2-6: Riverine Wetlands and Riparian Areas

Protect and restore the riparian structure, function and native species composition (willows, bullrush, etc.) in existing areas that provide for riparian vegetation along the Columbia River's backwater sloughs, oxbow ponds, and islands for migratory birds (wintering waterfowl, bald

eagles, shorebirds, breeding songbirds (Bullock's orioles, yellow warblers, song sparrows, etc.)), colonial waterbirds (great blue herons, great egrets, etc.), native insect diversity, and rare plants.

<table>
<tr><th rowspan="2">Unit</th><th colspan="8">Alternatives</th></tr>
<tr><th>A</th><th>B</th><th>B-1</th><th>C</th><th>C-1</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Columbia River</td><td rowspan="3">Inventory and monitor riverine and riparian habitats as projects allow.</td><td colspan="8" rowspan="3">Inventory, protect, maintain and improve riverine and riparian habitats, where appropriate, within the Hanford Reach of the Columbia River.</td></tr>
<tr><td>Ringold</td></tr>
<tr><td>Wahluke</td></tr>
</table>

Rationale and Strategies

The Hanford Reach encompasses the last non-tidal, free-flowing segment of the Columbia River in the United States. The riparian/wetland communities along the Hanford Reach are some of the least represented habitats in this river system and elsewhere within the Columbia Basin. The Hanford Reach: 1) provides important stop-over habitat for migratory land and waterbirds; 2) is wintering habitat for bald eagles, white pelicans, and many waterfowl species, such as mallards, green-winged teal, pintails, goldeneyes and gadwalls; 3) provides important nesting and breeding habitat for shorebirds, waterfowl, and other aquatic birds; and 4) is a designated Important Bird Area (IBA). Comprised of the Columbia River and the near-shore environment, the IBA extends approximately 1/4-mile inland from the river between the Vernita Bridge and the Ringold Fish Hatchery.

Backwater areas and sloughs often form in the lee of cobble bars where silt has been deposited; this silt provides for wetland communities. The largest wetland systems are associated with the most developed cobble bars. Other, smaller wetlands are scattered throughout the north shore. This habitat system is thought to be rare elsewhere along the Columbia River, but may have been common before the extensive construction of hydroelectric dams (Downs et al. 1994). These systems are rich in species diversity, both within and between sites. Dominant species include common spikerush, needle spikerush, alkali bulrush, western lilaeopsis, broadleaf cattail, and various rushes. On the Monument, this plant community type is often relatively pristine. Conserving and protecting these areas is important to the preservation of Monument Proclamation resources.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Inventory plant species composition of riparian areas in the Columbia River corridor and determine the composition of native and non-native species.	✓	✓	✓	✓	✓	✓	✓	✓
Install permanent vegetation monitoring plots in representative areas to track changes in riparian and wetland vegetation composition. Re-monitor plots every five years to track changes in species composition.		✓	✓	✓	✓			✓
Continue to document current vegetation types using GPS to update and add information to the GIS database.	✓	✓	✓	✓	✓	✓	✓	✓
Continue to inventory and control non-native plant species according to the IPSIMP.	✓	✓	✓	✓	✓	✓	✓	✓
Inventory and document the location of rare plants. Conduct specific inventories when planning management activities, public access, recreation activities, and other developments (see the Rare Plants objective).		✓	✓	✓	✓	✓	✓	✓
Inventory mature trees that are important heron colony sites, bald eagle roosts, or raptor nest sites. Conduct habitat evaluations to determine if mature trees are limiting, and conduct restoration if mature trees are not being replaced.		✓	✓	✓	✓	✓	✓	✓
Conduct wildlife inventories for species of concern (herons, colonial nesting species, shorebirds, waterfowl, bald eagles). Gather information on their abundance, seasonal use, breeding/nesting, population trends, and habitat requirements, using this information to improve management.	✓	✓	✓	✓	✓	✓	✓	✓
Continue to document wildlife species occurrences using GPS to update and add information to the GIS database.	✓	✓	✓	✓	✓	✓	✓	✓
Contribute Monument-specific information on species of concern to regional efforts to conserve species and determine the importance of the Hanford Reach to local/regional/state populations for wildlife species of concern.	✓	✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Provide law enforcement services for public use of river areas in order to protect and prevent disturbance of important wildlife areas through seasonal restrictions or targeted area closures.	✓	✓	✓	✓	✓	✓	✓	✓
Maintain a seasonal winter closure of the Hanford Reach area (and White Bluffs Boat Launch), November through March annually, to allow a sanctuary for wintering waterfowl.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.3.7 Objective 2-7: Riparian Shoreline Area Restoration

Along the Columbia River shoreline and islands, protect, manage and restore up to 1,166 acres of riparian habitat in the appropriate mosaic of native riparian plant communities and seral stages associated with the Columbia River. Ensure that riparian habitat supports riparian-dependent species (e.g., wintering waterfowl, bald eagles), breeding songbirds (Bullock's orioles, yellow warblers, song sparrows, etc.), colonial waterbirds (great blue herons, great egrets, etc.), native insect diversity, and rare plants. Priority areas for riparian restoration will be identified based upon the following factors:

- *Areas where restoration activities will have the potential to be successful, based on soil characteristics, elevation, aspect, presence of remnant native species, and essential riparian components (e.g., willows).*

- *Areas where restoration can improve habitat for, and use by, high-priority, riparian-dependent wildlife species, especially those that are endangered, threatened, rare, or sensitive (e.g., bald eagles).*

- *Areas affected by ground-disturbing activities required for operations and maintenance of the FWS or other agencies that have valid existing rights on Monument lands.*[54]

- *Areas that occur in between areas of high-quality habitats or vegetation communities where restoration activities could increase size of remnant patches, reduce habitat fragmentation, and increase habitat connectivity on and/or adjacent to the Monument.*[55]

[54] Other agencies may have responsibilities to mitigate habitat disturbed through management activities.

[55] This may include being away from public access in order to allow restoration to be undisturbed.

- *Areas that have been treated for invasive plant species, where priority is given to those areas close to valuable biological resources. These areas should be restored to native plants to prevent future invasion of non-native species into high-quality areas.*[56]

- *Areas highly affected by non-native plant species (i.e., salt cedar, Russian olive, Russian knapweed, etc.) with low native plant species abundance and diversity (areas where non-native species exceed 20% of the total vegetative cover).*

- *Areas affected by previous land uses—such as old farm fields, plowed areas, grazed areas, and areas of former miliary activity—that currently have a low abundance and diversity of native plant species (as long as these areas are not part of historical sites).*

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	822	Same as Alt A.						
Rattlesnake	44							
Ringold	156							
Wahluke	143							
Total	***1,166 acres***							

Rationale and Strategies

The Hanford Reach extends from the upper end of the McNary Reservoir to the Priest Rapids Dam and contains significant riparian habitat which is otherwise rare within the Columbia River system (National Park Service 1994). The riparian/wetland communities along the Hanford Reach are also rare elsewhere within the Columbia Basin as a result of hydropower development. The Hanford Reach and associated riparian zones provide habitat for numerous wildlife and plant species, including remnant habitat for aquatic organisms that were widespread before much of the Columbia River system was converted to reservoirs. The current riparian vegetation communities of the Hanford Reach are generally characterized by diverse shrubs and trees that include a substantial component of, or dominance by, willows.

Although the Hanford Reach is ostensibly free-flowing, changes in its hydrology from upstream dams have likely altered some riparian communities and substrates. For example, much of the substrate previously mapped as sand (ACOE 1976) is now cobble. Thus, some communities

[56] Ibid.

may reflect a transient state. Some vegetation present within the river corridor is different than what would be historically present in a natural river setting. Tree species were not historically prevalent; natural flood flows annually scoured the river's shorelines, thereby reducing the potential for tree establishment or survival. Likewise, naturally occurring native species are not as abundant on shorelines due to daily fluctuations of river levels through hydropower generation activities. As a result of the loss of riparian habitat types along the rest of the river, and because of the value of riparian areas as wildlife habitat, conserving and protecting these vegetation types are an important aspect of Monument management.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Continue to document, map and refine the current GIS data base on vegetation condition on the Monument.	✓	✓	✓	✓	✓	✓	✓	✓
Continue to inventory and control non-native plant species according to the IPSIMP.	✓	✓	✓	✓	✓	✓	✓	✓
In riparian zones highly affected by non-native species, treat non-natives and then restore/re-vegetate the area using native species characteristic of the Columbia River system.		✓	✓	✓	✓			✓
Annually conduct planting and seeding restoration activities on priority plant communities to improve the cover and distribution of native understory and overstory species. Consider the needs of priority wildlife species, including colonial nesting birds (e.g., ring-billed gulls), riparian songbirds (e.g., yellow warblers), wintering waterfowl, and bald eagles.		✓	✓	✓	✓			✓
Reestablish native riparian communities by controlling non-natives (e.g., Russian olive, black locust) and conducting plantings using native species cuttings, seedling transplants, or other nursery-grown plant materials.		✓	✓	✓	✓			✓

2.10.3.8 Objective 2-8: Inventory and Monitor Habitats

Over the life of the CCP, identify and develop inventory/monitoring protocols, conduct high-priority inventories and monitoring, and identify management-oriented research to promote the conservation, restoration and adaptive management of shrub-steppe, grassland, riparian, aquatic and other habitats (e.g., cliffs, vernal pools, dunes, microbiotic crusts, lithosols).

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Inventory and monitor habitats as projects allow.	Conduct systematic inventories, monitoring and research that promotes conservation and restoration initiatives for habitats and identifies potential impacts from public use, fire, etc.						
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Based upon the breadth of wildlife and habitat management activities on the Monument, there is a myriad of associated monitoring activities that could be conducted by the biological staff. Inventorying and monitoring will be part of habitat objectives for shrub-steppe, grasslands, riparian/riverine, springs, seeps, vernal pools, and lithosols. Inventory and monitoring is required to assess the effects of management actions, to both prevent any adverse effects to Monument Resources, but also to assess whether Monument objectives are being met. Monitoring can be used to identify trends and to adapt management actions when information indicates a change is required. Inventory and monitoring will show where the Monument has made progress and can be used to develop quantitative measures to evaluate the Monument's performance in meeting planned goals and objectives.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Evaluate existing research and monitoring data for each habitat type (shrub-steppe, grassland, riparian, aquatic, and unique habitats) to identify scientific information gaps and priority research needs within one year of the CCP being approved.	✓	✓	✓	✓	✓	✓	✓	✓
Based upon identified gaps in scientific information, conduct habitat inventories, and initiate research within two to five years of the CCP being approved.		✓	✓					✓
Conduct habitat inventories, focusing on areas where facilities and use are concentrated.				✓	✓	✓	✓	
Prepare an inventory and monitoring plan for high-priority species and habitats to evaluate and refine restoration and management activities.		✓	✓	✓	✓			✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Incorporate geo-referenced monitoring data (birds, mammals, fish, and invertebrates) into the GIS map coverages. Base future management decisions (e.g., sagebrush restoration, IPM, fire suppression) upon spatial analyses of monitoring data, considering vegetation, soils and wildlife, where possible.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.4 Goal 3: Enhance Monument resources by establishing and maintaining connectivity with neighboring habitats.

2.10.4.1 Objective 3-1: Connectivity

Promote connectivity of the Monument shrub-steppe/grassland habitats with adjacent lands (e.g., BOR Scattered Tract Lands, WDFW Crab Creek Wildlife Management Area, Columbia National Wildlife Refuge, Eagle Lakes, Yakima Training Center, Yakama Indian Reservation, and WDFW lands) to benefit associated wildlife species (e.g., loggerhead shrikes, sage grouse, sage sparrows, Brewer's sparrows). Connectivity on a larger landscape scale is essential to promote recovery of declining shrub-steppe obligate species (e.g., sage grouse, burrowing owls, curlews, pygmy rabbits, ground squirrels).

<table>
<tr><th rowspan="2">Unit</th><th colspan="8">Alternatives</th></tr>
<tr><th>A</th><th>B</th><th>B-1</th><th>C</th><th>C-1</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Columbia River</td><td rowspan="5">Maintain habitat connec-tivity; prevent habitat fragmen-tation as projects allow.</td><td colspan="4" rowspan="5">Restoration actions strengthen connectivity through planned management actions.</td><td colspan="2" rowspan="5">Same as Alt. A.</td><td rowspan="5">Same as Alt. B.</td></tr>
<tr><td>Rattlesnake</td></tr>
<tr><td>Ringold</td></tr>
<tr><td>Saddle Mountain</td></tr>
<tr><td>Wahluke</td></tr>
</table>

Rationale and Strategies

Although modified by recent and historic fires, invasive species, and historic grazing, several of the shrub-steppe plant communities (e.g., big sagebrush/bluebunch wheatgrass and bitterbrush/Indian ricegrass) found on the Monument are regionally significant. A major management issue regarding shrub-steppe is the restoration and connection of communities on the Monument with those on adjacent lands, thereby improving ecosystem functionality and supporting shrub-steppe obligate species.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Establish working groups of interested agencies, governments and private entities to identify habitats and species with a high potential to benefit from connectivity within areas outside the Monument within one year of the CCP being approved.		✓	✓	✓	✓	✓	✓	✓
Coordinate with partners to identify conservation and funding strategies for protection of connected habitat within three years of the CCP being approved.		✓	✓	✓	✓	✓	✓	✓
Meet annually with adjacent landowners, other agencies, tribes, sportsmen and environmental groups to discuss common habitat/wildlife management objectives and future possibilities.		✓	✓	✓	✓	✓	✓	✓
Continue to participate in the planning process and forums of other agencies and governments to achieve protection of Monument resources.	✓	✓	✓	✓	✓	✓	✓	✓
Maintain and promote intra- and interagency coordination to protect and improve connectivity of shrub-steppe habitat.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.5 Goal 4: Protect the distinctive geological and paleontological resources of the Monument.

2.10.5.1 Objective 4-1: Geologic Resource Location

Within five years of the CCP being adopted, begin a comprehensive mapping of the unique, rare, or exemplary geological resources of the Monument, with a target of at least five percent of total Monument acreage inventoried annually.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Inventory resources as projects allow.	Inventory 10% of lands annually; prioritize areas based on an annual assessment of threats.			Inventory 8% of lands annually; prioritize areas based on an annual assess-ment of threats.	Inventory 5% of lands annually; prioritize areas based on an annual assess-ment of threats.	Same as Alt. C-1.	Same as Alt. B.
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

See Objective 4.2 below.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Contract with universities or consultants to conduct a literature review and field assessment of geological resources. (See also Research Goal)		✓	✓	✓	✓			✓
Conduct inventories of geological resources using existing staff.		✓	✓	✓	✓	✓	✓	✓
Add information/data regarding geological resources to the GIS database.	✓	✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Seek partnerships for Ice Age Floods features surveying, cataloging and interpretation.	✓	✓	✓	✓	✓	✓	✓	✓
Use MIST and resource advisors to limit impact to geological resources from wildfire events.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.5.2 Objective 4-2: Paleontologic Resource Location

Within five years of the CCP being adopted, begin a comprehensive mapping of the paleontological resources of the Monument, with a target of at least one percent of total Monument acreage inventoried annually.

<table>
<tr><th rowspan="2">Unit</th><th colspan="8">Alternatives</th></tr>
<tr><th>A</th><th>B</th><th>B-1</th><th>C</th><th>C-1</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Columbia River</td><td rowspan="5">Inventory resources as projects allow.</td><td colspan="3" rowspan="5">Inventory 2% of Monument lands annually; areas to be prioritized based on an annual assessment of threats.</td><td colspan="2" rowspan="5">Inventory 1% of Monument lands annually; areas to be prioritized based on an annual assessment of threats.</td><td rowspan="5">Same as Alt. B.</td></tr>
<tr><td>Rattlesnake</td></tr>
<tr><td>Ringold</td></tr>
<tr><td>Saddle Mountain</td></tr>
<tr><td>Wahluke</td></tr>
</table>

Rationale and Strategies

The Monument has a rich geological and paleontological background ". . . with dramatic landscapes that reveal the creative forces of tectonic, volcanic, and erosive power" (Monument Proclamation). The Monument Proclamation also notes that the Monument ". . . contains significant geological and paleontological objects." The "objects" specifically mentioned in the Monument Proclamation include the White Bluffs; fossilized remnants of rhinoceros, camel, mastodon and other animals; and the Hanford Dune Field. Equally as important, although not specifically mentioned, are the visible remnants of the Ice Age Floods, such as glacial erratics, berg mounds, and ripple marks. The sand dunes themselves are comprised of sand carried in on the massive floods that covered this area; wind subsequently shaped these depositions into the dune fields on the Hanford Site.

While much is known about Central Hanford's geological and paleontological resources, the majority of the Monument remains unmapped. In order to fully protect these resources, and provide public access to them, a thorough mapping of known geologic/paleontologic phenomenon will be necessary, as well as the identification of as yet unknown resources.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Contract with universities or consultants to conduct a literature review and field assessment of paleontological resources. (See also Research Goal)		✓	✓	✓	✓	✓	✓	✓
Add information/data regarding paleo resources to GIS database.	✓	✓	✓	✓	✓	✓	✓	✓
Use MIST and resource advisors to limit impact to paleontological resources from wildfire events.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.5.3 Objective 4-3: Threat Abatement

Throughout the life of the CCP, protect, or minimize the destruction of, the unique, rare or exemplary geological and paleontological resources of the Monument.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Identify and address at least two threats annually.		Identify and address at least one threat annually.				Same as Alt. B.
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

As noted in Objectives 4-1 and 4-2, the Monument has a number of striking geological and paleontological resources, especially the signature White Bluffs along the Columbia River. While many of the threats to these resources were eliminated with the creation of the Monument,

both internal and external concerns do remain, including erosion following fire, landslides aggravated by irrigation waters, inadvertent disturbance through environmental cleanup, looting, destruction of stabilizing vegetation through trespass, and other forces. Once resources are identified through Objectives 4-1 and 4-2, all known and potential threats to those resources need to be identified, and corrective steps taken to eliminate or lessen those threats. Corrective actions might include signs, education, increased patrols, new or modified regulations, routing of visitors away from sensitive resources, planting of vegetation, etc. The exact threat abatement strategy will be dependent upon the type and location of the resource, the known threats, and a host of other factors.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Identify threats and develop protection strategies for distinctive geological and paleontological resources within three years of the inventory being completed.		✓	✓	✓	✓	✓	✓	✓
Through the USGS, conduct a congressionally funded assessment of the cause of sloughing of the bluffs along the Columbia River.	✓	✓	✓	✓	✓	✓	✓	✓
Within one year of the USGS White Bluffs sloughing study being completed, implement feasible recommendations that protect the integrity of the White Bluffs.	✓	✓	✓	✓	✓	✓	✓	✓
Develop cooperative partnerships to mitigate island and shoreline erosion within one year of the White Bluffs study being completed.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.6 Goal 5: Protect and acknowledge the Native American, settler, atomic and Cold War histories of the Monument to ensure present and future generations recognize the significance of the area's past, incorporating a balance of views.

2.10.6.1 Objective 5-1: Cultural/Historical Management Plan

Develop and begin implementing a cultural resource management plan with stakeholder and tribal involvement within three years of the CCP being adopted.[57]

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Develop a Cultural Resources Management Plan.							
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

The Monument is rich in the evidence of Native Americans who used these lands for millennia and the Euro-American settlers that came later. Some research has been done by the DOE and others regarding the identification of existing cultural resource sites on the Monument. However, these studies were mostly project specific, and large areas of the Monument have not been surveyed. The sources are fragmented, and research needs to be conducted to assimilate these diverse sources of information. The background research on what cultural resources are currently documented on the Monument will serve as the basis for the Cultural Resources Management Plan. The management plan would also address protocols for cultural resource surveys, protection, tribal consultation, monitoring, inadvertent discovery, and other issues of concern.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Form a cooperative planning team for cultural resources with tribal and other governmental partners.	✓	✓	✓	✓	✓	✓	✓	✓

[57] The DOE is primarily responsible for cultural resource issues until the FWS develops its own plan. However, that plan would only apply to FWS-managed lands unless adopted by the DOE. Until a management plan is developed, the FWS will comply with all applicable laws (e.g., NHPA, Native American Graves Protection and Repatriation Act), federal regulations, and FWS policies.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Identify and evaluate existing cultural resource inventories and studies for validity and reliability.	✓	✓	✓	✓	✓	✓	✓	✓
Incorporate components of the DOE's Cultural Resources Management Plan as appropriate.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.6.2 Objective 5-2: Oral History Program

Develop and implement an ongoing oral history program on settlement and use of the Monument.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Develop an oral history program.							
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

The Monument has inherited a historic legacy that has not been appropriately recorded. Due to the events of 1943 and the eviction of the Native Americans and other residents of the Hanford Reach area, much of the local history prior to the establishment of the Hanford Site has been lost. Former residents that have direct knowledge of pre-1943 events are today at least sixty-five years of age. It is a priority that a program be established to record oral histories before any more recollections are irrevocably lost. The importance of oral histories has been recognized by many tribes, and some oral histories are being collected. Future interpretive and educational programs and exhibits would benefit greatly from the addition of this information, as well as cultural resource management. Many former residents are very anxious to share the events of their lives in the Hanford area, and many have family heirlooms and artifacts that they wish to

donate for future display.[58] A data base of this information should be developed, recorded and preserved as soon as possible.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Work with partners to create a data base detailing recorded oral histories, historical archives, and available antiquities.		✓	✓	✓	✓	✓	✓	✓
Record oral histories from Native Americans and long-time residents and incorporate these into interpretation and education programs.		✓	✓	✓	✓	✓	✓	✓
Seek out local residents that lived in the Hanford area prior to 1943, including participants of the Hanford/ White Bluffs Annual Reunion.		✓	✓	✓	✓	✓	✓	✓
Apply for grants to assist with funding to obtain oral histories.		✓	✓	✓	✓	✓	✓	✓

2.10.6.3 Objective 5-3: Cultural Resource Surveys and Inventories

Conduct cultural resource surveys on the Monument for emergency stabilization, project work, research, and data acquisition.

<table>
<tr><th rowspan="2">Unit</th><th colspan="8">Alternatives</th></tr>
<tr><th>A</th><th>B</th><th>B- 1</th><th>C</th><th>C-1</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Columbia River</td><td rowspan="5">Conduct mandatory Section 106 (National Historic Preserva-tion Act) project com-pliance.</td><td colspan="2" rowspan="5">Complete Section 106 compliance and an additional 1,000 acres/year.</td><td colspan="2" rowspan="5">Complete Section 106 compliance and an additional 750 acres/year.</td><td rowspan="5">Complete Section 106 compli-ance and an addi-tional 500 acres/year.</td><td rowspan="5">Same as Alt. C.</td><td rowspan="5">Same as Alt. B.</td></tr>
<tr><td>Rattlesnake</td></tr>
<tr><td>Ringold</td></tr>
<tr><td>Saddle Mountain</td></tr>
<tr><td>Wahluke</td></tr>
</table>

[58] The annual Hanford/White Bluffs reunion provides a perfect opportunity to record stories and descriptions of life along the Hanford Reach prior to the establishment of the Hanford Site.

Rationale and Strategies

Cultural resources constitute an important component of the Monument Proclamation and are one of the chief reasons the Monument was created. However, while much is known about the physical and spiritual resources in Central Hanford, much less is known about the Monument itself. Prior to a comprehensive management plan being developed, and fully effective protection strategies being implemented, inventories of the Monument's cultural resources must be initiated.

Under all alternatives, cultural resource surveys mandated by Section 106 of the NHPA would be conducted prior to any ground-disturbing activities on the Monument. Alternatives B–F all call for at least some additional inventory work to be conducted. Dependant on the alternative chosen, the areas to be inventoried annually will be prioritized according to the emphasis of the alternative. For example, in Alternatives C, C-1, D and E, areas that are identified as having more public use and/or scheduled for future facility development will receive priority.

Since Monument lands have traditionally been managed by a variety of federal, state, local and tribal entities, it is realistic to promote and actively foster cooperative efforts toward the inventorying, monitoring and protection programs for cultural resources. This would benefit the resource by providing more oversight of cultural programs and increased sharing of inventory data. It would add an important, enhanced presence on the Monument to deter theft and vandalism. Agreements between the varied stakeholders would help to solidify trust and support cooperative research and protection efforts.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Using GIS overlays, identify data base gaps to determine areas for additional surveys as indicated in each alternative.		✓	✓	✓	✓	✓	✓	✓
Prioritize annual cultural resource inventories to aid in filling data gaps, focusing on areas that will undergo restoration efforts.		✓	✓					✓
Prioritize annual cultural resource inventories to aid in filling data gaps, focusing on facility development and public use patterns.				✓	✓	✓	✓	
Develop agreements and implement inventorying, monitoring and protection programs for cultural resources between the FWS, other agencies and tribes within five years of the CCP being adopted.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.6.4 Objective 5-4: National Register of Historic Sites

Inspect five to fifteen National Register of Historic Listed and Eligible Properties (National Register) eligible archaeological sites and historic structures semi-annually.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Inspect fifteen sites/year.		Inspect ten sites/year.		Inspect five sites/ year.	Same as Alt. C.	Same as Alt. B.
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Since many historic properties have been removed over time, those that remain—including buildings, structures and historic and prehistoric archeological sites—should be evaluated for listing on the National Register. If eligible, these sites should be monitored and efforts made to protect and stabilize them as historic properties.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Identify and evaluate historical and archeological sites eligible for listing on the National Register.		✓	✓	✓	✓	✓	✓	✓
Prioritize sites in terms of significance and risk analysis.		✓	✓	✓	✓	✓	✓	✓
Take corrective action to protect and stabilize as appropriate.		✓	✓	✓	✓	✓	✓	✓
Develop partnerships to assist with monitoring and implementation of protective actions.		✓	✓	✓	✓	✓	✓	✓

2.10.6.5 Objective 5-5: Traditional Cultural Properties[59]

Assist the DOE in the evaluation of potential Traditional Cultural Properties in collaboration and consultation with affected tribes within five years of the CCP being adopted.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Assist in the evaluation of potential TCPs.							
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Tribal governments have a strong interest in maintaining the integrity of their TCPs, which have both religious and subsistence significance. It is important to management efforts on the Monument that these properties be identified and evaluated. This should be accomplished in coordination with designated representatives of the tribes who can best identify the sites and speak as to their significance. A monitoring program should be established in cooperation with tribal representatives to guarantee continued sustainability.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Work with tribes to identify TCPs.		✓	✓	✓	✓	✓	✓	✓
Prepare and implement monitoring and management plans for eligible and designated TCPs.		✓	✓	✓	✓	✓	✓	✓

[59] The DOE has completed a National Register Determination of Eligibility for *Laliik* (Rattlesnake Mountain) to identify its potential as a TCP, determining that it is eligible under National Register criteria. The Washington State Historic Preservation Office has concurred with this determination.

2.10.6.6 Objective 5-6: Cultural Resource Protection

Develop and implement a protection plan for cultural resource sites at risk for potential damage through erosion and vandalism within one year of the CCP being adopted.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Develop a Cultural Resource Protection Plan.						
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

There are many cultural resources on the Monument, identified or not, that are at risk of damage and/or loss from a variety of sources. An example is the erosion of Locke Island, a culturally rich site, caused by severe slumping of the White Bluffs;[60] erosion of Locke Island is the subject of a new report that came out in 2006 (Bjornstad 2006b). Vandalism of cultural resources is another threat that has negative impacts on both cultural resources and relations with the tribes. Once destroyed, these resources are irretrievable, hence the need for implementation of a strategy for protection within a one year time frame.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Identify and prioritize cultural resources at risk.		✓	✓	✓	✓	✓	✓	✓
Identify sources of potential damage (i.e., erosion, White Bluffs slumping, visitor activities, vandalism).		✓	✓	✓	✓	✓	✓	✓
Develop plans with cooperative partners (i.e., tribes, USGS, DOE, BPA, Grant County PUD) to mitigate damage to cultural resources where possible.		✓	✓	✓	✓	✓	✓	✓

[60] Stabilization of the island and/or bluffs would require a major undertaking involving several agencies and tribal governments.

2.10.6.7 Objective 5-7: Recovered Cultural Resources

In coordination with tribes, establish policies and procedures for recovered artifacts and inadvertent discovery of human remains within two years of the CCP being adopted.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Establish recovery policies.							
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Presently, any and all artifacts that are discovered during resource inventories and management activities are left in place, their locations GPS recorded, data collected, and entered into a database. No policies or procedures exist for recovering and cataloging artifacts. Further, no policies exist for the return of artifacts that may have been collected from the Monument prior to its establishment. It is hoped that in the future some of these artifacts may be donated back for scientific study and display, where appropriate, hence the need for established protocols.

Many areas of the Monument were used as burial grounds for Native Americans. The discovery of human remains will be managed and repatriated in accordance with the Native American Graves Protection and Repatriation Act (NAGPRA). Policies need to be established that will properly protect these remains if inadvertently discovered or exposed.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Develop a plan for the inadvertent discovery and repatriation of human remains with affected tribes and implement it by developing Memorandums of Understanding (MOUs) with tribes.	✓	✓	✓	✓	✓	✓	✓	✓
Implement education programs for Monument staff and volunteers on the proper handling and reporting of discoveries and donations.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.7 Goal 6: Provide a rich variety of educational and interpretive opportunities for visitors to gain an appreciation, knowledge and understanding of the Monument, compatible with resource protection.

2.10.7.1 Objective 6-1: Interpretive Planning

Within two years of the CCP being adopted, develop and implement a multi-disciplinary interpretive plan, incorporating a variety of interpretive and educational opportunities to appeal to a broad spectrum of interests, age groups, and learning styles and abilities.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Complete an Interpretive Plan.						
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

The Improvement Act identifies wildlife interpretation and environmental education as two of the six primary wildlife-dependent recreational opportunities to be implemented at national wildlife refuges. The creation of a long-range, multi-disciplinary interpretive plan is essential for the integrated development of interpretive and educational facilities, materials and programs. These should reflect consistency in design, function and placement across the Monument. They should incorporate themes identified as unique to the Monument's habitat, wildlife and heritage and contain content that is easily understood by the visiting public.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Form an interpretive planning team that reflects the varied interests and talents of the regional constituencies.		✓	✓	✓	✓	✓	✓	✓
Identify goals and objectives of the Monument's interpretive program.		✓	✓	✓	✓	✓	✓	✓
Identify overarching themes unique to the Monument.		✓	✓	✓	✓	✓	✓	✓
Identify potential placement locations of interpretive facilities.		✓	✓	✓	✓	✓	✓	✓
Map sensitive resources at proposed interpretive sites and determine and implement mitigation measures to reduce the impacts of site development.		✓	✓	✓	✓	✓	✓	✓
During the plan development and review periods, seek the input of local, state and tribal governments; valid existing rights holders; outdoor recreation interests; outfitters and guides; and all other interested parties.		✓	✓	✓	✓	✓	✓	✓

2.10.7.2 Objective 6-2: Interpretive Sites

Create ten to twenty interpretive sites over the duration of the CCP, potentially including a Horn Rapids site, beginning within two years of the completion of the Interpretive Plan.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		4 sites.	4 sites.	4 sites.	4 sites.	4 sites.	4 sites.	4 sites.
Rattlesnake		1 site.	1 site.	3 sites.	2 sites.	4 sites.	3 sites.	1 site.
Ringold		2 sites.	2 sites.	2 sites.	2 sites.	3 sites.	2 sites.	2 sites.
Saddle Mountain		0 sites.	0 sites.	1 site.	1 site.	2 sites.	1 site.	0 sites.
Wahluke		3 sites.	3 sites.	5 sites.	4 sites.	7 sites.	5 sites.	3 sites.
Total		***10 sites.***	***10 sites.***	***15 sites.***	***13 sites.***	***20 sites.***	***15 sites.***	***10 sites.***

Rationale and Strategies

For many visitors, interpretive sites are the only contact they will have for Monument information. Signing is crucial to enhance the visitor's enjoyment and understanding of the Monument's resources and heritage; it creates a positive and memorable experience. It is also the foremost way to promote the agency's message and management philosophies. Interpretive signing is a cost-effective means of conveying information to the visitor.

The north portion of the Monument is fairly remote. As visitation increases, a satellite visitor contact station would benefit those entering the Monument from the north. Size and services to be offered would be driven by visitor responses to survey questions. Given the permit system proposed in Alternative F, this would also be of foreseeable benefit in issuing permits. An unmanned contact station is also a possibility.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Identify and prioritize potential sites for their interpretive value, significance and ease of access.		✓	✓	✓	✓	✓	✓	✓
Perform habitat inventories with GIS and on-the-ground surveys to avoid sensitive natural and cultural resources.		✓	✓	✓	✓	✓	✓	✓
Identify single and/or multiple themes to be addressed at each site.		✓	✓	✓	✓	✓	✓	✓
Incorporate Monument visual design standards and guidelines in designing sign panels, framing, construction materials, ground preparation, and landscaping.		✓	✓	✓	✓	✓	✓	✓
Include multi-lingual signing as appropriate.		✓	✓	✓	✓	✓	✓	✓
Coordinate site locations with other agencies where appropriate.		✓	✓	✓	✓	✓	✓	✓
Within eight years, initiate a study to determine the need, location and scope of a second contact station serving people to the north of the Monument.						✓		✓

2.10.7.3 Objective 6-3: Interpretive Trails

Over the life of the CCP, create two to six interpretive trails.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River				1 trail.	1 trails.	2 trails.	1 trail.	
Rattlesnake								
Ringold		1 trail.	1 trail.	1 trail.	1 trail.	1 trail.	1 trail.	1 trail.
Saddle Mountain						1 trail.		
Wahluke		1 trail.	1 trail.	2 trails.	2 trails.	2 trails.	2 trails.	1 trail.
Total		***2 trails.***	***2 trails.***	***4 trails.***	***4 trails.***	***6 trails.***	***4 trails.***	***2 trails.***

[1] This table portrays a reasonably foreseeable scenario for trail locations; this could change with implementation depending upon resource inventories.

Rationale and Strategies

Interpretive trails are a popular component to educational facilities and will serve dual purposes on the Monument. They provide visitors with a designated route of travel to view and learn about the Monument's unique resources, as well as providing protection for sensitive resources through proper routing and construction techniques. Visitors will be encouraged to stay on the trail and interpretive messages will educate them as to why. Interpretive trails will also be planned and established in conjunction with the development of wildlife viewpoints, observation decks, and/or photography blinds. Interpretive trails will be designed to be easily traversed by all age groups.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Identify and prioritize potential sites for interpretive value and significance.		✓	✓	✓	✓	✓	✓	✓
Perform habitat inventories with GIS and surveys to avoid sensitive natural and cultural resources.		✓	✓	✓	✓	✓	✓	✓
Identify interpretive themes appropriate for each trail.		✓	✓	✓	✓	✓	✓	✓
Incorporate Monument visual design standards and guidelines for parking areas, trailheads and interpretive signing.		✓	✓	✓	✓	✓	✓	✓
Design trail surfaces to meet FWS and American Disability Act standards and to avoid erosion.		✓	✓	✓	✓	✓	✓	✓

2.10.7.4 Objective 6-4: Recreational Use Education

Within one year of the CCP being adopted, develop and distribute educational materials on proper recreational use practices for the protection of Monument resources.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Develop educational materials.						
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

All interpretive messages will have a component that addresses sensitive resources and proper recreational use practices. In addition, specific informational materials will be prepared and distributed describing Monument rules and regulations, seasons of use, and visitor safety. Proper preparation for travel in desert and river environments will be addressed, as will methods the visiting public can use to lessen their impact to sensitive resources.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Incorporate information on proper use practices into signing at each interpretive site and trail.		✓	✓	✓	✓	✓	✓	✓
Prepare and distribute fact sheets addressing general rules and regulations, special use restrictions, and seasonal closures at appropriate locations (points of entrance, orientation kiosks, trailheads, etc.).		✓	✓	✓	✓	✓	✓	✓
Provide information about sensitive resources and their protection at the appropriate interpretive sites.		✓	✓	✓	✓	✓	✓	✓
Provide multi-lingual materials as appropriate.		✓	✓	✓	✓	✓	✓	✓

2.10.7.5 Objective 6-5: Environmental Education

Within two to six years of the CCP being adopted, develop and implement a multi-disciplinary environmental education program with curricula aligned with national and state educational standards.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Full program within 6 years.		Full program within 4 years.	Full program within 5 years.	Full program within 2 years.	Full program within 4 years.	Full program within 6 years.
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Environmental education is identified by the Improvement Act as a priority program for national wildlife refuges. On the Monument audiences will primarily be students at all levels. All K-12 programs must be aligned with state and national education standards. This is necessary for administrator approval of proposed field trips and programs. An outdoor facility could be designed to accommodate classes doing hands-on investigative learning; a site on the Ringold Unit is proposed as it would be most convenient for regional schools. Programs will also be designed and presented at the indoor classrooms at the Hanford Reach National Monument Heritage and Visitor Center (Visitor Center). For example, curricula highlighting the Columbia River, spawning salmon, and the shrub-steppe environment will be acquired and/or prepared and evaluated. The FWS would investigate school offerings and requirements to provide for service-learning projects and to include programs focusing on at-risk students.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Prepare curricula that address Monument resources, such as the Columbia River, spawning salmon and the shrub-steppe environment.		✓	✓	✓	✓	✓	✓	✓
Align K-12 programs with state and national education standards.		✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Designate an area in the Ringold unit as an outdoor classroom for hands-on activities.				✓	✓	✓	✓	
Survey the needs and interests of local teachers for program subject material.		✓	✓	✓	✓	✓	✓	✓
Post environmental education program offerings on an education page on the Monument's web site.		✓	✓	✓	✓	✓	✓	✓

2.10.7.6 Objective 6-6: Interpretive Programs and Special Events

Offer interpretive and educational programs and special events, both on and off site.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	1/year on site; 6/year off site.			2/year on site; 8/year off site.		3/year on site; 12/year off site.	2/year on site; 8/year off site.	Same as Alt. A.
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

The FWS promotes several "special events" annually that the Monument could participate in (i.e., National Migratory Bird Day, National Fishing Week, Earth Day, Refuge Week, etc.). Special events can be a huge draw if planned properly. The Monument would benefit from the positive exposure created by hosting a special event (e.g., an event during Earth Science Week). For example, the spring Rattlesnake Mountain and Wildflower Tour (Kennewick Community Education) has been very popular. Partnerships with special interest groups would reduce the workload on staff. New programs would be created as needed, featuring Monument resources, management actions, step-down plan development, and restoration activities.

Heritage tourism initiatives are being developed by various federal, state and local agencies as well as regional special interest groups. The Monument's interpretation and education program

would benefit by becoming a cooperative partner in these efforts. The Monument and adjacent DOE lands are rich in history, and efforts such as preservation of the B Reactor are examples of where agencies and special interest groups would benefit each other through partnerships.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Design and facilitate special event interpretive programs.				✓	✓	✓	✓	
Seek outside funding to assist with special event costs.				✓	✓	✓	✓	
Solicit participation from local special interest groups (i.e., environmental organizations, sportsman's groups, community colleges).				✓	✓	✓	✓	
Align programs with national FWS special events.				✓	✓	✓	✓	
Solicit interest groups and trained docents to assist with Monument presentations.	✓	✓	✓	✓	✓	✓	✓	✓
Create several interpretive programs with different themes.	✓	✓	✓	✓	✓	✓	✓	✓
Cooperate with local, state and federal partners to facilitate heritage tourism initiatives.						✓		

2.10.7.7 Objective 6-7: Training Programs

Provide one to two education training programs per year that focus on Monument-specific resources and issues for educators, FWS staff, partners, outfitters and volunteers.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River				1 program per year.		2 programs per year.	Same as Alt. C.	
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Training workshops are an important component to an environmental education program. They benefit staff and volunteers by providing in-depth information on Monument resources to those members that will be communicating with the public. It is more efficient to present one program to all staff at one time rather than individual training. Teachers benefit from Monument training sessions by expanding their knowledge of the resources. They will be better prepared to provide field learning opportunities for their students, either on the Monument or elsewhere.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Design and present an annual training program.				✓			✓	
Design and present two annual training programs.						✓		
Survey teachers, staff and volunteers as to proposed program offerings.				✓		✓	✓	

2.10.8 Goal 7: Provide access and opportunities for high-quality recreation compatible with resource protection.

2.10.8.1 Objective 7-1: Visitor Services Plan

Develop and implement a Visitor Services Plan within two to five years of the CCP being adopted.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Complete a plan within 5 years.		Complete a plan within 3 years.		Complete a plan within 2 years.	Same as Alt. C.	Same as Alt B.
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

A Visitor Services Plan is needed to provide detailed direction (e.g., siting trails, parking areas, restroom facilities, signs) for implementing the CCP. The plan will support natural and cultural resources management by integrating visitor use in a manner that is compatible with resource protection, while also supporting visitor understanding and appreciation of these resources. Plan components will: 1) include objectives and strategies to welcome and orient visitors; 2) provide quality hunting, fishing, wildlife observation, wildlife photography, environmental education, interpretation and other appropriate recreational opportunities (see related Objectives under Goals 6 and 7); and 3) direct communication, outreach and partnership efforts.

A monitoring component will be a critical part of the plan. Too many visitors, or visitor use in fragile locations, has the potential to cause unacceptable impacts to natural and cultural resources. Likewise, crowding and other social impacts degrade the quality of visitor experiences. Monitoring will provide objective data on the type and extent of visitor impacts to natural and cultural resources and on the quality of visitor experience. Such data will be valuable for decision makers, as well as visitors seeking to understand and minimize impacts.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Develop a Visitor Services Plan to concentrate visitor use and place facilities only in appropriate areas.		✓	✓					✓
Develop a Visitor Services Plan to concentrate visitor use and place visitor facilities along the perimeter of the Monument.				✓	✓		✓	
Develop a Visitor Services Plan to concentrate visitor use and place visitor facilities throughout the Monument.						✓		
Develop an outreach component within the Visitor Services Plan to enhance public understanding and appreciation of the NWRS mission and Monument resource values and teach visitors techniques they can use to minimize impacts and enhance experiences.		✓	✓	✓	✓	✓	✓	✓
Develop a monitoring component in the plan to assess visitor satisfaction, recreational demand, and the impacts of recreational activities on natural and cultural resources.		✓	✓	✓	✓	✓	✓	✓
During plan development and review periods, seek the input of local, state and tribal governments; valid existing rights holders; and other interested parties.		✓	✓	✓	✓	✓	✓	✓

2.10.8.2 Objective 7-2: Commercial Guide Permit System

Institute a permit system for commercial outfitters and guides operating on Monument lands within two years of the CCP being adopted.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Develop and implement a commercial guide permit system.							
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Commercial guides and outfitters can be valuable partners with the FWS in providing recreation, education and interpretive services for visitors who may not otherwise have the means to participate in these activities. By policy, it is the FWS's responsibility to oversee and permit all commercial activities occurring within national wildlife refuge boundaries. A plan is needed to address aspects of commercial uses such as legal compliance, visitor safety, quality of visitor experience, potential competition for use areas between outfitters and public recreationists, and minimizing impacts to Monument resources.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Develop a comprehensive list of all outfitters and guides operating on the Monument.	✓	✓	✓	✓	✓	✓	✓	✓
Initiate outreach to commercial outfitters and guides and other interested parties to explain permitting requirements and identify issues, opportunities and concerns related to these activities on the Monument.	✓	✓	✓	✓	✓	✓	✓	✓
Develop a plan to manage commercial uses on the Monument. Within the plan, include commercial outfitter protocols for reporting visitor use, fee schedules, and performance evaluation.	✓	✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Hold public meetings to explain the permit system requirements and to seek feedback proposed system.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.8.3 Objective 7-3: Columbia River Surface Use

Within two to five years of the CCP being adopted, seek partnerships/cooperative management agreements with those agencies with jurisdiction on the Columbia River to determine mutually agreeable surface use regulations.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Pursue as re-sources allow.	Develop partner-ships within five years.		Develop partnerships within three years.				Same as Alt. B.

Rationale and Strategies

The Columbia River is the main focus of visitor use on the Monument. The Hanford Reach is a local and regional destination for waterfowl hunters and salmon, steelhead, sturgeon and bass anglers. Canoeing and kayaking is growing in popularity. Demand for commercial boat tour services is increasing. With various local, state and federal agencies having management authority over the riverbed, water column, shorelines, islands, and recreational activities on the river, there are many regulations in effect with no single source providing public information or enforcement. To ensure public safety, resource protection, and quality of visitor experience, ideally, those agencies with jurisdiction of the Hanford Reach would develop a coordinated approach for developing, dispersing and enforcing mutually agreed upon regulations.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Through partnerships where appropriate, provide public information related to Hanford Reach visitor information, including rules and regulations.		✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Create an interagency forum with those agencies with jurisdiction on the Hanford Reach to address public safety, resource protection, information dispersal, commercial outfitting and guiding, and enforcement.		✓	✓	✓	✓	✓	✓	✓
Where deemed advantageous to the public and to management efficiency, seek to enter into partnerships for management, information dispersal, and law enforcement on the Hanford Reach.		✓	✓	✓	✓	✓	✓	✓

2.10.8.4 Objective 7-4: Hunting Plan[61]

Within two years of the CCP being adopted, revise the Hunting Plan to provide for high-quality hunting opportunities on the Monument in accordance with—to the extent practicable—WDFW laws, regulations and management plans.

Unit	Alternatives (Acres Open To Hunting)[1]							
	A	B	B-1	C	C-1	D	E	F
Columbia River	5,588	3,341	0	3,920		6,962		7,797
Rattlesnake[2]	0							
Ringold	3,120		0	3,120				
Saddle Mountain	24,055	21,411	0	24,055				
Wahluke	29,486	35,176	0	40,006				57,747
Total	***62,249***	***63,048***	***0***	***71,101***	***71,101***	***74,143***	***74,143***	***92,719***

[1] This includes the total acres open to some form of hunting. For example, under Alternative B in the Columbia River Corridor Unit, the only hunting allowed is waterfowl hunting on the river outside of the WDFW waterfowl sanctuary (i.e., below the "wooden power lines").

[2] The Rattlesnake Unit would be closed to sport hunting, although controlled elk hunting as a population control measure is a future possibility under Alternative C on 42,000 acres; see Objective 1-13.

[61] As noted previously, a Sport Hunting Plan was developed and implemented while this CCP was in draft in response to a lawsuit filed by the Fund For Animals. That plan only considers no hunting and the status quo (i.e., Alternative A). In order to implement other alternatives, including the preferred alternative, the Sport Hunting Plan will need to be revised.

Rationale and Strategies

Hunting is identified as a priority public use by the Improvement Act, when it is compatible with national wildlife refuge purposes. Public input during the EIS scoping period identified hunting-related issues that included access, commercial guides, horses, public safety, facilities, weapon and species restrictions, and the quality of information available on hunting opportunities. A Hunting Plan that addresses these issues and establishes guidelines for hunting on the Monument is an important component of the overall Visitor Services Plan (see Objective 7-1).

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Within the Hunting Plan, consider options for management of the existing goose pit blinds, including a permit system, removal, installation of new blinds, or requiring use of temporary blinds.		✓	✓	✓	✓	✓	✓	✓
In conformance with FWS policy, phase out the put-and-take ring-necked pheasant stocking program within two years.[62]	✓	✓	✓	✓	✓	✓	✓	✓
Within the Hunting Plan, consider establishing special hunt programs for youth, disabled and master hunters.		✓	✓	✓	✓	✓	✓	✓
Within the Hunting Plan, assess the need for hunting retrieval and safety zones in the Monument.		✓	✓	✓	✓	✓	✓	✓
Distribute the draft (revised) Hunting Plan for review by agencies, user groups, and interested persons.		✓	✓	✓	✓	✓	✓	✓
Work cooperatively with the WDFW to enforce state hunting laws and Monument-specific regulations.		✓	✓	✓	✓	✓	✓	✓
Seek to develop partnerships with hunting interests to assist with design, development and maintenance of hunting-related facilities.		✓	✓	✓	✓	✓	✓	✓

[62] FWS policy does not allow the stocking of non-native species. There would be no removal of remaining pheasants, and non-native species that do not cause significant negative impacts to the Monument would be allowed to remain (e.g., chukars, Hungarian (gray) partridges).

2.10.8.5 Objective 7-5: Fishing Plan

Within two to five years of the CCP being adopted, develop a Fishing Plan that provides for high-quality opportunities on the Monument in accordance with—to the extent practicable—WDFW fishing laws, regulations and management plans.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Create a Fishing Plan within 5 years.		Create a Fishing Plan within 3 years.		Create a Fishing Plan within 2 years.		Same as Alt. B.
Ringold								
Wahluke								

Rationale and Strategies

Fishing is identified as a priority public use by the Improvement Act, as long as it is compatible with national wildlife refuge purposes. Fishing is the most popular visitor activity that occurring on the Monument, contributing 67% of total annual visitor days; the fall Chinook salmon run is a regionally important recreation attraction. Public input during the EIS scoping period identified fishing-related issues to address that included facility needs, access, crowding, public health and safety, commercial outfitting and guiding, and tournaments. A Fishing Plan that addresses these issues and establishes guidelines for sport fishing on the Monument is an important component of the overall Visitor Services Plan (see Objective 7-1).

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Coordinate with agencies with jurisdictional authority on Monument waters in developing the Fishing Plan.		✓	✓	✓	✓	✓	✓	✓
Distribute the draft Fishing Plan for review by agencies, user groups, and interested persons.		✓	✓	✓	✓	✓	✓	✓
Seek to develop partnerships with fishing groups to assist with design, development and maintenance of fishing-related facilities.		✓	✓	✓	✓	✓	✓	✓

2.10.8.6 Objective 7-6: Wildlife Observation and Photography

Provide additional wildlife observation and photography opportunities within ten years of the CCP being adopted, targeting major habitats and key wildlife species.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Create up to 6 wildlife observation sites within 10 years.		Create up to 8 wildlife observation sites and up to two photography sites within 10 years.		Create up to 12 wildlife observation sites and up to 3 photoraphy sites within 10 years.	Same as Alt. C.	
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Wildlife observation and photography are identified by the Improvement Act as priority public uses, as long as they are compatible with national wildlife refuge purposes. With its diverse habitats and abundance of plant and animal species, the Monument offers excellent potential to provide high-quality wildlife observation and photography opportunities. The Monument's ability to provide these opportunities can be expanded through partnership efforts with local and regional interest groups.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Identify potential sites for wildlife observation and photography across the Monument's key habitats, including riparian/riverine, upland shrub-steppe, grassland, dune and cliff/lithosol areas, considering siting factors such as public safety, resource protection needs, quality of experience, existing access, and infrastructure needs.		✓	✓	✓	✓	✓	✓	✓
Provide diverse access options, including disabled, foot, automobile, watercraft, horseback and bicycle. Consider the potential to incorporate sites along auto tour routes, non-motorized trails, and water trails.		✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Use staff or volunteers to conduct wildlife observation and photography programs, tours and/or workshops on the Monument, factoring in the needs of diverse audiences and physical abilities. Seek partnerships and volunteer assistance from organizations such as National Audubon Society, Native Plant Society, TNC, Richland Rod and Gun Club, Washington State University, etc.		✓	✓	✓	✓	✓	✓	✓
Enhance the existing interpretive wayside on Highway 240 to interpret the elk herd and other topics, such as the ecological importance of ALE—connectivity, other wildlife use of the ALE, insect diversity, ongoing research, cultural resources, and other topics.		✓	✓	✓	✓	✓	✓	✓
Cooperate in the development of a potential National Audubon Society-sponsored Great Birding Trail segment on the Monument.		✓	✓	✓	✓	✓	✓	✓

2.10.8.7 Objective 7-7: Hiking

Provide high-quality hiking opportunities on the Monument and linked into off-site trail systems that are compatible with resource protection.

Unit	Alternatives (Acres)[1]							
	A	B	B-1	C	C-1	D	E	F
Columbia River	2,421	0		16,917	16,917; open 1-2 trails in sand dunes.	16,917	16,374	7,419
Rattlesnake	0			Open 1 trail.		Open 1-2 trails.		0
Ringold	3,120							
Saddle Mountain	24,055	21,411		24,055				
Wahluke	29,486	35,176		57,747				

Unit	Alternatives (Acres)[1]							
	A	B	B-1	C	C-1	D	E	F
Total	*59,082*	*59,707*		*101,739 1-2 trails on Rattlesnake*			*101,196 2 trails*	*92,341*

[1] Opportunities in open areas may include cross country hiking, trail-use only, or a combination of each. Please note that these are acres ***potentially*** open to hiking. Many areas noted as 'open' on the maps may only have certain areas open, or openings may be seasonal.

Rationale and Strategies

While hiking is not a priority public use of the NWRS, it does support uses such as wildlife observation, photography, environmental education, and interpretation, which may be priority uses of a particular refuge. Carefully planned hiking routes and/or hiking areas, together with use stipulations, can minimize impacts while providing high-quality opportunities to experience and learn about the Monument. Identifying parameters for hiking—such as resource protection needs, seasonal restrictions, group size limitations, facilities, and visitor information needs—would be an important component of the Visitor Services Plan (See Objective 7-1).

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Identify hiking routes—and explore opportunities to connect Monument trails with off-site trails—that explore interpretive, educational and wildlife observation opportunities; include in the Visitor Services Plan.		✓	✓	✓	✓	✓	✓	✓
Seek to develop partnerships with local hiking groups to assist with design, development and care of trails and facilities.		✓	✓	✓	✓	✓	✓	✓

2.10.8.8 Objective 7-8: Equestrian Plan

Within two to five years of the CCP being adopted, develop an Equestrian Plan that provides for high-quality equestrian opportunities compatible with resource protection.

Unit	Alternatives[1]							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Open with no special restric-tions.	Open, limited to select roads and trails; establish plan in 5 years.		Open, limited to select roads and trails; establish plan in 3 years.		Open, limited to select roads and trails; establish plan in 2 years.	Same as Alt. C.	Same as Alt. B.
Ringold								
Saddle Mountain								
Wahluke								

[1] The Rattlesnake Unit is closed to horses under all alternatives.

Rationale and Strategies

While equestrian use is not a priority public use of the NWRS, it does support uses such as wildlife observation, photography, environmental education, and interpretation, which may be priority uses of a particular refuge. Locally, there are few areas available for equestrian use. User groups have been responsible and forthcoming with volunteer assistance to self-police their activities and help maintain use areas. Carefully planned equestrian routes and use stipulations can minimize impacts, while providing high-quality opportunities to experience and learn about the Monument. An Equestrian Plan that addresses travel routes, resource protection needs, seasonal restrictions, group size limitations, facilities, and visitor information needs would be an important component of the overall Visitor Services Plan (see Objective 7-1).

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Develop an Equestrian Plan that addresses travel routes, infrastructure needs, public safety, resource protection, seasonal restrictions, party size limits, and quality of experience.		✓	✓	✓	✓	✓	✓	✓
Within the Equestrian Plan, explore interpretive, educational and wildlife observation opportunities associated with trails.		✓	✓	✓	✓	✓	✓	✓
Seek partnerships with local equestrian groups to assist with design, development and maintenance of trails and facilities.		✓	✓	✓	✓	✓	✓	✓

2.10.8.9 Objective 7-9: Boat Launches

Provide boat launch facilities to facilitate access to and from the Hanford Reach of the Columbia River.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River								
Vernita Area	Maintain primitive launch.			Developed launch.				Same as Alt. C; south shore dock.
White Bluffs	Maintain current launch and winter closure.			Close launch and access road.	Improve current launch.		Launch open to non-motorized boats only.	Close launch, provide a dock.
Ringold	Maintain primitive launch.	Developed launch in 5 years.		Developed launch in 3 years.				Same as Alt. B.
South Shore						Up to 2 on south shore in 15 years.[1]		

[1] This would have to be a DOE action and would be dependent upon Hanford cleanup progress.

Rationale and Strategies

As identified in public scoping for the EIS, boat access to the Hanford Reach is a key element in facilitating river-related recreation opportunities in the Monument. The number and type of boat access facilities provided will play an important role in shaping the type of recreational experiences on the Columbia River and Monument. For example, numerous access points may result in increased use with resultant crowding, increased wildlife disturbance, and loss of solitude opportunities. Fewer access points may preserve solitude, yet result in fewer visitors

to experience, learn about, and appreciate the Hanford Reach. The number and type of boat accesses across the alternatives varies with alternative themes, described early in this chapter.

Vernita Area

The Vernita Bridge Unit, currently administered by the WDFW under a lease agreement with the DOE, is the most intensively used site on the Monument, receiving heavy seasonal use from anglers willing to trailer over rocky terrain and launch from unimproved shoreline areas. Native American tribes have voiced concerns over degradation of sensitive natural and cultural resources in this area from vehicle travel, day use, camping, improper sanitation practices, and boat launching activities. The WDFW has focused on developing a boat launch in the Vernita Bridge area for decades, and input received during public scoping reflects visitor demand for an improved launch; there is a need to provide a designated area for river access, day use, and overnight use somewhere in the vicinity of the Vernita Bridge to protect resources and to meet visitor demand. However, there may be more suitable locations for such use upstream of the Vernita Bridge. An inventory could identify other suitable locations so that the best option can be selected for this important visitor access location. See Objective 7-11 for additional management strategies for the Vernita Bridge area.

White Bluffs

(See also the rationale for Objective 7-1.) Located in the central section of the Hanford Reach, the White Bluffs Boat Launch is predominantly used by sport fishermen during salmon and sturgeon seasons. The launch has traditionally been closed from winter through spring to provide waterfowl resting areas. However, since wintering waterfowl have typically migrated from the area by April, the launch could be opened earlier each year with no detrimental effect. A range of management options for this area that were raised included requests to maintain or improve the White Bluffs Boat Launch, as well as requests to close the boat launch and manage the area for quiet and solitude. No closures would take place until substitute launching facilities were developed.

Ringold

Located adjacent to the Monument's southern boundary, the Ringold Fish Hatchery plays an important role in providing visitor access to the Hanford Reach. The hatchery is located on BOR land which is leased to the WDFW. With a primitive boat launch, day overnight, and shoreline use areas, this site receives thousands of visits annually, primarily fishing-related. Because this site is located adjacent to the Monument, has easy access from a paved county road, and is already somewhat hardened, it would be a logical location to work in partnership to provide improved boat launch facilities. (See Objective 7-11 for additional management strategies for the Ringold area.)

South Shore

Public scoping indicated a desire for increased boat access to the Columbia River from Richland. Providing increased access along the south shore fits the theme of Alternative D.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Coordinate with the DOE and WDFW to curtail cross-country vehicle travel near the Vernita Bridge.	✓	✓	✓	✓	✓	✓	✓	✓
Based on factors such as public safety, resource sensitivity, and site suitability, determine the most suitable site for public river access at the Vernita Bridge or upstream. If a site is found that is more suitable than the existing use area, work to secure public access and provide visitor facilities commensurate with the final CCP direction. Once access and facilities are in place, close and rehabilitate the existing site.		✓	✓	✓	✓	✓	✓	✓
Coordinate with the DOE and WDFW to seek outside funding and partners to develop a boat launch in the Vernita area.				✓	✓	✓	✓	✓
Explore funding options for a Ringold boat launch with the WDFW, BOR, Washington Interagency Committee for Outdoor Recreation, and other sources.		✓	✓	✓	✓	✓	✓	✓
Work with the DOE, EPA, WDOE and WDFW to identify potential locations for boat access on the south shore based upon visitor safety, resource protection needs, existing infrastructure, and additional infrastructure needs. Work with other agencies to secure funding for boat access development on the south shore, if appropriate.						✓		
Work cooperatively with the Northwest Water Trail partnership to include the Hanford Reach as a segment within the Columbia River Water Trail.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.8.10 Objective 7-10: Camping[63]

Over the life of the CCP, seek to provide camping opportunities on the Monument.

<table>
<tr><th rowspan="2">Unit</th><th colspan="8">Alternatives[1]</th></tr>
<tr><th>A</th><th>B</th><th>B-1</th><th>C</th><th>C-1</th><th>D</th><th>E</th><th>F</th></tr>
<tr><td>Columbia River</td><td colspan="3">Phase out unapproved camping activities at Vernita.</td><td colspan="2">Same as Alt. A.

Develop 3-6 boat-in campsites within 6 years.</td><td colspan="2">Create a developed campground in the Vernita area.

Develop 3-6 boat-in campsites within 6 years.</td><td>Same as Alt. A.</td></tr>
<tr><td>Ringold</td><td>Continue primitive camping.</td><td colspan="2">Enhance the current primitive camping within 5 years.</td><td colspan="2">Create semi-developed camping within 3 years.</td><td>Create a developed camp-ground within 2 years.</td><td>Same as Alt. C.</td><td>Same as Alt B.</td></tr>
<tr><td>Saddle Mountain</td><td></td><td></td><td></td><td></td><td></td><td>Create a developed camp-ground within 15 years.</td><td></td><td></td></tr>
<tr><td colspan="9">[1] Several of these actions are dependent upon other agencies and/or organizations. Phasing out camping at Vernita will involve the DOE. Campgrounds at Vernita and Ringold might require the cooperation and assistance of the BOR, DOE, WDFW, Grant Count PUD, etc.</td></tr>
</table>

Rationale and Strategies

Public scoping indicated a strong demand for camping opportunities on the Monument. While camping is not a priority public use of the NWRS, it can support uses such as wildlife observation, photography, environmental education, and interpretation, which may be priority uses of a particular refuge. However, based on the recently finalized FWS appropriate uses

[63] Since the release of the draft CCP, the FWS has completed its policy on appropriate uses. As a result, an appropriate use test has been applied to camping (see Appendix H), and it has been determined that all camping, other than for non-motorized floatboating, is not an appropriate use of the Monument. Floatboat camping has been determined to be appropriate for public safety reasons. Other forms of camping have been left in the CCP so that the alternatives represented reflect those commented on by the public in the draft CCP.

policy, camping has been determined to be an inappropriate use on the Monument, other than to protect the safety of floatboaters.

Vernita Area

The Vernita Bridge Unit, currently administered by the WDFW under a lease agreement with the DOE, is the most intensively used site on the Monument, receiving heavy seasonal use from anglers willing to trailer over rocky terrain, launch boats, and camp along unimproved shoreline areas. Although the DOE lease prohibits camping, visitors appear to camp in this area year-round. Native American tribes have voiced concerns over degradation of sensitive natural and cultural resources in this area from vehicle travel, day use, camping, improper sanitation practices, and boat launching activities. Demand for a designated area for river access, day use, and overnight use somewhere in the vicinity of the Vernita Bridge was identified during public scoping for the EIS. However, there may be more suitable locations for such use upstream of the Vernita Bridge, and as noted, most camping has been determined to be an inappropriate use on the Monument. An inventory could identify other suitable locations so that the best option can be selected for this important visitor access location. (See Objective 7-10 for additional management strategies for the Vernita Bridge area.)

Non-Motorized Boat Camping

Non-motorized boating (e.g., canoeing, kayaking) is currently constrained due to the distance between access points and restrictions on overnight use in the Monument. Non-motorized boating supports priority public uses such as wildlife observation, wildlife photography, interpretation and education. Scoping indicated a strong demand for camping opportunities somewhere in the middle of the Hanford Reach, allowing visitors to safety float the entire stretch in a two-day trip. Motorized boats do not have these time and safety constraints.

Ringold

Located adjacent to the Monument's southern boundary, the Ringold Fish Hatchery is situated on BOR land which is leased to the WDFW. A small, undeveloped camping area serves anglers and currently provides the first available camping opportunity for non-motorized boaters seeking to float the Hanford Reach from upstream launches. Because this site is located adjacent to the Monument, has easy access from a paved county road, and is already somewhat hardened, it would be a logical location to work in partnership to provide improved boat launch facilities. (See Objective 7-10 for additional management strategies for the Ringold area.)

Saddle Mountain

Scoping indicated a demand for a developed campground along Highway 24. This action best fits the theme of Alternative D, and although subsequently found to be an inappropriate use of the Monument at this time, is considered here as it was included in the draft CCP.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Coordinate with the DOE and WDFW to assist with enforcement of the existing day use only requirement in the Vernita Bridge area.	✓	✓	✓	✓	✓			✓
Coordinate with the DOE and WDFW to curtail cross-country vehicle travel in the Vernita Bridge Unit.	✓	✓	✓	✓	✓	✓	✓	✓
Considering factors such as public safety, resource sensitivity, and site suitability, determine the most suitable site for public river access in the immediate vicinity of the Vernita Bridge or upstream. If a suitable site is found, secure public access and provide visitor facilities commensurate with the final CCP direction at the new site. Once new facilities are in place, close and rehabilitate the existing site.		✓	✓	✓	✓	✓	✓	✓
Coordinate with the DOE and WDFW to seek outside funding and partners to provide a developed camping area in the Vernita Bridge area or alternative location.						✓	✓	
Identify a suitable site for a campground on the Saddle Mountain Unit, considering resource protection needs, visitor safety, existing infrastructure, and additional infrastructure needs.						✓		
Coordinate with the DOE, EPA, WDOE and WSDOT to evaluate the River Corridor Unit, roughly between the White Bluffs Boat Launch and the Ringold Fish Hatchery, for areas that would be appropriate for boat-in campsite locations.				✓	✓	✓	✓	

2.10.8.11 Objective 7-11: General Public Access

Modify historic public access and use patterns to best protect Monument resources while providing additional opportunities for compatible uses.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Enforce closure and west of Vernita Bridge.[1]		Enforce closure south and west of Vernita Bridge;[1] create new access points on the north (Alt. D.) and south shores.[2]			Create new access points on the north and south shores.[2]	Same as Alt. B.
Rattlesnake				Establish 1 trail.		Establish 1-2 trails.		
Ringold	Close little-used parking lots.					Same as Alt. A; establish an auto tour from the Ringold entrance to SR 24.	Close little-used parking lots.	
Saddle Mountain		Close the summit area and a portion of the road.		Close the road to motor use.				Same as Alt. C.
Wahluke		Open 5,785 additional acres.[2]		Open 28,321 additional acres.[2]		Same as Alt. C;[2] establish an auto tour.	Same as Alt. C.[2]	

[1] This would require action by the DOE.
[2] This would be dependent upon lifting of Hanford exclusion zone and/or Hanford cleanup progress.

Rationale and Strategies

The existing public use areas on today's Monument lands has evolved over the decades as byproducts of changing DOE operational needs, without consideration of resource suitability, visitor impacts, quality of visitor experience, or management efficiency. This has resulted in some situations where recreation activities are concentrated in and around fragile resources, while other areas more suitable for recreation activities are closed. The strategies address this situation by identifying options for closing some areas and opening new areas to public access. The strategies under any particular alternative coincide with the management theme of that alternative, as described earlier in this Chapter.

Recreational use can have significant impacts to island resources (see Sections 2.2 and 3.21 for a description of island resource values). Impacts on wildlife resources from shoreline activities—especially those that extend above the mean high-water mark—include disturbance of colonial nesters (especially during pre-nesting when birds can be disturbed from nesting, as well as later when there are young flightless birds); destruction of bank swallow nesting sites; disturbance to breeding waterfowl; and interruption of foraging and resting activities by a wide range of raptors, passerines, wading birds, waterfowl and mammals. Other impacts include the spread of invasive weeds, unsanitary waste, littering and illegal collecting. The public use closure is proposed due to sensitive island resources, the costs required to ensure resource protection, and the ready availability of other opportunities elsewhere in the Monument and surrounding areas.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Provide signing and vehicle parking areas as needed to facilitate non-motorized public access to additional acreage in the Wahluke Unit.[1]		✓	✓	✓	✓	✓	✓	✓
Following resource inventories, establish an auto tour route on the Wahluke Unit along the old military road north of State Route 24.[1]						✓		
Install signing and infrastructure necessary to close the Saddle Mountain summit area and a portion of the road leading to the summit. Provide vehicle parking adjacent to State Route 24 for visitors seeking non-motorized recreation opportunities in the Saddle Mountain Unit.		✓	✓					
Install signing and infrastructure necessary to close the Saddle Mountain Road to motorized use. Provide vehicle parking adjacent to State Route 24 for visitors seeking non-motorized recreation opportunities in the Saddle Mountain Unit.				✓				✓
Coordinate the closure of the Saddle Mountain Road with valid existing rights holders to ensure the uninterrupted continuation of access for administrative purposes.				✓				✓
Monitor visitor use patterns in the Ringold Unit and identify unused parking lots for closure.		✓	✓	✓	✓	✓	✓	✓
Following resource inventories, identify one or more potential foot trail corridors in the Rattlesnake Unit.			✓	✓	✓	✓	✓	

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Coordinate Rattlesnake Unit access planning and implementation with the DOE, Energy Northwest, BPA and Benton County PUD to address public safety and security issues.				✓	✓	✓	✓	
Install signing, conduct public outreach, and provide enforcement to maintain the existing closure south and west of the Vernita Bridge.[2]		✓	✓	✓	✓	✓		✓
Following resource inventories, identify one or more potential public access points on the north shore of the Columbia River.[1]						✓	✓	
Following resource inventories, identify one or more potential public access points on the south shore of the Columbia River[1, 2]				✓		✓	✓	
Following resource inventories, identify one or more potential foot trail corridors in the Hanford sand dunes area.[1,2] Coordinate sand dunes access planning and implementation with Energy Northwest and the BPA to address public safety and security issues.				✓		✓	✓	
Discontinue allowing dogs on the Monument, outside of leashed dogs in parking lots and retrieving dogs during hunting seasons. Provide visitors with information on off-Monument locations allowing dogs.		✓	✓	✓	✓	✓	✓	✓
Close the Hanford (already closed) and McNary Islands to recreational use to protect sensitive natural and cultural resources.	✓	✓	✓	✓	✓	✓	✓	✓

[1] This action would be dependent upon the DOE lifting or resizing the Hanford exclusion zone.
[2] This would be a DOE action.

2.10.8.12 Objective 7-12: Visitor Access Permits

Within one year of the CCP being adopted, implement a visitor access permit system for the Monument, including the potential establishment of fee areas.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River								Establish a permit system for all non-river public access areas.
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

A permit system was identified during alternative development as a method to increase visitor compliance of regulations, improve public safety, decrease illegal behavior, and allow for better tracking of visitor activities and locations. The permit system is the core of Alternative F.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Develop an access permit system, addressing procedures for permit application, permit issuance, potential fee schedule, and enforcement.								✓
Seek approval to include the potential permit in the federal pilot fee demonstration project, allowing revenues to remain on-site.								✓

2.10.9 Goal 8: Protect the natural visual character and promote the opportunity to experience solitude on the Monument.

2.10.9.1 Objective 8-1: Visual Resources Plan

Develop a Visual Resources Management Plan for the Monument.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Develop a Visual Resources Management Plan within 7 years.		Develop a Visual Resources Management Plan within 5 years.		Develop a Visual Resources Manage-ment Plan within 3 years.	Same as Alt. C.	Same as Alt B.
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

The Monument's scenic landscapes provide a striking backdrop for many visitor activities. Input received during public scoping for the EIS and planning workshops called for protecting and maintaining the integrity of these scenic landscapes. Completion of a comprehensive visual resources inventory, followed by development of sensitivity classes and associated standards and guidelines, would provide managers with a valuable tool for protecting these resources.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Build from the existing key observation points inventory to complete a visual resources inventory of the Monument, placing each acre in the Monument into a sensitivity class. Provide the draft inventory to affected agencies and governments on the Monument to increase their understanding of the project and to seek their comments.		✓	✓	✓	✓	✓	✓	✓
Work with agencies to develop design standards and guidelines for structures, utilities and activities taking place on the Monument.		✓	✓	✓	✓	✓	✓	✓
Seek cooperation from those agencies carrying out projects or activities on the Monument to bring their structures, utilities and activities into compliance with the established standards and guidelines.		✓	✓	✓	✓	✓	✓	✓
Participate in planning for off-site projects to minimize any potential negative impacts to the Monument's visual resources.		✓	✓	✓	✓	✓	✓	✓

2.10.9.2 Objective 8-2: Light and Noise Standards

Develop light and noise standards for the Monument.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		Develop light and noise standards within 7 years.		Develop light and noise standards within 5 years.		Develop light and noise standards within 3 years.	Same as Alt. C.	Same as Alt B.
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Noise and light pollution can disturb wildlife and degrade the quality of visitor experiences. Standards to minimize noise and light pollution overall, and to minimize the effects of ongoing activities on sensitive habitats and recreational opportunities, would benefit both wildlife and Monument visitors.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Identify sources of noise and light that impact the Monument and identify abatement strategies for each source.		✓	✓	✓	✓	✓	✓	✓
Identify wildlife species and associated habitats that are vulnerable to noise and light disturbance and factor in abatement strategies accordingly.		✓	✓	✓	✓	✓	✓	✓
Identify recreation activities and associated locations that are sensitive to noise and light disturbance and factor in abatement strategies accordingly.		✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Develop an outreach and education plan to inform Monument visitors, other agencies, and individuals conducting activities on the Monument of issues associated with noise and light pollution and seek their assistance in minimizing impacts to the Monument.		✓	✓	✓	✓	✓	✓	✓
Participate in planning for off-site projects, seeking to minimize any potential negative impacts related to noise and light pollution.		✓	✓	✓	✓	✓	✓	✓

2.10.9.3 Objective 8-3: Solitude

Manage for solitude opportunities in select areas on the Monument.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River		The areas to promote and protect solitude will need to be determined. The wilderness inventory will be used as a starting point.						
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

The Monument currently offers excellent opportunities for visitors to experience solitude. Solitude was identified as an important resource during public scoping for the EIS. In future years, as visitation to the Monument increases, solitude opportunities could become degraded without careful planning and implementation of protective management actions.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Identify areas that will be managed for solitude, giving special consideration to areas with wilderness characteristics.		✓	✓	✓	✓	✓	✓	✓
Identify indicators to monitor whether solitude opportunities are being achieved, such as group encounter rates, noise and the number of visual intrusions. Establish indicator thresholds and subsequent management actions when thresholds are exceeded.		✓	✓	✓	✓	✓	✓	✓
Inform visitors about typical visitor use patterns on the Monument to allow those seeking solitude to best plan their visit.		✓	✓	✓	✓	✓	✓	✓
Consider management strategies to enhance solitude opportunities, such as parking lot size limits, group size limits, permits, concentration of visitor facilities along roads, seeking to limit Monument overflights, etc.		✓	✓	✓	✓	✓	✓	✓

2.10.10 Goal 9: Facilitate research compatible with resource protection, emphasizing research that contributes to management goals of the Monument.

2.10.10.1 Objective 9-1: Research

Over the life of the CCP: 1) develop standards and protocols to support existing, and encourage new, research with other agencies (e.g., DOE, WDFW, USGS), universities, and non-profit and other organizations; 2) gather scientific information to facilitate management of Monument resources; and 3) gather scientific information for the general advancement of science.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Manage research activities through a Special Use Permit System.	Utilizing partnerships and cooperative working groups, implement strategic research activities on the Monument within one year of the CCP being adopted.						
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Research is critical for protecting Monument resources, determining natural resource components and their interactions, and understanding the consequences of management actions on the parts and the whole. Research is also critical for the general advancement of science and scientific inquiry. The Monument and surrounding area have been recognized as a premier location to conduct research due to the character of the environment and, in some areas, lack of human disturbance over decades. Because the Monument was a buffer surrounding the nuclear facilities on Central Hanford, it has been relatively free from human disturbance (e.g., agricultural activities) since the 1940s. The Monument contains one of the largest areas of undisturbed shrub-steppe habitat within the Columbia Basin. Because public access and use was limited, it offers unique opportunities for a variety of ecologically based research and monitoring. (The ALE Unit has been designated a National Environmental Research Park, an RNA, and an IBA for Washington State.)

The Monument was established under the provisions of the Antiquities Act of 1906 to conserve a unique and biologically diverse landscape encompassing an array of scientific and historic objects. Conducting research into these scientific and historic objects will ensure that the FWS and others will manage the Monument to achieve the specific purposes for which the Monument was established and help fulfill the mission of the NWRS.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Establish research operations, access and equipment maintenance protocols for research on the Monument.		✓	✓	✓	✓	✓	✓	✓
Within one year of the CCP being adopted, develop research project and prioritization standards with the goal of Monument resource protection.		✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Form an interagency advisory group that includes scientific and academic interests to assist with the review of research proposals.		✓	✓	✓	✓	✓	✓	✓
Conduct an annual review of research results and adapt management accordingly.	✓	✓	✓	✓	✓	✓	✓	✓
Request researchers incorporate a public outreach/ education component into their activities.				✓	✓	✓	✓	
Develop a dissemination network/system to share findings of research conducted on or for the Monument.		✓	✓	✓	✓	✓	✓	✓
Coordinate with the DOE to ensure that research projects under their approval do not impact important wildlife and habitat resources. Continue to support DOE research projects that are compatible with Monument purposes.	✓	✓	✓	✓	✓	✓	✓	✓
Inventory and evaluate all residual research plots to determine their feasibility for removal.		✓	✓	✓	✓	✓	✓	✓
Work cooperatively with researchers and other agencies for the removal of obsolete research equipment and facilities.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.11 Goal 10: Establish and maintain a cooperative fire management program that protects facilities, resources and neighbors and fulfills natural resource management objectives.

2.10.11.1 Objective 10-1: Fire Plan

Within five years of the CCP being adopted, review and revise the existing Fire Management Plan, retaining, improving, or expanding on its capabilities to protect the Monument's resources and assist in local fire management.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Revise the existing Fire Management Plan within five years of the CCP being adopted.							
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

Although a natural part of the Monument's ecosystems, fire can also be the biggest threat to those ecosystems. The natural fire regime has been replaced by one that has a higher frequency rate due to human causes and one that is augmented or altered by invasive species, such as cheatgrass which dries out earlier in the year than native bunchgrasses, lengthening the fire season. Likewise, the natural landscape surrounding the Monument has been replaced by one of private property, highly susceptible to fire damage. An effective Fire Management Plan is crucial to the long-term conservation of Monument resources and the protection of private property. The existing plan, while sufficient, will require revision as a new CCP is implemented, new techniques in fire management are developed, and new understandings about fire in the landscape are realized.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Use prescribed fire to accomplish resource management objectives.	✓	✓	✓	✓	✓	✓	✓	✓
Develop a fire prevention and education program component.	✓	✓	✓	✓	✓	✓	✓	✓
Suppress fires to the smallest acreage that is feasible for fire fighter and public safety and resource protection.	✓	✓	✓	✓	✓	✓	✓	✓
Integrate fire management into all Monument programs.	✓	✓	✓	✓	✓	✓	✓	✓
Identify capital needs for fire management facilities.	✓	✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Reduce hazardous fuels on the Monument by appropriate means, such as prescribed fire, mechanical and/or chemical treatments to protect natural, cultural, scenic and recreational resources.	✓	✓	✓	✓	✓	✓	✓	✓
Promptly mitigate impacts of wildland fires that threaten life, property and critical natural and cultural resources.	✓	✓	✓	✓	✓	✓	✓	✓

2.10.11.2 Objective 10-2: Firefighting

Expand the firefighting capability of the Monument.

Unit	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Columbia River	Increase the Monument's firefighting capability.							
Rattlesnake								
Ringold								
Saddle Mountain								
Wahluke								

Rationale and Strategies

As noted, fire is arguably the biggest threat to Monument resources. Having adequate resources available to contain and extinguish large fires is critical to the long-term preservation of natural, cultural and recreational resources.

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Increase existing firefighting personnel by 50% (see Section 3.19.7.4).	✓	✓	✓	✓	✓	✓	✓	✓

Strategy	Alternatives							
	A	B	B-1	C	C-1	D	E	F
Increase the number of fire engines and other equipment by 50% (see Section 3.19.7.4).	✓	✓	✓	✓	✓	✓	✓	✓
Increase the cache of firefighting equipment to a sufficient size for the personnel on staff to be able to fight at least two major fires per year.	✓	✓	✓	✓	✓	✓	✓	✓
Review, update and execute cooperative agreements, including, at a minimum, an annual meeting to discuss the capabilities of each partner.	✓	✓	✓	✓	✓	✓	✓	✓

Chapter 3

Affected Environment

3.0 Introduction

This chapter describes the physical and biological environment, public uses, cultural resources, and socioeconomic conditions, as they exist in the Monument today. These existing conditions represent the environment that would be affected by the alternatives being considered in this CCP/EIS. The affected environment is the baseline for the comparison of impacts of alternatives in the environmental analysis in Chapter 4.

3.0.1 Methods and Sources of Information

A great deal of information currently exists regarding the resources in the Monument. Extensive research and environmental monitoring has been and is currently being conducted on Monument lands. In many cases, however, comprehensive inventories of Monument lands have not been completed to a level sufficient for intensive management of natural and cultural resources. In-depth resource inventories for cultural resources, wildlife, vegetation and public use activities are either currently underway or pending the selection of the preferred management alternative.

The best available information was used to describe the existing conditions in the Monument. The information used in this analysis was obtained from a variety of sources.

- Other DOE reports and NEPA documentation, especially the CLUP.
- Relevant scientific literature (see Appendix T for reference sources).
- Existing databases and inventories.
- Consultations with other resource professionals.
- Personal knowledge of resources based on field visits and experience.

Where relevant, the reader is referred to the appendices and/or the original source material for detailed information regarding the affected environment in the Monument.

3.0.2 Study Area

The area being considered in this CCP/EIS is located near the Tri-Cities (Kennewick, Pasco, and Richland) in south-central Washington State.

The Monument lies along both sides of the Columbia River, approximately 30 miles north of the Oregon border, 200 miles east of the Pacific Ocean, 110 miles west of Idaho border, and 150 miles south of the Canadian border (see Map 1). Most of the Monument's 195,777 acres are located in Benton, Franklin and Grant Counties, although the northeast corner extends a short distance into Adams County.

The Monument is about 30 miles north to south and 24 miles east to west. The Columbia River flows through the Monument and, turning south, forms part of the eastern boundary. The Rattlesnake Hills, of which Rattlesnake Mountain is a part, are the southwestern boundary of the Monument, Umtanum Ridge the western boundary, and the Saddle Mountains the northern boundary. The lands that border the Monument to the west, north and east are principally range and agricultural land.

The Monument lies between three major population centers: Portland, Oregon (230 miles by road); Seattle, Washington (225 miles); and Spokane, Washington (140 miles). The cities of Kennewick, Pasco, Richland (the Tri-Cities), and West Richland constitute the nearest population centers and are located just south of the Monument.

3.1 Geographic/Ecosystem Setting

The state of Washington is generally thought of as temperate or even wet; in reality, however, most of the state east of the Cascade Mountain Range is quite dry, to the point of meeting the definition of desert.

The Monument comprises lands originally acquired by the federal government in 1943 for the Manhattan Project. All the land within the Monument currently belongs to the DOE as part of the 375,000-acre Hanford Site. The Monument was created primarily from parts of the Hanford Site that were considered safety and security buffers during the weapons production period of the site's history. As such, the Monument forms a large horseshoe-shaped area around what is generally known as Central Hanford and, because use has been restricted in the area, the Monument provides a buffer for the smaller areas currently used for storage of nuclear materials, waste storage, waste disposal, and the Energy Northwest Power Plant.

When European settlers first arrived in the Pacific Northwest, they found a harsh, but surprisingly productive arid landscape that today is identified as the Columbia Basin Ecoregion (DOE 1996). This area historically included over 14.8 million acres of steppe and shrub-steppe vegetation across most of central and southeastern Washington State (Franklin and Dyrness 1973), as well as portions of north-central Oregon.

Today, much of the Columbia Basin Ecoregion has been converted into farms and urban centers. However, the protected status of the Hanford Site since 1943 resulted in its becoming a refuge for native plants, animals and biological communities that were once far more common in the surrounding landscape. Equally important, the portion of the Columbia River within the Hanford Site is unique within the post-dam Columbia River system in the United States. Within the Hanford Site, the river is essentially free flowing through an approximately 51-mile segment (46.5 miles within the Monument). This stretch is called the Hanford Reach. The Hanford Reach extends from the upper end of the McNary Dam Reservoir to Priest Rapids Dam and contains significant riparian habitat that is otherwise rare within the Columbia River system (National Park Service 1994). It is because of this duel juxtaposition of increasingly rare habitats—the only free-flowing, non-tidal stretch of the Columbia River remaining in the United States and the largest remnant of the shrub-steppe ecosystem that dominated the Columbia Basin prior to European settlement—that President Clinton established the Hanford Reach National Monument through Presidential Proclamation in June 2000.

The Monument is characterized as a shrub-steppe ecosystem. Such ecosystems are typically dominated by a shrub overstory with a grass understory. In the early 1800s, the dominant plants in the area were big sagebrush underlain by perennial Sandberg's bluegrass and bluebunch wheatgrass. With the advent of settlement, livestock grazing and agricultural production contributed to colonization by non-native plant species that currently dominate large portions of the landscape. Although agriculture and livestock production were the primary subsistence activities in the area at the turn of the century, these activities ceased when the Hanford Site was designated in 1943. Remnants of past agricultural practices are still evident.

At 195,777 acres, the Monument, along with the Department of Defense's (DOD) Yakima Training Center, retain the largest remaining blocks of relatively undisturbed shrub-steppe in the Columbia Basin Ecoregion (Smith 1994, Soll et al. 1999; see Map 2). When settlers arrived, the vegetation in the ecoregion consisted primarily of shrubs, perennial bunchgrasses, and a variety of forbs. An estimated 60% of shrub-steppe in Washington has been converted to agriculture or other uses. Much of what remains is in small parcels in shallow rocky soils or has been degraded by historic land uses (mostly livestock grazing). This conversion of land extends even into the Monument; the Monument encompasses undeveloped land interspersed with industrial development along the southern shoreline of the Columbia River, and human-made intrusions—such as roads, power lines, irrigation canals, communications structures, and remnant domestic plants—are evident throughout the Monument.

The Monument contains some of the best remaining large-scale examples of the shrub-steppe vegetation type in the Pacific Northwest, supporting habitat for many species of native wildlife (including shrub-steppe obligate species), a diverse array of native plant communities (including many threatened and endangered taxa) and microbiotic crusts, and a unique invertebrate fauna that is still being catalogued (Soll et al. 1999, Evans et al. 2003). Many places in the Monument are relatively free of non-native species and are extensive enough to retain characteristic populations of shrub-steppe plants and animals that are absent or scarce in other areas.

The Monument's importance as a refuge for the shrub-steppe ecosystem is not solely related to size, however. The presence of a large diversity of physical features and examples of rare, undeveloped, deep and sandy soil has led to a corresponding diversity of plant and animal communities. Because it is located within the hottest and driest part of the ecoregion, the Monument also retains some of its own uniqueness and fragility.

The Monument's other key feature—the Hanford Reach—is home to the most important salmonid spawning grounds remaining on the Columbia River. The Hanford Reach and associated riparian zones provide habitat for numerous wildlife and plant species, including remnant habitat for aquatic organisms that were widespread before the remainder of the Columbia River system was converted to reservoirs. Surveys have identified several rare plant associations along the shoreline and islands of the reach (Salstrom and Easterly 1995, Soll and Soper 1996), further defining the Monument's importance to the nation.

It was due to the Monument's—and the Hanford Reach's—singular importance to the nation that the National Park Service (NPS), in a record of decision issued on July 16, 1996, recommended that the Hanford Reach and its surrounding lands be designated a recreational river in the NWSRS and that other lands in the area be designated a national wildlife refuge. While that designation has yet to be realized, on June 9, 2000, portions of the Hanford Site, including the Hanford Reach and associated islands, wildlife management areas to the north, White Bluffs, Hanford Dunes, ALE, and the McGee Ranch/Riverlands area, were designated as the Hanford Reach National Monument to be administered as part of the NWRS. Although the DOE currently owns the entire Monument, the FWS exercises management over 165,000 acres of the Monument, and the WDFW manages a small recreational access area.

3.1.1 Current Administrative Units

The Monument is currently divided into six administrative units (see Map 5). These units are artifacts from DOE management, delineated to fulfill their purposes. As noted in Chapter 2, new unit delineations are proposed, are based on biological and administrative needs, that meet the mission of the FWS. The existing administrative management units are described below.

3.1.1.1 Fitzner-Eberhardt Arid Lands Ecology Reserve

The 73,930-acre Fitzner-Eberhardt Arid Lands Ecology Reserve[64] lies in the southwest portion of the Monument in Benton County. The ALE was officially recognized as a valuable site for

[64] Richard Fitzner and Lester Eberhardt were two acclaimed sage grouse biologists, killed a plane crash while conducting aerial wildlife surveys. On November 30, 1993, Congress official renamed the area the "Fitzner-Eberhardt Arid Lands Ecology Area" in their honor.

scientific study in 1967 due to the rich and relatively undisturbed character of its native shrub-steppe ecosystem.[65] The ALE was subsequently designated a federal RNA in 1971. The area has been managed for the DOE by the FWS since 1997. It is closed to public access but open for scientific research and educational purposes by special-use permit.

3.1.1.2 McGee Ranch/Riverlands Unit

The DOE manages this 9,096-acre unit to the north of the ALE. The unit lies entirely within Benton County and contains the biologically diverse Umtanum Ridge area and extensive native grasslands and shrublands, as well as powering corridors and highly degraded former agricultural lands, homesteads and town sites. There is no official public access, although the Riverlands area north of the Midway Substation Road has been subject to trespass for years.

3.1.1.3 Vernita Bridge Access Area

This small area (approximately 405 acres) on the Columbia River just north of the Vernita Bridge in Grant County has been managed by the WDFW since 1971, primarily to provide river access for fishing and boating.

3.1.1.4 Saddle Mountain Unit

This 30,981-acre unit borders the north shore of the Columbia River and is located entirely within Grant County. This unit of the Monument has been managed by the FWS since 1971. It contains sagebrush stands and important rare plant habitats, along with heavily disturbed former agricultural lands and the Saddle Mountain Lake, a large area of irrigation wasteway impoundments. It provides good views to the B Reactor (see Section 3.20.6). The unit is bisected by State Route 24 but is otherwise closed to public access.

3.1.1.5 Wahluke Unit

The 58,034-acre Wahluke Unit, located primarily in Grant and Franklin Counties, is managed for public access (i.e, open to public use). This unit was managed by the WDFW from 1971 to 1999 and has been managed by the FWS since 1999. It includes most of the Monument's

[65] Subsequent major fires in 2000 and 2007 have disturbed large portions of the ALE. However, much still remains untouched, and restoration efforts in a closed areas should return the ALE to its previous condition, albeit not for many years.

signature geologic feature—the White Bluffs—as well as significant shrub-steppe plant communities and rare plant habitats. The unit includes the Wahluke Branch Wasteway and associated impoundments, in particular the WB-10 Ponds.

3.1.1.6 River Corridor Unit

This 23,331-acre unit of the Monument includes the Hanford Reach of the Columbia River, along with the Columbia River islands and a 0.25-mile corridor along both the south and north shores of the river within Benton, Franklin and Grant Counties. The unit also contains the Hanford Dunes. Management of this unit is multi-jurisdictional, involving the DOE, FWS, Washington State Department of Natural Resources (WDNR), and several different state and county agencies.

3.2 Climate

The Monument lies in the semi-arid shrub-steppe Pasco Basin of the Columbia Plateau in southeastern Washington State. The region's climate is greatly influenced by the Pacific Ocean and the Cascade Mountain Range to the west and other mountain ranges to the north and east. The Pacific Ocean moderates temperatures throughout the Pacific Northwest, and the Cascade Range generates a rain shadow that limits rain and snowfall in the eastern half of Washington State. The Cascade Range also serves as a source of cold air drainage, which has a considerable effect on the wind regime on the Hanford Site. Mountain ranges to the north and east of the region shield the area from the severe winter storms and frigid air masses that move southward across Canada.

Climatological data for the Hanford Site are compiled at the Hanford Meteorology Station (HMS) located on Hanford's Central Plateau. Meteorological measurements have been taken at the HMS since late 1944. Prior to the establishment of the HMS, local meteorological observations were made at the Old Hanford Townsite (1912 through late 1943) and in Richland (1943 and 1944). A climatological summary for Hanford is provided in Hoitink et al. (2003).

Data from the HMS capture the general climatic conditions for the region and describe the specific climate of Hanford's Central Plateau. The large size of the Hanford Site and its complex topography give rise to substantial spatial variations in wind, precipitation, temperature and other meteorological parameters. An example of this is the marked differences in the annual distribution of wind directions and speeds measured at the HMS on the Central Plateau and at the 300 Area near the southeastern corner of the Hanford Site. To accurately characterize meteorological differences across the Hanford Site, the HMS operates a network of automated monitoring stations. These stations, which currently number thirty, are located throughout the

Hanford Site and in neighboring areas. A 408-foot instrumented meteorological tower operates at the HMS. Most of the other network stations use short-instrumented towers about thirty-feet high. Data is collected and processed at each monitoring site, and key information is transmitted to the HMS every fifteen minutes. This monitoring network has been in full operation since the early 1980s.

For reporting purposes throughout this section the seasons are defined as follows:

- Winter – December through February
- Spring – March through May
- Summer – June through August
- Autumn – September through November

3.2.1 Wind

Prevailing wind directions near the surface in most of the Monument are from the northwest all months of the year, although winds from the northwest occur most frequently during the winter and summer. Winds from the southwest also occur regularly in the Monument, especially in the southeastern quadrant. During the spring and fall, there is an increase in the frequency of winds from the southwest and a corresponding decrease in winds from the northwest.

Monthly average wind speeds at fifty feet above the ground are lower during the winter months, averaging six to seven miles per hour (mph), and faster during the summer, averaging eight to nine mph. The fastest wind speeds in the Monument are usually associated with flow from the southwest. However, the summertime drainage winds from the northwest out of the Cascade Mountains frequently exceed thirty mph. The maximum speed of the drainage winds (and their frequency of occurrence) tends to decrease toward the southeast.

3.2.2 Temperature and Humidity

Monthly averages and extremes of temperature, dew point, and humidity are presented in Neitzel (2004). Based on data collected from 1946 through 2002, the average monthly temperatures on the Monument's lower levels range from a low of 31°F in January to a high of 76°F in July. The highest winter monthly average temperatures recorded were 44°F in February 1958 and February 1991, and the lowest average monthly temperature was 12°F in January 1950. The highest monthly average temperature recorded was 82°F in July 1985, and the lowest summer monthly average temperature was 63°F in June 1953.

Daily maximum temperatures in the Monument vary from an average of 35°F in late December and early January to 96°F in late July. There are, on average, fifty-two days during the summer months with maximum temperatures of 90°F, and twelve days with temperatures greater than or equal to 100°F. The greatest number of consecutive days on record with maximum daily temperatures of 90°F is thirty-two. The record maximum temperature was 113°F, recorded on August 4, 1961, and again on July 13, 2002.

From mid-November through early March, the average daily minimum temperature is below freezing; the daily minimum in late December and early January is 21°F. On average, the daily minimum temperature drops to 0°F or below only three days per year; however, only about one winter in two experiences such low temperatures. The greatest number of consecutive days on record with minimum daily temperatures of 0°F or below is eleven. The record minimum temperature of -23°F was recorded on both February 1 and 3, 1950.

The annual average relative humidity in the Monument is 55%. It is highest during the winter months, averaging about 76%, and lowest during the summer, averaging about 36%. The annual average dewpoint temperature in the Monument is 34°F. In the winter, the dewpoint temperature averages about 27°F, and in the summer it averages about 43°F.

3.2.3 Precipitation

Average annual precipitation in the Monument's lower levels is 6.8 inches. In 1995, the wettest year on record, the precipitation measured was 12.3 inches; in 1976, the driest year, only 3.0 inches were measured. The wettest season on record was the winter of 1996-97, with 5.4 inches of precipitation; the driest season was the summer of 1973, with only 0.03 inches of precipitation. Most precipitation occurs during the late autumn and winter, with more than half of the annual amount occurring from November through February. Days with greater than 0.50 inches of precipitation occur on average less than once each year.

Average snowfall ranges from 0.1 inch in October to a maximum of 5.2 inches in December, decreasing to 0.5 inches in March. The record monthly snowfall of 23.4 inches occurred in January 1950. The seasonal record snowfall of 56.1 inches occurred during the winter of 1992-93. Snowfall accounts for about 38% of all precipitation from December through February.

3.2.4 Fog and Visibility

Fog has been recorded during every month of the year in the Monument; however, 89% of the occurrences are from November through February, with less than 3% from April through September. The average number of days per year with fog (visibility of six miles or less) is forty-eight; the average number of days with dense fog (visibility of 0.25 mile or less) is twenty-

five. The greatest number of days with fog was eighty-four in 1985-86 and the least was twenty-two in 1948-49. The greatest number of days with dense fog was forty-two in 1950-51 and the least was nine days in 1948-49. The greatest persistence of fog was 114 hours in December 1985, and the greatest persistence of dense fog was forty-seven hours in December 1957.

Other phenomena causing restrictions to visibility (i.e., visibility of six miles or less) include dust, blowing dust, and smoke from field burning. There are few such days; an average of five days per year have dust or blowing dust, and an average of less than one day per year has visibility reduced from smoke to less than six miles.

3.2.5 Severe Weather

Concerns about severe weather generally center on hurricanes, tornadoes and thunderstorms. Washington does not experience hurricanes, and tornadoes are infrequent and generally small in the northwestern part of the United States. The National Climatic Data Center maintains a database that provides information on the incidence of tornados reported in each county in the United States. This database reports that in the ten counties closest to the Monument (Adams, Benton, Franklin, Grant, Klickitat, Kittitas, Walla Walla and Yakima Counties in Washington, and Morrow and Umatilla Counties in Oregon), only twenty-two tornados have been recorded since 1950. Of these, fifteen tornadoes had maximum wind speeds estimated in the range of 40 to 72 mph, four had maximum wind speeds in the range of 73 to 112 mph, and three had maximum wind speeds in the range of 113 to 157 mph. There were no deaths or substantial property damage (in excess of $50,000) associated with any of these tornadoes.

For a five-degree block centered at 117.5° west longitude and 47.5° north latitude (the area in which the Monument is located), the expected path length of a tornado is five miles, the expected width is 312 feet, and the expected area is about one square mile (Ramsdell and Andrews 1986). The estimated probability of a tornado striking a point in the Monument is less than 0.0001% per year. However, the Monument could be affected by extreme winds generated by a nearby tornado.

On average, there are ten thunderstorms in the vicinity of the Monument per year. They are most frequent during the summer; however, they have occurred in every month. Thunderstorms can generate high-speed winds and hail. Using the National Weather Service criteria for classifying a thunderstorm as *severe* (i.e., hail with a diameter of 0.75 inch or greater or wind gusts of 58 mph), only 1.9% of all thunderstorm events surveyed in the Monument have been severe storms, and all met the criteria based on their wind gusts. High-speed winds in the Monument are more commonly associated with strong cold frontal passages. In rare cases, intense low-pressure systems can generate winds of near hurricane force.

3.2.6 Global Warming

A continuously growing body of unequivocal scientific evidence has emerged supporting the theory of global climate change. During the 20th century, the global environment experienced variations in average worldwide temperatures, sea levels, and chemical concentrations. Global air temperatures on the earth's surface have increased by 3.3° Fahrenheit since the mid 19th century (Solomon et al. 2007). Subsequently, sea levels rose approximately 0.07 inches) ± 0.02 inches per year during the 20th century (Solomon et al. 2007). While the concept of global warming is widely accepted, the extent and impact of future changes as well as the exact source (natural or human induced) remains a debate (Overseas Private Investment Corporation 2000). Emerging consensus contends that increasing quantities of greenhouse gases in the atmosphere, especially carbon dioxide (CO_2), are beginning to impact climate and may be the dominant force driving recent warming trends. The atmospheric concentrations of CO_2 and methane in 2005 were 379 parts per million and 1774 parts per billion, respectively. These amounts greatly exceed concentrations recorded in the global environment over the last 650,000 years (Solomon et al. 2007). Greenhouse gases and other emissions from human activity have enhanced the heat trapping capability of the earth's atmosphere, causing warmer temperatures. Although the increase in carbon dioxide is largely attributed to fossil fuel use, land use changes have also increased the amount of cleared land surfaces, thereby reflecting more solar radiation (Intergovernmental Panel on Climate Change 2001, Solomon et al. 2007).

Global forecasting models offer a variety of predictions based on different emission scenarios. The Overseas Private Investment Corporation (2000) suggests that a further increase in greenhouse gases emissions could double atmospheric concentrations of CO_2 by 2060 and subsequently increase temperatures by as much as 2° to 6.5° Fahrenheit over the next century. Recent model experiments by Solomon et al. (2007) show that if greenhouse gases and other emissions remain at 2000 levels, a further global average temperature warming of about 0.18° Fahrenheit per decade is expected. Sea-level rise is expected to accelerate by two to five times the current rates due to both ocean thermal expansion and the melting of glaciers and polar ice caps. Consequently, patterns of precipitation and evaporation may be altered. These changes may lead to more severe weather, shifts in ocean circulation (currents, upwelling), as well as adverse impacts to economies and human health (Overseas Private Investment Corporation 2000, Intergovernmental Panel on Climate Change 2001, Buddemeier et al. 2004). Although there is considerable debate regarding the extent and the ultimate impact these changes will have on Earth's environment, most, if not all, national wildlife refuges could be impacted, including the Monument.

3.3 Hydrology

Hydrology considerations in the Monument include surface water, groundwater and the vadose zone. *Groundwater* refers to water within the saturated zone. The *vadose zone* is the unsaturated or partially saturated region between ground surface and the saturated zone; water there is called soil moisture. Permeable saturated units in the subsurface are called *aquifers*.

3.3.1 Surface Water

Surface water in the Monument includes the Columbia River, Columbia riverbank seepage, and springs and ponds, as well as runoff and flooding. Intermittent surface streams, such as Cold Creek, may also contain water after large precipitation or snowmelt events. There is also surface water associated with irrigation east and north of the Columbia River within the Monument. The Monument is adjacent to the Yakima River.

3.3.1.1 Columbia River

Originating in the Canadian Rockies of southeastern British Columbia, the Columbia River drains a total area of approximately 262,480 square miles on its 1,240-mile journey to the Pacific Ocean. Partly due to this large drainage and partly due to the abundant precipitation over much of its watershed, the Columbia River is the fourth largest river in the United States in terms of total flow (an estimated average discharge of 71,016 cubic feet per second), even though it is only the twelfth longest river in the country. Over much of its course, the river's flow is highly "unnatural," being heavily regulated by numerous dams.[66] Priest Rapids is the nearest upstream dam, and McNary is the nearest downstream dam on the Columbia River. Lake Wallula, the impoundment created by McNary Dam, extends upstream past Richland, Washington, to the southern part of the Monument. Except for the Columbia River estuary, the only unimpounded stretch of the river in the United States is the Hanford Reach, which extends from Priest Rapids Dam downstream approximately fifty-one miles to the McNary Pool north of Richland. The creation of the Monument was based, in part, on the fact that the Hanford Reach is a free-flowing stretch of the Columbia River.

[66] There are ten dams upstream of the Monument on the Columbia River, seven in the U.S. (Priest Rapids, Wanapum, Rock Island, Rocky Reach, Wells, Chief Joseph) and three in Canada (Keenleyside, Revelstone, Mica). Downstream of the Monument are four dams on the mainstem of the Columbia River (McNary, John Day, The Dalles, Bonneville) (see Map 16). This does not include the dozens, if not hundreds of dams on the Snake River and other tributaries in the Columbia River system.

Flows through the Hanford Reach can fluctuate significantly depending on the year, season and time of day. Seasonal and daily flows through the Hanford Reach are controlled primarily by releases from the large upstream storage dams, including Mica, Duncan and Keenleyside in Canada and Libby, Hungry Horse, and Grand Coulee in the United States. Grand Coulee, as the largest and most upstream development in the United States, establishes the daily flow regime through the mid-Columbia River and, ultimately, the Hanford Reach.

Generally speaking, these storage reservoirs are drawn down in the fall and winter to provide flood protection from peak river flows caused by rainstorms and snowmelt in the spring and refill by the end of the spring runoff. Coordination of these reservoir operations is carried out through regional forums established for that purpose, such as the Pacific Northwest Coordination Agreement and the Columbia River Treaty with Canada.

Hourly flows in the Hanford Reach are directly affected by releases from Priest Rapids Dam, which is owned and operated by the Grant County Public Utility District. This dam is operated as one of a system of seven hydroelectric projects immediately upstream of Hanford Reach through the Mid-Columbia Hourly Coordination Agreement. The seven projects are owned and operated by federal agencies (BOR and ACOE in cooperation with the BPA) and three public utility districts (Douglas, Chelan and Grant Counties). The Grant County Public Utility District recently was issued a new license to operate the Priest Rapids Complex (Priest Rapids and Wanapum Dams) by the Federal Energy Regulatory Commission (FERC); the license sets the year-round Priest Rapids minimum flow at 36,000 cubic feet per second (cfs). However, from the time fall Chinook salmon spawning starts (typically sometime in October or November) through the emergence of fry in May, flows are targeted at 50,000 to 70,000 cfs as a result of the Hanford Reach Fall Chinook Protection Program.[67]

Natural flows in the Columbia River vary greatly on a seasonal basis but are typically stable over the short term because of the river's sheer size. Columbia River flows typically peak from April through June during spring runoff and are lowest from September through October. Flow rates near Priest Rapids during the eighty-six-year period from 1917 to 2003 averaged nearly 120,000 cfs. Daily average flows during this period ranged from 20,000 to 690,000 cfs. The lowest and highest flows occurred before the construction of upstream dams. During the ten-year period from 1993 through 2003, the average flow rate was also about 120,000 cfs.

As a result of daily fluctuations in discharges from Priest Rapids Dam, the depth of the river varies significantly over a short time. River stage changes of up to twelve feet during a twenty-four-hour period may occur along the Hanford Reach (Poston et al. 2000). Daily fluctuations (maximum to minimum flow) typically exceed 100,000 cfs about 25% of the time and are less

[67] The Hanford Reach Fall Chinook Protection Program was developed by federal and state agencies, public utility districts, and environmental organizations in an effort to establish a flow scenario that would protect spawning salmon and the resultant smolts.

than 50,000 cfs about 25% of the time. The width of the river varies from approximately 1,000 feet to 3,300 feet along the Hanford Reach. The width also varies temporally as the flow rate changes, which causes repeated wetting and drying of an area along the shoreline.

The primary uses of the Columbia River include the production of hydroelectric power, irrigation of cropland in the Columbia Basin, transportation of materials, residential and industrial water use, and recreation. The Hanford Reach is the upstream limit of barge traffic on the mainstem Columbia River. Barges are used to transport reactor vessels from decommissioned nuclear submarines to Hanford for disposal. Several communities located along the Columbia River rely on the river as their source of drinking water. The Columbia River is also used as a source of industrial water for several Hanford Site facilities (Dirkes 1993), particularly the nuclear reactor operated by Energy Northwest. Recreational uses include fishing, hunting, boating, sailboarding, water-skiing, diving and swimming. Storage reservoir operations are also conducted for the benefit of both resident and anadromous fish and play a major role in protecting the near-river developments from severe flooding.

3.3.1.2 Columbia Riverbank Seepage

The discharge of groundwater into the Columbia River has been known to occur for many years. Riverbank seeps were documented long before Hanford Site operations began (Jenkins 1922). In the early 1980s, researchers identified 115 springs along the Benton County shoreline of the Hanford Reach (McCormack and Carlisle 1984). Seepage occurs both below the river surface and on the exposed riverbank, particularly at low-river stage. The seeps flow intermittently, apparently influenced primarily by changes in river level. In many areas, water flows from the river into the aquifer at high river stages and then returns to the river at low river stages.

3.3.1.3 Yakima River

The Yakima River, which flows near the southwestern boundary of the Monument, has much lower flows than the Columbia River. The average flow, based on nearly sixty years of daily flow records, is about 3,712 cfs, with an average monthly maximum of 17,500 cfs and a minimum of 165 cfs. Exceptionally high flows were observed during 1996 and 1997. The highest average daily flow rate during 1997 was nearly 45,900 cfs. Average flow during 2006 was 3,650 cfs. The Yakima River System drains surface runoff from a portion of the Monument. Groundwater from the Monument does not reach the Yakima River and, because the elevation of the river surface is higher than the adjacent water table (based on well water-level measurements), groundwater is expected to flow from the Yakima River into the aquifer underlying the Monument, rather than from the aquifer into the river (Thorne et al. 1994).

3.3.1.4 Springs and Streams

Several springs are found on the slopes of the Rattlesnake Hills along the western edge of the Monument. TNC, in its *Biodiversity Inventory and Analysis of the Hanford Site 1997 Annual Report* (Hall 1998), documented an alkaline spring at the eastern end of Umtanum Ridge. Rattlesnake and Snively Springs form small surface streams; water discharged from Rattlesnake springs flows down Dry Creek for about 1.6 miles before disappearing into the ground. While these springs are small, their impact on the Monument is huge; they provide water sources for a variety of wildlife and allow the growth of trees for songbird and raptor use as nest sites, sanctuaries and hunting perches.

3.3.1.5 Runoff and Net Infiltration

Due to the arid landscape, runoff and infiltration of precipitation is limited. The total estimated precipitation over the Pasco Basin is about 3,232 cubic feet annually (DOE 1988). Precipitation varies both spatially and temporally, with higher amounts generally falling at higher elevations. Annual precipitation measured at the HMS has varied from 3.0 inches to 12.3 inches since 1945. Most precipitation occurs during the late autumn and winter, with more than half of the annual amount occurring from November through February. Mean annual runoff from the Pasco Basin is estimated at less than twenty cubic feet per year (DOE 1988). Most of the remaining precipitation is lost through evapotranspiration. However, some precipitation that infiltrates the soil is not lost to evaporation or transpiration and eventually recharges the groundwater flow system.

Cold Creek and its tributary, Dry Creek, are ephemeral streams within the Yakima River drainage. When surface flow does occur, it infiltrates rapidly and disappears into the surface sediments in the western part of the Hanford Site.

3.3.1.6 Flooding

Large Columbia River floods have occurred in the past and were annual events prior to the era of dam construction. Major floods on the Columbia River are typically the result of rapid melting of the snowpack over a wide area augmented by above-normal precipitation. The maximum historical flood on record occurred June 7, 1894, with a peak discharge through the Hanford Reach of 742,000 cfs. The largest recent flood took place in 1948 with an observed peak discharge of 700,000 cfs through the Hanford Reach. While still possible, the probability of flooding at the magnitude of the 1894 and 1948 floods has been greatly reduced by the construction of numerous flood control/water-storage dams upstream of the Monument. For example, exceptionally high spring runoff in 1996 resulted in a maximum discharge of only

415,000 cfs, according to the United States Geological Survey (USGS; 2002). According to ACOE records, the 100-year regulated flood for this part of the river is 440,000 cfs.

3.3.1.7 Non-Riverine Surface Water

Other than rivers and springs, there are no naturally occurring bodies of surface water on or adjacent to the Monument. However, there are artificial wetlands, caused by irrigation return, on the east and west sides of the Wahluke Slope, which lies north of the Columbia River. Hatcheries and irrigation canals constitute the only other artificial surface water in the Monument vicinity. The Ringold Hatchery is located just south of the Monument boundary on the east side of the Columbia River.

3.3.2 Vadose Zone

In the Hanford area, the thickness of the vadose zone ranges from zero feet near the Columbia River to more than 300 feet beneath parts of the Monument (estimated). Unconsolidated glacio-fluvial sands and gravels of the Hanford Formation make up most of the vadose zone. In some areas, however, the fluvial-lacustrine sediments of the Ringold Formation make up the lower part of the vadose zone.

Moisture movement through the vadose zone is important in and around the Monument because it is the driving force for migration of most contaminants to groundwater.

The major source of recharge to the vadose zone is natural precipitation. Natural infiltration in the vadose zone causes older, preexisting water to be displaced downward by newly infiltrated water. The amount of recharge at any particular site is highly dependent on the soil type and the presence of vegetation. Usually, vegetation reduces the amount of infiltration through the biological process of transpiration.

3.3.3 Groundwater

Groundwater beneath the Monument originated as either natural recharge from rain and snowmelt, or as artificial recharge from excess irrigation, canal seepage, and wastewater disposal. The groundwater will eventually return to the surface environment as discharge to springs and seepage into rivers and streams, through evaporation from shallow water table areas, or brought to the surface through wells or excavations. However, it may take many thousands of years for groundwater in deeper aquifers to reach the surface.

3.3.3.1 Monument Aquifer System

Groundwater beneath the Monument is found in both an upper unconfined aquifer system and deeper basalt-confined aquifers. The unconfined aquifer system is also referred to as the suprabasalt aquifer system because it is within the sediments that overlie the basalt bedrock. Portions of the suprabasalt aquifer system are locally confined. However, because the entire suprabasalt aquifer system is interconnected on a site-wide scale, it is considered an unconfined aquifer system.

3.3.3.1.1 Basalt-Confined Aquifer System

Relatively permeable sedimentary interbeds and the more porous tops and bottoms of basalt flows provide the confined aquifers within the Columbia River Basalts. Hydraulic-head information indicates that groundwater in the basalt-confined aquifers generally flows toward the Columbia River at various rates, depending on density and conductivity and, in some places, toward areas of enhanced vertical communication with the unconfined aquifer system (Hartman et al. 2001, DOE 1988). The basalt-confined aquifer system is important because there is a potential for significant groundwater movement between the two systems.

3.3.3.1.2 Unconfined Aquifer System

The unconfined aquifer system is composed primarily of the Ringold Formation and overlying Hanford Formation. In some areas, pre-Missoula gravels (distantly derived subunit) of the Cold Creek Unit lie between these formations and below the water table. The other subunits of the Cold Creek Unit are generally above the water table.

Groundwater in the unconfined aquifer at Hanford generally flows from recharge areas in the elevated region near the western boundary of the Monument toward the Columbia River on the eastern and northern boundaries. The Columbia River is the primary discharge area for the unconfined aquifer. The Yakima River borders the Monument on the southwest and is generally regarded as a source of recharge. Along the Columbia River shoreline, the daily river level fluctuations may result in water table elevation changes of up to ten feet. During the high river stage periods of 1996 and 1997, some wells near the Columbia River showed water level changes of more than ten feet. As the river stage rises, a pressure wave is transmitted inland through the groundwater. The longer the duration of the higher river stage, the farther inland the effect is propagated. The pressure wave is observed farther inland than the water actually moves. For the river water to flow inland, the river level must be higher than the groundwater surface and must remain high long enough for the water to flow through the sediments. Typically, this inland flow of river water is restricted to within several hundred yards of the shoreline (McMahon and Peterson 1992).

Estimated groundwater recharge rates from precipitation range from near zero to over 0.001 inches per year (Fayer et al. 1996, Gee et al. 1992). Recharge is highly variable both spatially and temporally. It is highest for coarse-textured soils bare of deep-rooted vegetation and in years with rapid snowmelt events and precipitation during cool months. The magnitude of recharge at a particular location is influenced by five main factors—climate, soils, vegetation, topography and springs and streams. Events such as the 24 Command Fire that burned vegetation from a large portion of the Monument in 2000 also affect recharge rates.

3.3.3.2 Groundwater Residence Times

Tritium and carbon-14 measurements indicate that residence or recharge time (length of time required to replace the groundwater) takes tens to hundreds of years for spring waters. Recharge takes from hundreds to thousands of years for the unconfined aquifer and more than 10,000 years for groundwater in the shallow confined aquifer (Johnson et al. 1992). However, because of large volumes of recharge from wastewater that was disposed on the Hanford Site between 1944 and the mid-1990s, and the relatively high permeability of Hanford Formation sediments, groundwater travel time on parts of the Monument to the Columbia River has been shown to be much faster, in the range of ten to thirty years (Freshley and Graham 1988, USGS 1987). Residence times in this portion of the aquifer are expected to increase because of the reduction in wastewater recharge. Chlorine-36 and noble gas isotope data suggest groundwater ages greater than 100,000 years in the deeper confined systems (Johnson et al. 1992). These relatively long residence times are consistent with semiarid-site recharge conditions.

3.3.4 Hydrology East and North of the Columbia River

Groundwater in the northern and eastern portions of the Monument is affected by high artificial recharge from irrigation and irrigation canal leakage of Columbia Basin Project water. Areas north and east of the Monument are irrigated by the SCBID, and return flows, both surface and groundwater, occur in the Monument. Artificial recharge has increased water table elevations in large areas of the Pasco Basin, in some places by as much as 300 feet (Drost et al. 1989).

There are two general hydrologic areas that impinge on the Monument boundaries to the east and north of the river. The eastern area extends from north to south between the lower slope of the Saddle Mountains and the Esquatzel Diversion Canal and includes the Ringold Coulee, White Bluffs area, and Esquatzel Coulee. The water table occurs in the Pasco gravels of the Hanford Formation in both Ringold and Esquatzel Coulees. Runoff from spring discharge at the mouth of Ringold Coulee is greater than 10,000 gallons per minute. Elsewhere in this area, the unconfined aquifer is in the less-transmissive Ringold Formation. The movement of excessive groundwater, i.e., excess irrigation water, seeping through the Hanford Formation along buried paleochannels atop the relatively impermeable Ringold Formation is leading to the creation

perched aquifers, resulting in a series of springs along the White Bluffs (Bjornstad 2006a). The increased hydraulic pressure in these sediments has caused subsequent slumping and landslides (Bjornstad 2006a, Brown 1979, Newcomer et al. 1991).

The other principal irrigated area is the northern part of the Pasco Basin on the Wahluke Slope, which lies between the Columbia River and the Saddle Mountain anticline. Irrigation on the Wahluke Slope has created ponds and seeps in the Saddle Mountain Unit. The direction of unconfined groundwater flow is southward from the basalt ridges toward the Columbia River.

3.4 Environmental Contaminants

For more than forty years, the primary mission of the Hanford Site was the production of weapons-grade plutonium for the United States nuclear arsenal. The vast infrastructure associated with that mission on the Hanford Site comprised nine nuclear reactor sites along the Columbia River, plutonium separation plants on the central plateau to the south, and fuel fabrication and research facilities near the city of Richland. Tremendous quantities of wastes were generated during this production era, the storage and disposal of which resulted in contamination of the surrounding environment, including some lands within the Monument.

Today, the Hanford Site mission focuses on treatment and disposal of these legacy wastes. The DOE is obligated to comply with various laws that pertain to the environmental cleanup and closure of the Hanford Site, including the CERCLA, Resource Conservation and Recovery Act (RCRA), Clean Water Act (CWA), and several state regulations. The cleanup schedule and process is regulated by the Hanford Federal Facility Agreement and Consent Order (signed May 15, 1989; also referred to as the Tri-Party Agreement or TPA). Three regulatory agencies are involved in this comprehensive cleanup and compliance agreement—DOE, EPA and Washington Department of Ecology (WDOE). Specifically, the TPA is intended to accomplish the following cleanup-related actions.

- Define and rank CERCLA and RCRA cleanup commitments.
- Establish responsibilities.
- Provide a basis for budgeting.
- Maintain a concerted goal of achieving full regulatory compliance and remediation with enforceable milestones.

The FWS is also involved in Hanford Site cleanup issues through its role as a member of the Hanford Natural Resource Trustee Council (HNRTC). The general objectives of the HNRTC

are to help ensure that natural resource values are fully considered in decisions related to the Hanford Site (including Monument lands); to integrate, to the extent practicable, natural resource restoration into remedial actions; to minimize resource injury during remedial action; to encourage the development and implementation of site-wide natural resource planning which supports mitigation, restoration and management goals and encompasses good stewardship practices; and to provide the DOE and regulatory agencies the information necessary to achieve the above objectives. The HNRTC consists of trustee agencies and governments with authority under the CERCLA to seek legal damages for injury to natural resources at Hanford. The HNRTC trustees include BLM, DOE, FWS, Oregon Department of Energy, WDOE, WDFW, CTUIR, Nez Perce Tribe, and Yakama Nation. The HNRTC is working with the DOE and other agencies to help provide ecological and other input in support of site remediation and cleanup.

Much of what is now considered Monument land once served as a buffer around the core areas of the Hanford Site. Few activities were allowed on these buffer lands, and consequently they contain large amounts of ecologically valuable and, in some instances, near-pristine habitat. The DOE still "owns" all Monument lands. Transfer of lands within the Monument boundaries to the DOI (i.e., FWS) is possible, but only uncontaminated land can be transferred. DOI policy requires a pre-acquisition survey to determine the suitability of any land proposed for transfer into the NWRS (e.g., is the land clean enough to support refuge [Monument] purposes).[68]

Based on existing or future actions and management plans from the DOE, Energy Northwest (a commercial nuclear power reactor operating on the Hanford Site), the state of Washington, and/or local counties, exclusion zones or emergency response zones associated with the Hanford Site may overlap some of the Monument lands. Wherever necessary, the FWS will either restrict access or ensure that those individuals using affected portions of the Monument will be advised of emergency procedures and comply with all requirements of those plans.

Cleanup activities at the Hanford Site are scheduled to continue for at least two to three decades, which is beyond the expected span of this CCP. See Sections 3.5, "Air Quality," and 3.6, "Water Quality," for additional information on the environmental quality of the Monument.

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[68] There are numerous issues associated with land transfer. An important condition of the transfer process ensures that the DOE remain legally and fiscally responsible for any of its legacy wastes that might be discovered on transferred lands in the future. This responsibility includes the costs associated with long-term monitoring and any future cleanup actions that may become necessary on any Monument lands. Post-remediation monitoring of formerly contaminated areas and periodic reviews to determine the efficacy of the remediation efforts are required by law. Based on decisions by and advice from the TPA, it may be necessary to advise against or otherwise restrict activities related to hunting, fishing, other recreational activities, or gathering of plants on some areas of the Monument. There are numerous isolated patches of land within the Monument that supported military or other site-related missions, and at least some of these areas will most likely require additional cleanup or will be excluded from the transfer package. All of these issues, and the land transfer process itself, are the responsibility of the DOE to address, and the DOE will address all analysis necessary under the NEPA through other documentation. It should be noted that not all land transfers require NEPA analysis.

3.5 Air Quality

3.5.1 State of Washington Air Quality

The Clean Air Act is the basis for federal regulation of air quality in the United States. While the EPA sets national ambient air quality standards, the states have the primary responsibility for ensuring that air quality within the state meets the national standards. This is done through state plans that are approved by the EPA.[69]

State and local governments have the authority to impose stricter standards for ambient air quality than the national standards, and the state of Washington has established more stringent standards for sulfur dioxide. In addition, Washington has established standards for total suspended particulates and fluorides that are not covered by national standards. The state standards for carbon monoxide, nitrogen dioxide, small particulates, and lead are identical to the national standards.

All but one area in Washington (the Wallula area located approximately twenty miles southeast of the Monument) meets the federal health-based clean air standards, and air quality in Washington has been steadily improving. The number of days Washington violated air quality standards has seen a dramatic decrease, from 150 days in 1987 to seven days in 1999 (the last data available). In addition, the number of people in Washington exposed to air that violates federal standards has dropped from a high of more than 2,000,000 people in 1990 to about 112,000 people in 1999.

The main sources of air pollution in Washington are, in order, motor vehicles, industry, wood stoves and fireplaces, and outdoor burning. Other sources include lawnmowers, boats and recreational vehicles, aircraft and trains. Although the sources have remained largely the same over the years, the amount of air pollution they contribute has shifted. For example, in 1991 motor vehicles caused 43% of Washington's air pollution, and industrial emissions were responsible for 25%. Wood stoves contributed 20% and outdoor burning 10%. In 1999 emission percentage estimates indicated a significant increase in air pollution from motor vehicles (57%) and a decline in pollution caused by industry (17%), wood stoves (11%), and outdoor burning (5%). This shift may be due to several factors. For example, Washington has

[69] Ambient air quality standards define levels of air quality that are necessary, with an adequate margin of safety, to protect the public health (primary standards) and the public welfare (secondary standards). *Ambient air* is that portion of the atmosphere, external to buildings, to which the general public has access. The EPA has issued ambient air standards for sulfur oxides (measured as sulfur dioxide), nitrogen dioxide, carbon monoxide, lead, ozone and small particles with an aerodynamic diameter less than or equal to ten micrometers. Particulate matter is a federally regulated pollutant; in high concentrations, it poses a health risk to both sensitive and healthy populations.

grown, more people are driving, air pollution control technologies for industry have improved, fewer people heat their homes with wood, and outdoor burning is allowed in fewer areas.

3.5.2 Monument Air Quality

Compared to other areas of Washington State, the Monument has some of the cleanest air over the majority of the year. The Benton (County) Clean Air Authority conducts air monitoring that is responsible for determining County's compliance with EPA National Ambient Air Quality Standards. The WDOE provides this service for Adams, Franklin and Grant Counties through its Eastern Regional Office. All four counties, and subsequently the Monument, are in attainment for all state and federal standards. Average pollution levels are well below the national average. However, particulate concentrations can reach relatively high levels in eastern Washington because of exceptional natural events (i.e., dust storms and large brush fires) that occur in the region. Thus, on occasion, the Monument experiences problems with particulate matter. The primary sources of particulate matter over the Monument include activity-related and wind-blown dust from construction and agriculture; wind-blown dust from open lands; agricultural burning; and wildfires. Other minor sources impacting the Monument include wood-burning stoves and fireplaces, industrial sources, and motor vehicles.[70]

While air quality on the Monument is generally good, there are concerns regarding chemical and radiological pollutants. The DOE and WDOE, as well as the Benton Clean Air Authority, have extensive monitoring systems in place to check for both types of pollutants. For example, during the last ten years, carbon monoxide, sulfur dioxide, and nitrogen dioxide have been monitored periodically in communities and commercial areas southeast of the Hanford Site. These urban measurements are typically used to estimate the maximum background pollutant concentrations for the Hanford Site. For a full discussion of these potential pollutants, monitoring systems, and results refer to the *Hanford Site National Environmental Policy Act Characterization* (Neitzel 2004) and the *Hanford Site Environmental Report for Calendar Year 2003* (DOE 2004).

3.6 Water Quality

The CWA and the Washington Water Pollution Control Act provide the statutory basis for the regulation of water quality in Washington State. The CWA established the National Pollutant Discharge Elimination System (NPDES) to limit the amount of pollutants that could be

[70] In June 1996, the EPA adopted the policy that allows dust storms to be treated as uncontrollable natural events. This means that EPA will not designate areas affected by dust storms as non-attainment. However, states are required to develop and implement a natural events action plan.

discharged into waterways. The EPA has not delegated the authority to issue NPDES permits at the Hanford Site to the state of Washington. However, WDOE regulations have established a state permit program for the discharge of waste materials from industrial, commercial and municipal operations into ground and surface waters of the state.

The CCP and this EIS focus on management of the Monument. Numerous DOE, EPA and WDOE publications deal with water contamination on the Hanford Site and its cleanup. For a full discussion of contaminants and their remediation, visit the DOE's web site (www.hanford.gov) or one of the DOE public information repository locations.

3.6.1 Columbia River

Washington State has designated the water quality of the Columbia River from Grand Coulee Dam to the Washington-Oregon border, which includes the Hanford Reach, as Class A, Excellent (DOE 2003). Class A waters are suitable for essentially all uses, including raw drinking water, primary-contact recreation, and wildlife habitat. State and federal drinking water standards apply to the Columbia River; EPA drinking water standards apply to Columbia River water at community water supply intakes downstream of the Hanford Site. These standards apply indirectly to contaminants from DOE facilities (and also non-DOE facilities) to the extent that water releases affect community water systems.

During 2002, the USGS measured several water quality parameters at the Vernita Bridge, upstream of the Monument, and at the Richland Pumphouse downstream of the Monument. Total dissolved solids, dissolved nitrogen, and dissolved oxygen measured near the Monument during 2002 were well within EPA and state standards. There were no statistically significant differences between upstream and downstream samples for these parameters (Poston et al. 2005).

The Pacific Northwest National Laboratory (PNNL) measured both radiological and non-radiological constituents in Columbia River water during 2002 as part of a continuing environmental monitoring program (Poston et al. 2003). Cumulative water samples are collected at Priest Rapids Dam and at the Richland Pumphouse. Additional samples were taken at transects of the river and at near-shore locations at the Vernita Bridge, 100-F Area, 100-N Area, the Hanford Town sites, and the 300 Area. These water samples were collected at frequencies varying from quarterly to annually. These data show a statistical increase in tritium, nitrate, uranium and iodine-129 along the Hanford Reach. All these constituents are known to be entering the river from contaminated groundwater beneath the Hanford Site. Measurements of strontium-90 at the Richland Pumphouse were not statistically higher than those at the Vernita Bridge, even though strontium-90 is known to enter the river through groundwater inflow at 100-N Area. Measurements of tritium along transects showed higher concentrations near the shoreline relative to mid-river for samples from the 100-N Area, Hanford Town sites, 300 Area, and Richland Pumphouse.

Other sources of pollutants entering the river are irrigation return flows and groundwater seepage associated with irrigated agriculture. The USGS (1995) documented nitrate groundwater contamination in Franklin County, which also seeps into the river along the Hanford Reach. However, in spite of pollutants introduced from the Hanford Site and other sources, dilution in the river results in contaminant concentrations that are below drinking water standards (Poston et al. 2003).

3.6.2 Springs and Seeps

The quality of water of the non-riverine springs in the Monument varies depending on the source. However, they are all up-gradient of Hanford waste sites and groundwater contamination plumes, so water quality is generally quite good. This is not the case with many of the Columbia riverbank springs. In areas of contaminated groundwater, riverbank springs are also generally contaminated. However, contaminant concentrations in seeping water along the riverbank may be lower than in groundwater because of the bank-storage phenomenon (see Section 3.3.1.2). Contaminants have been detected in near-shore samples downstream from riverbank springs (Poston et al. 2003). Riverbank springs are monitored for radionuclides at the 100-N Area, Hanford Town sites, and 300 Area. Hanford Site contaminants occur in some of these springs (Peterson and Johnson 1992, Poston et al. 2003); detected radionuclides include strontium-90; technetium-99; iodine-129; uranium-234, -235 and -238; and tritium. Other detected contaminants include arsenic, chromium, chloride, fluoride, nitrate and sulfate. Volatile organic compounds were below detection limits.

3.6.3 Other Surface Water

There are two other surface water sites within the Monument—the Saddle Mountain Lake and the WB-10 Ponds. Both are the present due to irrigation return ponding, the result of being the terminal ends of the Columbia Basin Project irrigation drainage system. Any contamination present is likely either wind-borne or carried in with irrigation return flows. Water quality parameters have been measured in Saddle Mountain Lake since the late1970's as part of Columbia Basin Project investigations, and in 1998 and 2005, the FWS collected common carp and bass from Saddle Mountain Lake as part of ongoing efforts to understand the effects of pesticides to fish, wildlife and their habitat in the Columbia Basin Project. Water quality and biota from the WB-10 Ponds had never been sampled until the 2005 fish tissue sampling. Carp and bass tissue samples collected from Saddle Mountain Lake and WB-10 Ponds had detectable levels of some organochlorine pesticides and PCBs. Further investigation is needed to determine the extent of health concerns, if any.

3.6.4 Groundwater

Due to decades of industrial and agricultural use in the area of the Hanford Site, groundwater contaminants are present under parts of the Monument, most notably along the south shore of the Columbia River. Many of these contaminant plumes are well documented by the DOE; others are in the process of being documented. In any event, the process and responsibility of identifying and cleaning these contaminants lies with other agencies. For additional discussion of groundwater contamination and the NEPA processes involved, see Section 3.4.

The FWS will continue to work with the DOE, EPA and WDOE to ensure that the public using the Monument will not be harmed by groundwater contaminants. Essential to the protection of public health is the DOE's extensive monitoring program. Radiological and chemical components in groundwater at the Hanford Site are monitored to characterize physical and chemical trends in the flow system, establish groundwater quality baselines, assess groundwater remediation, and identify new or existing groundwater problems. Groundwater is also monitored to verify compliance with applicable environmental laws and regulations. Samples are collected from approximately 700 wells to determine the distributions of radiological and chemical constituents in Hanford Site groundwater. Detailed results and interpretations are presented in Hartman et al. (2001).

3.6.4.1 Natural Groundwater Quality

The quality of natural groundwater at the Hanford Site varies depending on the aquifer system and depth, which generally is related to residence time in the aquifer. Groundwater chemistry in the basalt-confined aquifers displays a range, depending on depth and residence time (DOE 1988). The chemical type varies from a calcium and magnesium-carbonate water to a sodium- and chloride-carbonate water. Some of the shallower basalt-confined aquifers in the region (e.g., the Wanapum basalt aquifer) have exceptionally good water quality characteristics (Johnson et al. 1992). However, deeper basalt-confined aquifers typically have high dissolved solids content and some have fluoride concentrations over the drinking water standard (DOE 1988).

3.6.5 Vadose Zone

The Hanford Site has more than 800 past-practice liquid-disposal facilities. Radioactive liquid waste was discharged to the vadose zone—the unsaturated or partially saturated region between ground surface and the saturated zone—through reverse (injection) wells, French drains, cribs, ponds, trenches and ditches. Most effluent was released in the 200 Areas which are remote from the Monument; approximately 280 unplanned releases in the 200 Areas also contributed contaminants to the vadose zone that ultimately connects to the Monument near the Columbia

River shoreline through groundwater transport (DOE 1997). Many of these were from underground tanks that leaked and have contributed contamination to the vadose zone. In addition, approximately fifty active and inactive septic tanks and drain fields and numerous radioactive and non-radioactive landfills and dumps have affected the vadose zone (DOE 1997). The landfills are, and were used to, dispose of solid wastes, which, in most instances, are easier to locate, retrieve and remediate than are liquid wastes. During Hanford Site operations, cooling water from the single-pass reactors in and just outside the Monument along the Columbia River was routinely routed to retention basins in the 100 Area prior to return to the river. Thermal shock from the hot cooling water cracked the basins so that much of the cooling water leaked into the vadose zone. In addition, trenches were used for disposal of cooling water from several reactors. Contaminated cooling water that had contacted broken fuel rods was routed to trenches rather than being directly returned to the river, further contaminating the vadose zone. The amount of contamination remaining in the vadose zone is unknown.

3.7 Geology and Geomorphology

3.7.1 Geologic History

Geologic history, with spectacular landscapes exhibiting the power of nature, was a significant contributing element in the establishment of the Monument. The Monument lies within the geologic area known as the Columbia Basin and contains all its main geologic elements (DOE 1988). Four major events formed most of the earth (the soil and rocks) and geologic features (ridges and valleys) of the Columbia Basin and therefore the Monument.

1) The area was flooded with numerous basaltic lava flows.

2) Tectonic forces in the Earth folded the basalt.

3) In this landscape, the ancestral Columbia River meandered across the area, leaving behind layers of sediment called the Ringold Formation and Cold Creek Unit.

4) The last, and most recent, event—the Ice Age Floods—ended 10,000 years ago after the area was inundated by a series of floods, which left more sediment in what is informally called the Hanford Formation.[71]

[71] The earliest Ice Age Floods occurred 1-2 million years ago (Bjornstad et al. 2001; Bjornstad 2006a).

3.7.1.1 Lava Flows

Lava flows erupted from cracks in the earth over a period from seventeen to six million years ago, spreading over Idaho, Oregon and Washington. Under the Monument, these basaltic lava deposits (called the Columbia River Basalt Group) are over 13,000 feet thick (Reidel and Hooper 1989). Although the Columbia River Basalt Group is one of the smallest flood-basalt areas, the individual lava flows that comprise the area are some of the largest found on Earth. Within the area covered by the Columbia River Basalt Group are two distinct subbasins, each having its own geologic character—the Columbia Basin and Pasco Basin.

3.7.1.1.1 Columbia Basin

This basin encloses the Columbia River Basalt Group, which is surrounded by the Cascade Mountains to the west, Rocky Mountains to the northeast, and Blue Mountains to the southeast. The Columbia Basin lies mostly in southeastern Washington but does extend into western Idaho and northern Oregon.

3.7.1.1.2 Pasco Basin

The Pasco Basin is a depression in the lower part of the Columbia Basin. Geographically, the ridges surrounding the Monument and vicinity define this smaller basin; the basin is bounded by the Saddle Mountains to the north, Naneum Ridge to the west, the Rattlesnake Hills to the south, and the Palouse Slope to the east—generally the area north of where the Snake River flows into the Columbia River. These ridges surrounding the Pasco Basin are the result of tectonic forces. The Pasco Basin is filled with Ringold sediment from the ancestral Columbia River and sediment left by the Missoula Floods. The Hanford Site comprises the southern portion of the Pasco Basin, occupying over 586 square miles.

3.7.1.2 Tectonic Forces

After the lava flows had cooled and hardened, the earth's tectonic forces buckled and folded the basalt in the western Columbia Basin into generally east-west trending, long, narrow ridges called anticlines and intervening valleys called synclines. Collectively, geologists call this series of ridges and valleys in the western Columbia Basin the Yakima Fold Belt.

3.7.1.3 Ancestral Columbia River

The ancestral Columbia River repeatedly changed its course over the past fifteen million years and left deposits of gravel, sand, silt and clay (Tallman et al. 1981; Reidel et al. 1994). The deposits were the result of the ancestral river's growing restriction in the low areas of the Pasco Basin and lower Yakima Valley as the rising ridges of basalt grew. These processes changed the course of the Columbia River from a southerly direction (toward Yakima and Goldendale) to an easterly direction (toward Wallula Gap) and left behind the Ringold Formation (Fecht et al. 1987). Later, regional uplift in the western United States caused the river to cut through its own earlier deposits (the Ringold Formation), exposing the Monument's signature White Bluffs.

Today the Columbia River continues its erosion. The force that first exposed the White Bluffs is now wearing away its base. Groundwater, along with irrigation water seeping into the ground from northeast of the bluffs, makes them unstable. The result is the White Bluffs are sliding and sloughing into the Columbia River, giving back its ancestral deposits.

3.7.1.4 Ice Age Floods

The last major geologic event to shape the Monument were the Ice Age Floods. During the freezes and thaws that occurred in the last Ice Age—the Wisconsin—ice dams formed and failed across several river systems in the Northwest. The largest and most frequent floods—and the ones with the greatest impact to the interior Columbia Basin—came from glacial Lake Missoula in northwestern Montana, where ice dams across the Clark Fork River formed and failed many times, each time releasing a wall of water that surged southwest through the Columbia Basin, inundating most of the Monument several hundred feet deep.[72] However, smaller floods may have escaped down-valley from glacial lakes Clark and Columbia along the northern margin of the Columbia Basin (Waitt 1980) or down the Snake River from glacial Lake Bonneville (Malde 1968).

The Ice Age Floods began as early as one million years ago (Bjornstad et al. 2001), with the most recent occurring around 13,000-15,000 years ago. The Ice Age Floods inundated the Monument dozens—if not hundreds—of times. The floods affected the landscape in different ways. As the water moved across eastern Washington, it eroded the basalt, forming channels of barren rocky land referred to as the channeled scabland. At other localities, such as away from the main flood channels, the water deposited massive bars of sand and gravel in only a few

[72] The floods are of such national interest that the NPS is currently in the process of establishing the Ice Age Floods Trail, which will link together existing local, state and federally sites, facilities and attractions into a "partnership" park that can be driven from point to point to tell the story of the floods and their impact on the Pacific Northwest. To find out more, please visit www.nps.gov/iceagefloods/.

days. Where the water ponded behind obstacles such as Wallula Gap, it left behind deposits of sand and silt known as the Touchet Beds.

When the floodwaters entered the Pasco Basin, they quickly became impounded behind solid basalt in the Wallula Gap, which was too restrictive for the volume of water involved. This temporary, reoccurring hydraulically dammed lake is known as Lake Lewis. Lake Lewis is estimated to have had a surface area of approximately 4,500 square miles and to have reached a depth of about 900 feet. In the Monument, the elevation of the lake level at times rose to 1,200 feet above sea level, which corresponds to the 1200 Foot Road near the toe of Rattlesnake Mountain. The reoccurring lake is estimated to have lasted only a week or less (O'Connor and Baker 1992).

Since the end of the Missoula Floods, winds have reworked the deposits of sand and silt left behind, shifting them into dune sands in the lower elevations and loess (windblown silt) around the margins of the Pasco Basin. Anchoring vegetation has stabilized many sand dunes. Where human activity has disturbed this vegetation, dunes have been reactivated. More recently, dunes have been reactivated by the removal of vegetation resulting from the 24 Command Fire (June-July 2000).

3.7.2 Landmass Elements

The Hanford Site today is a composite of what the lava flows, tectonic forces, river changes, and Missoula Floods of long ago left behind and the winds have since reshaped. The resulting landmass elements that affect, and are affected by, activities in the Monument are its physical and structural characteristics, the strata and structure of its rocks, and its potential for earthquakes.

3.7.2.1 Physical and Structural Characteristics

The Monument is basically defined by the Palouse Slope and Yakima Fold Belt. The rock of the Palouse Slope dips gently toward the central Columbia Basin and exhibits relatively mild structural deformation. A wedge of Columbia River basalt underlies the Palouse Slope, thinning gradually toward the east and north and lapping onto the adjacent highlands.

The Yakima Fold Belt is the name collectively given to all the ridges formed from the basaltic lava flows that are found in the central and western parts of the Columbia Basin. They are a result of tectonic forces compressing the basaltic lava flows and overlying sediment into a series of anticlines (ridges) and synclines (valleys). The five main ridges and valleys on the Monument are described below.

- The Saddle Mountains are the ridge that forms the northern boundary of the Pasco Basin and Monument. The Saddle Mountains are an east-west ridge about sixty-eight miles long and three miles wide.

- The Wahluke Slope is on the north side of the Columbia River. The Wahluke Slope is the trough (syncline) of basalt between the Saddle Mountains and Umtanum Ridge.

- Umtanum Ridge is the ridge that makes up the south boundary of the Wahluke Slope.

- The Rattlesnake Hills-Rattlesnake Mountain lie south and west of the Monument and are also the result of a fold of arched rock layers. The highest of the hills, Rattlesnake Mountain, reaches an elevation of 3,660 feet above mean sea level, making it the highest elevation in the area.

- The Cold Creek syncline is the folded trough of rock that lies between Umtanum Ridge and Yakima Ridge. The Yakima Ridge is one of the anticlines of the Yakima Fold Belt. The Cold Creek Bar, a deposit of Missoula Floods sediment, lies in this area along the northwest boundary.

3.7.2.2 Rock Strata and Structure

Beneath the Monument, the bedrock formation comprises a minimum of 100 basalt flows with a combined thickness of almost 13,000 feet (DOE 1988), all part of the Columbia River Basalt Group.

To organize the many deposits of basalt into a consistent nomenclature, geologists have named and grouped them based on their properties. The basalt deposit closest to the surface on the Monument, and therefore the one most often referred to, is the Saddle Mountains Basalt. The Saddle Mountains Basalt consists of ten distinct basaltic lava deposits (referred to as *members*). The most recent basalt flow underlying most of the Monument is called the Elephant Mountain Member of the Saddle Mountains Basalt.

In addition to basalt, the Monument also has sedimentary formations. One of the sedimentary formation on the Monument is found between the basaltic lavas and is called the Ellensburg Formation. However, the majority of the sediment is above the basalt in a stacked column with the Ringold Formation on the bottom, overlain by the Cold Creek Unit, and topped with a formation not formally named but called the Hanford Formation; these sediments overlie the Columbia River Basalt Group. The formations that comprise the stacked column are primarily exposed in lower elevation areas around the Monument, such as at the White Bluffs.

3.7.2.2.1 Ellensburg Formation

The Ellensburg Formation is the name applied to all sediment that is found interbedded with the Columbia River Basalt Group. The Ellensburg Formation formed as long as seventeen million years ago, although the youngest portion on the Monument may have formed as recently as eight million years ago. The Ellensburg Formation was created when volcanic rock and sediment of eroded volcanic rock from the Cascade Range and Rocky Mountains interfingered with the basalt of the Columbia River Basalt Group (Swanson et al. 1979). The thickest accumulations of the Ellensburg Formation lie along the western margin of the Columbia Basin. While deposition along the western margin was primarily from volcanic debris flows and related stream and sheet floods, no volcanic debris flows have been identified on the Monument (Reidel et al. 1994). Volcanic rock formed from falling ash (tuff) is the dominant material in the Monument portion of the Ellensburg Formation. The Ellensburg Formation is exposed along the ridges of the Yakima Fold Belt.

3.7.2.2.2 Ringold Formation

The Ringold Formation formed between eight and three million years ago when the ancestral Columbia River left deposits of gravel, sand, silt and clay (Tallman et al. 1981; DOE 1988; Lindsey 1996).[73] Although exposures of the Ringold Formation are limited to the White Bluffs within the Monument, extensive data on the Ringold Formation are available from boreholes. The Ringold Formation on the Monument is over 600 feet thick. The subsurface sediment next to the basalt bedrock is dominated by gravel and forms most of the lower half of the Ringold Formation. The middle part of the Ringold Formation is dominated by sand deposits. Lake deposits dominate the upper layer of the Ringold Formation (DOE 1988).

3.7.2.2.3 Cold Creek Unit

The Cold Creek Unit includes all material underlying the Hanford Formation and overlying the Ringold Formation (DOE 1988) and is found locally in the Cold Creek syncline. Distribution of the Cold Creek Unit depends in part on erosion of the underlying Ringold Formation and post-depositional erosion by the Missoula Floods (Slate 1996). The Cold Creek Unit distinguishes itself from the Hanford and Ringold Formations because it exhibits a time when the Ringold Formation was being eroded and very little was being deposited. Early during the Cold Creek interval, the Columbia River flowed through various channels between Umtanum Ridge and Gable Mountain, eroding a wide swath to the south across the middle of the Hanford Site before gradually shifting course to the east, where it continued to erode the eastern half of

[73] There is some debate if these sediments are actually from an ancestral Columbia River. Other suggested sources include the Clearwater/Salmon drainage system in Idaho or the Pend Oreille River in northeastern Washington.

the Hanford Site. At this time the uppermost Ringold Formation was removed from much of the Pasco Basin, and the development of White Bluffs began.

The Cold Creek Unit can be further divided into lower and upper segments. Lower Cold Creek Unit sediments include a series of extensively weathered, carbonate-rich, cemented, ancient soil profiles called paleosols. Wind-derived sediments and minor fine-grained stream deposits were deposited on the Lower Cold Creek Unit, resulting in a wide variety of sediments that are called the Upper Cold Creek Unit. The thickness and type of sediment was highly variable due to several localized environments. Because of their fine-grained and/or cemented nature, the Upper and Lower Cold Creek Units play important roles in the movement of water and contaminants through the vadose zone (DOE 1988).

The thickness of the Cold Creek deposits ranges from zero to sixty-six feet. The top of the Cold Creek Unit is composed of a very hard rock that formed as precipitation evaporated and left behind minerals, forming what geologists call *caliche* or *hardpan*.

3.7.2.2.4 Hanford Formation

The Hanford Formation is the informal name for the rock strata and structure that lie on top of the Cold Creek Unit above the Ringold Formation. As the Missoula floods inundated the Monument and then receded, massive deposits were left behind, blanket low-lying areas over most of the Monument and are informally called the Hanford Formation. Gravel, sand and silt dominate the Hanford Formation (Reidel et al. 1992); the relative proportion of each material at any given location is related to its distance from main high-energy flows at the time of deposition (DOE 1988).

3.7.2.2.5 Clastic Dikes

Clastic dikes are fissures filled with sand, silt, clay and minor coarser debris. They are commonly associated with, but not restricted to, Missoula Floods deposits in the Columbia Basin. Many dikes occur as sharp-walled, near-vertical tabular bodies filled with multiple layers of unconsolidated sediment. Thin clay/silt linings separate the margins of dikes and internal layers (Fecht et al. 1999). Dikes vary in width from less than 0.039 inches to more than 6.5 feet and in length from less than 3.0 feet to more than 164.0 feet (Fecht et al. 1999).

3.7.2.3 Surface Soils

Soils on the Monument have not been fully mapped; the area north of the Columbia River still needs considerable cataloging work. However, the work completed to date has identified and

described the following fifteen different soil types, varying from sand to silty and sandy loam, on the Hanford Site (Hajek 1966).

1) *Ritzville silt loam.* This is a dark-colored silt loam soil found midway up the slopes of the Rattlesnake Hills. It develops under bunch grass from silty wind-laid deposits mixed with small amounts of volcanic ash. Characteristically more than sixty inches deep, Ritzville silt loam may be separated by bedrock occurring between thirty and sixty inches.

2) *Rupert sand.* This is one of the most extensive soil types on the Hanford Site. It develops under grass, sagebrush, and hopsage in coarse sandy alluvial deposits mantled by wind-blown sand. Rupert sand is a brown to grayish-brown coarse sand, grading to dark grayish-brown at a depth of thirty-five inches. Rupert sand forms hummocky terraces and dune-like ridges.

3) *Hezel sand.* Similar to Rupert sand, Hezel sand is a laminated, grayish-brown, strongly calcareous silt loam subsoil usually encountered within thirty-nine inches of the surface. Where it occurs as a surface soil, it is very dark brown. Hezel sand is formed in wind-blown sands that mantle lake-laid sediment.

4) *Koehler sand.* Koehler sand is similar to other sandy soils found on the Hanford Site, but it differs in that it mantles a lime-silica cemented hardpan layer. It develops in a wind-blown sand mantle and exhibits a very dark grayish-brown surface layer, somewhat darker than Rupert sand. Its calcareous subsoil is usually dark grayish-brown at about eighteen inches.

5) *Burbank loamy sand.* This is a dark-colored, coarse-textured soil underlain by gravel. Its surface soil is usually about sixteen inches thick but may be as much as thirty inches. The gravel content of its subsoil ranges from 20% to 80%.

6) *Ephrata sandy loam.* Ephrata sandy loam is found on level topography on the Hanford Site. Its surface is darkly colored, and its subsoil is a dark grayish-brown, medium-textured soil underlain by gravelly material that may continue for many feet.

7) *Lickskillet silt loam.* This soil is found on the ridge slopes of the Rattlesnake Hills and on slopes higher than 2,509 feet. It is similar to Kiona silt loam except the surface soil is darker. Lickskillet silt loam is shallow over basalt bedrock and exhibits numerous basalt fragments throughout the profile.

8) *Ephrata stony loam.* Ephrata stony loam is similar to Ephrata sandy loam. It differs in that many large hummocky ridges comprise debris released from melting glaciers. Areas of Ephrata stony loam located between hummocks contain numerous boulders several feet in diameter.

9) *Pasco silt loam.* Pasco silt loam is a poorly drained, very dark grayish-brown soil formed in recently deposited alluvial material. Its subsoil is variable, consisting of stratified layers. Only small areas of Pasco silt loam are found on the Hanford Site, all in low areas adjacent to the Columbia River.

10) *Kiona silt loam.* Kiona silt loam is found on steep slopes and ridges. Its surface soil is very dark grayish-brown and about four inches thick. Its subsoil is dark brown and contains basalt fragments twelve inches and larger in diameter. Many basalt fragments are found in its surface layer, and basalt rock outcrops are often present. Kiona silt loam is a shallow, stony soil normally occurring in association with Ritzville and Warden soils.

11) *Warden silt loam.* This is a dark grayish-brown soil with a surface layer usually around nine inches thick. Its silt loam subsoil becomes strongly calcareous at about twenty inches and becomes lighter colored. Granitic boulders are found in many areas. Warden silt loam is usually deeper than sixty inches.

12) *Scootney stony silt loam.* Scootney stony silt loam develops along the north slope of the Rattlesnake Hills and is usually confined to floors of narrow draws or small fan-shaped areas where draws open onto plains. It is severely eroded, with numerous basaltic boulders and fragments exposed. The surface soil is usually dark grayish-brown grading to grayish-brown within the subsoil.

13) *Esquatzel silt loam.* Esquatzel silt loam is a deep dark-brown soil, forming in recent alluvium derived from loess and lake sediment. Its subsoil grades to dark grayish-brown in many areas, but the color and texture of the subsoil is variable because of the stratified nature of the alluvial deposits.

14) *Riverwash.* Riverwash comprises wet, periodically flooded areas of sand, gravel and boulder deposits that make up overflowed islands in the Columbia River and adjacent land.

15) *Dune sand.* Dune sand is a miscellaneous land type that consists of hills or ridges of sand-sized particles drifted and piled up by wind. These dunes are either actively shifted or so recently fixed or stabilized that no soil layers have developed.

3.7.3 Seismic Activity

The recorded history of earthquakes in the Pacific Northwest dates from about 1840; the early record is probably incomplete because the region was sparsely populated (the early history is based on human perceptions of earthquakes). Seismograph networks did not start providing

earthquake locations and magnitudes in the Northwest until about 1960. A comprehensive network of seismic stations that provides accurate locating information for most earthquakes of magnitude greater than 2.5 (Richter Scale) was not installed in eastern Washington until 1969.

While large earthquakes (magnitude 7.0 or greater) occur in the Pacific Northwest, they are rare in the seismically stable interior Columbia Basin. A significant large earthquake (estimated at magnitude 7.4) did occur in north-central Washington in 1872; evidence of landslides near Lake Chelan suggests a location near there. The largest known earthquake in the Columbia Plateau occurred in 1936 near Milton-Freewater, Oregon. This earthquake had a magnitude of 5.75 and was followed by a number of aftershocks indicating a northeast-trending fault plane. Other earthquakes with magnitudes of 5.0 or greater occurred along the boundaries of the Columbia Plateau in a cluster near Lake Chelan in 1872 and extending into the northern Cascade Range, in northern Idaho and Washington, and along the boundary between the western Columbia Plateau and the Cascade Range. Other large earthquakes in the Columbia Basin occurred in the Milton-Freewater, Oregon, region in 1921; near Yakima, Washington, in 1892; and near Umatilla, Oregon, in 1893. In the central portion of the Columbia Plateau, the largest earthquakes near the Monument occurred in 1918 and 1973. These two events had magnitudes of 4.4 and were located north of the Monument near Othello.

Small earthquakes often occur in spatial and temporal clusters in the central Columbia Plateau and are termed *earthquake swarms*. The region north and east of the Monument is a region of concentrated earthquake swarm activity, but earthquake swarms have also occurred in several locations within the Monument. The frequency of earthquakes in a swarm tends to gradually increase and decay with no one outstanding large event within the sequence. Roughly 90% of the earthquakes in swarms have magnitudes of 2.0 or less. These earthquake swarms generally occur at shallow depths, with 75% of the events located at depths of less than 2.5 miles. Each earthquake swarm typically lasts several weeks to months and consists of several to 100 or more earthquakes. The locations are typically clustered in an area from three to six miles in lateral dimension. Detailed locations of swarm earthquakes indicate that the events occur on fault planes of variable orientation rather than on a single, through-going fault plane.

Although rare, earthquakes in the central Columbia Plateau do occur to depths of about eighteen miles. These deeper earthquakes are less clustered and occur more often as single, isolated events. Based on seismic refraction surveys, the shallow earthquake swarms are occurring in the Columbia River Basalts, and the deeper earthquakes are occurring in crustal layers below the basalts. The pattern of seismicity in the central Columbia Plateau suggests an association of the shallow swarm activity with the east-west oriented Saddle Mountains anticline.

3.7.4 White Bluffs Landslides

The White Bluffs along the Columbia River are the signature visual feature of the Monument; unfortunately, they are also the most endangered feature. Over the past two decades, the natural erosion rate has been greatly accelerated, in all likelihood due to irrigation waters from the Central Columbia Basin Irrigation Project saturating soils that are naturally unstable. The sediments comprising the White Bluffs are from an ancestral river and are nearly two miles wide within the Monument. These sediments are unconsolidated silts and sands, which promote the percolation of water until an impermeable stratum captures the flow and causes it to seep out, causing extreme slope instability, deep fissures, and water-filled pockets.

In 2003, a study/consolidation of existing information was funded through the Center For Conflict Resolution. Triangle Associates, a Seattle-based consulting firm, interviewed experts in the field, elected officials, agricultural and environmental interests, state and federal agency personnel, Native American representatives, and others in an effort to determine the extent of the problem and the concerns of those affected by the sloughing. Triangle Associates also conducted an extensive literature review on the landslides and held three workshops on geology, groundwater and irrigated agriculture, and the impacts of the landslides to fish and aquatic and riparian habitats. All of this information was consolidated into an assessment report published in March 2003. Of singular importance was the conclusion that the geologic and hydrologic processes at work are poorly understood and that additional study is needed to adequately address the problem. The USGS has had a proposal pending for this additional research.

Apart from the obvious damage to a unique geologic feature, sloughing of the White Bluffs has several other impacts. Although exposure of the Ringold Formation and fossil localities is a useful aspect of the landslide for geologists and paleontologists, these resources are being lost to the river with every landslide. While all the slides are detrimental, the most prominent and controversial slide is the one above Locke Island. Here, continual hydration of the fragile sediments has resulted in the slide of an estimated twelve million cubic yards of sediment into the modern-day river channel. The movement of the landslide into the river has forced the river to shift its flow, eating into Locke Island and eroding cultural sites on the island. Other impacts from the landslides include siltation of salmon redds. Sloughing threatens the rare White Bluffs bladderpod, which grows along the cliff edges. The Savage Island slide (ten million cubic yards) is located near the Ringold area, an area of heavy public use, raising concerns over public safety due to unstable soils and deep, water-filled pockets.

3.7.5 Special Geologic Features of the Monument

Several unique or special geologic features are found on the Monument. World-renowned bedrock basalt flows have ridge features (known as *wrinkle ridges*) analogous to those on Mars and possibly other portions of the solar system. Sand dunes are located in various parts of the

Monument, the result of reworked Pleistocene flood deposits being driven by high winds in the Columbia Basin. The dunes on the Monument are predominantly parabolic, although barchan and transverse dunes appear. The most notable dune field, located in the southeast corner of the Monument, was specifically included as part of the Monument in order to protect this unique geological phenomenon. These active, primarily unvegetated dunes range from ten to sixteen feet high, can cover several hundred acres, and migrate in an east to northeast direction at a rate of eight to fifteen feet per year. Various other dunes can be identified within the Monument landscape. The top of the White Bluffs have a field with both migrating dunes on the bluff edge and stabilized dunes to the east. Smaller dune areas are located within the ALE. Movement and stability varies depending on natural factors (fire, wind, vegetation) and human intervention (surface disturbance). For example, the 2000 fire in the ALE denuded the area, reactivating dunes which previously were protected from erosion by vegetative cover; it is likely that the large Milepost 17 and Wahtoma Fires of 2007 will have a similar effect on ALE sand dunes.

In addition to leaving behind sand to form dunes, the Missoula Floods contributed several other geologic features to the Monument. Glacial erratics are non-indigenous rocks, such as granitics, gneiss, quartzite, argillite and schist, carried on ice rafts by the raging flood waters from as far away as Montana and Idaho. These rocks, often reaching boulder size, are scattered around the Monument, up to the highest lake levels reached, about 1,200 feet on the flanks of Rattlesnake Mountain (Bjornstad et al. 2003; Bjornstad 2006a). Other unique features connected to the floods are bergmounds, giant ripple marks, and gravel bars. All of these features are considered slack water deposits that occur when turbulent water action subsides. The southwestern end of the Monument contains such topographic high points because the northern base of Rattlesnake Mountain was the periphery of the lake. The ripples and gravel bars are formed primarily of sand and gravel carried along by the sheer power of the flood waters. As the water was slowed by natural features, such as the Wallula Gap, or the floods naturally receded, the scouring power of the water was reduced, and the sands and gravels were deposited out. Like erratics, bergmounds were left when icebergs rafted lithic material from other areas. Bergmounds are typically composed of small gravels of the same materials as erratics but are found at slightly lower elevations, usually below 1,000 feet (Bjornstad et al. 2003; Bjornstad 2006a). It is believed that bergmounds were formed when larger icebergs grounded themselves at the shallow edges of the lake as the flood waters withdrew. Being larger and deeper, they hit bottom sooner than those carrying the erratic boulders. Once grounded, the ice melted, depositing the iceberg's load of sand and gravel in place.

3.8 Paleontological Resources

One of the major landmarks within the Monument, the White Bluffs, is the upper component of the Ringold Formation, which dates to between three and eight million years ago. The formation is composed of a 1,000-foot thick deposit of interbedded lacustrine and fluvial silts, sands and

conglomerate, with some paleosol remnants. The source of the sediments is unknown, although ideas about their origination include the Clearwater/Salmon drainage system from Idaho, the Pend Oreille River in northeastern Washington, and an ancestral Columbia River.

Regional uplifting about three million years ago resulted in the present upper Columbia River down cutting through about 600 feet of the Ringold Formation to its present elevation of 300 feet. This last erosional event has exposed a multitude of vertebrate and some invertebrate fossils in the Ringold Formation. Of particular note are rhinoceros and anadromous salmonid fossils from the late Miocene.

The subsequent White Bluffs component of the formation contains even more fossils, including twenty-seven species of mammals alone. Among the fauna found are rodents, lizards, frogs, turtles, fish, rabbits, bears, canids, cats, ground sloths, peccaries, deer, mastodons, camels, horses and zebras. Of particular interest is the nature of the fish species found (primarily warm-water species such as catfish and sunfish) and those not found (salmonids), supporting the theory of two separate river systems during the Miocene. The river system responsible for the White Bluffs deposit may not have been connected to the Pacific Ocean, hence the lack of anadromous fish remains.

In addition to the fossils found in the White Bluffs, petrified wood can be found in the Saddle Mountains, Umtanum Ridge, and Yakima Ridge. Scatterings of petrified wood can also be found in the Dry Creek and Cold Creek drainages. It should be noted that the collection of fossils is prohibited on the Monument.

3.9 Plants and Plant Communities

The term *plant communities* refers to plant species that coexist in generally recognizable groups. Plant communities are important indicators of biodiversity because they form the biotic component of the habitat used by other organisms. Plant community surveys were conducted as part of the biodiversity inventory over the entire Hanford Site, excluding only areas off-limits because of radiological hazards.

Plant communities are classified at one or more of three levels.

- Potential plant community type.
- Vegetation mapping unit.
- Cover type.

Potential plant community types reflect the plant species that are projected to dominate an undisturbed site over time, based on climate and other abiotic factors present at the site. A potential plant community type generally is identified by both its dominant shrub (when present) and dominant grass (or grasses when shrubs are absent).

Vegetation mapping units identify the existing vegetation of an area. Vegetation mapping unit types are grouped into more generalized cover types. The conservation significance of each area mapped is determined, using criteria developed by the WNHP, by an assessment (ranking) of ecological condition, size and the surrounding landscape. Vegetation mapping units that meet minimum biodiversity standards are designated "element occurrences" and will be entered into the WNHP tracking system for significant state- and region-wide elements of biodiversity. (As used here, an *element* is an entire biological system, such as a plant community or a wetland ecosystem.) Cover types are the plant communities that currently exist on site.

The diversity and vast size of native plant communities found in the Monument and Central Hanford is unmatched in the ecoregion. Biodiversity inventory personnel and the WNHP identified a total of seventeen terrestrial potential plant community types (or elements) that occur as forty-eight separate element occurrences in the Wahluke, Saddle Mountain, and ALE Units (see Maps 17 and 18). Only three of the seventeen identified terrestrial plant community elements are common to the ALE, Wahluke Slope, and Central Hanford. The terrestrial element occurrences cover approximately 90,000 acres, occupying significant amounts of the ALE and Wahluke Slope and lesser, though substantial, acreages within Central Hanford.

The condition and size of the big sagebrush/bluebunch wheatgrass community in the ALE and the bitterbrush/Indian ricegrass and big sagebrush/needle-and-thread dune complex occurrences on the Wahluke Slope and Central Hanford are extensive and of particular regional importance. Additionally, the inventory identified six riparian wetland communities along the southern (western) shore of the Hanford Reach as element occurrences. Such communities are rare elsewhere along a river system that is otherwise a series of lakes.

Although Daubenmire (1970) placed the Hanford Site within the big sagebrush/bluebunch wheatgrass vegetation zone, the site spans a wide climatic and edaphic (soil) range, resulting in equally diverse vegetation. Much of Central Hanford and the Wahluke Slope is drier than typical big sagebrush/bluebunch areas, receiving six to eight inches or less of precipitation per year and having sandy or coarse textured soils. Under these conditions, bluebunch wheatgrass grows poorly or not at all. At the other extreme, the more cool and moist (mesic) conditions with loamy soil at high elevation on Rattlesnake Ridge are typical of the three-tip sagebrush/Idaho fescue zone (Daubenmire 1970). This range of climatic variation, combined with equally diverse geologic and soil conditions, has produced a remarkable diversity of potential plant community types. Thus, while the big sagebrush/bluebunch wheatgrass community represents the climatic climax plant community expected to occur in the area (i.e., the plant community predicted to occur on deep loamy soils in areas with a gentle slope, moderate drainage, and average chemical characteristics), other community types dominate over

much of Central Hanford, the Wahluke Slope, and portions of the ALE. For the most part these are edaphic (soil-related) climax communities, dominated in the grass layer by needle-and-thread, Indian ricegrass, and Sandberg's bluegrass (more the result of low precipitation than soil type in some cases).

Natural plant communities have been altered by Euro-American activities, resulting in the proliferation of non-native species. A total of 727 species, representing ninety families of vascular plants, have been recorded for the Hanford Site (Sackschewsky and Downs 2001). Of this total, 179 are non-native species. Cheatgrass is the dominant non-native species. It is an aggressive colonizer and has become well established across the Hanford Site (Rickard and Rogers 1983). Hanford Site plants are adapted to low annual precipitation (6.8 inches), low water-holding capacity of the rooting substrate (sand), dry summers, and cold winters—situations that are ideal for cheatgrass.

Before settlement, the Hanford Site landscape lacked trees, although the Columbia River shoreline and natural springs supported a few scattered cottonwoods and willows. Homesteaders planted trees in association with agricultural areas. Shade and ornamental trees were also planted around former military installations and industrial areas in the Hanford Site. Currently, approximately twenty-three species of trees occur in the Monument. The most common species are black locust, Russian olive, cottonwood, willow, mulberry, sycamore and poplar. Many of these non-native species are aggressive colonizers and have become established along the Columbia River (e.g., mulberry, plains cottonwood, poplar, Russian olive), serving as a functional component of the riparian zone. For example, trees provide nesting habitat and cover for many species of mammals and birds. The 24 Command Fire negatively affected many shrubs and trees associated with streams and springs in the ALE; however, these species are recovering rapidly (see Map 19).

TNC (Soll et al. 1999) conducted plant surveys in the ALE, Wahluke Slope, Central Hanford, and riparian communities along the Columbia River shoreline from 1994 through 1997. These surveys tentatively identified thirty potential terrestrial plant communities. Designation as a potential community indicates the type of community that would exist in an area if it were free of disturbance. In addition to characterizing potential plant communities, TNC found 112 populations/occurrences of twenty-eight rare plant taxa in the Hanford Site (Soll et al. 1999). When combined with observations preceding the 1994-1999 inventory, a total of 127 populations of thirty rare plant species have been documented in the Hanford Site.

Range fires that historically burned through the area during the summers eliminate fire intolerant species (e.g., big sagebrush) and allow more opportunistic and fire-resistant species a chance to become established. Recovery of burned areas is a slow process, and it will be many years before areas will reestablish the natural component of vegetation and associated animal life.

3.9.1 General Description by Management Area

Each existing management area in the Monument is characterized by a unique assemblage of plant communities. Although there are commonalties among management areas, each area has features or combinations of features not found on the others. A total of twenty-one different upland plant community types and three found in riparian areas or along the Hanford Reach, ranging in total coverage from two to 84,000 acres, have been identified. A total of 91,637 acres of seventeen different types qualify as element occurrences.

3.9.1.1 ALE

One human-made and eighteen natural plant communities, ranging in size from two to 29,360 acres, have been identified and mapped in the ALE. The nineteen potential communities were composed of twenty-eight cover types. A total of 45,570 acres are in an ecological condition suitable for listing as element occurrences.

In general, ecological condition in the ALE improves with increasing elevation and more northerly aspects; the ALE has the largest expanses of loamy soils and north-facing aspects in the Monument. Plant communities above roughly 900 feet in elevation support the largest contiguous expanses of high-quality shrub-steppe in the Monument and the single largest element occurrence of high-quality bluebunch wheatgrass grassland in the Columbia Basin. Big sagebrush/bluebunch wheatgrass and three-tip sagebrush/bunchgrass communities cover more than 40,000 unbroken acres. The crest of Rattlesnake Mountain supports high-quality, low-growing lithosol communities on the shallow rocky soil. While also ecologically valuable, the lower elevation areas are dominated by generally lower-quality big sagebrush/Sandberg's bluegrass and big sagebrush/cheatgrass. Element occurrences of winterfat/Sandberg's bluegrass, black greasewood/alkali saltgrass, and a small occurrence of bitterbrush/dune complex at lower elevations add to the diversity and uniqueness of the site.

Two major spring systems, Snively and Rattlesnake, cross the western half of the site. These provide important aquatic and riparian habitats in an otherwise arid landscape.

The most ecologically important element occurrences in the ALE are the large big sagebrush/ bluebunch wheatgrass and three-tip sagebrush/bluebunch wheatgrass or Idaho fescue communities that cover nearly 40,000 contiguous acres on Rattlesnake Mountain. Other element occurrences of note include more than 1,000 acres of winterfat/Sandberg's bluegrass on the lower slopes of Rattlesnake Mountain, the big sagebrush/Sandberg's bluegrass occurrences on the flats in the Dry and Cold Creek Valleys, the willow riparian complex associated with the springs and creeks, and a degraded but uncommon example of black greasewood/saltgrass.

3.9.1.2 Wahluke Slope (Wahluke and Saddle Mountain Units)

The Wahluke Slope supports forty cover types of sixteen unique potential plant communities, including two resulting from human activities. Total coverage of each plant community ranges from a low of four to a high of nearly 59,000 acres. Six types found on the Wahluke Slope do not occur to any great extent in the ALE. A total of 15,595 acres qualify as element occurrences, including representations of four types not found in the ALE.

Except on the predominantly south-facing slope of the Saddle Mountains, the Wahluke Slope is dominated by sandier soils than the ALE. Vegetation spans a continuum from open sand dunes with sparse vegetation above the White Bluffs to loamy soil with big sagebrush communities high on the Saddle Mountain crest. There are no natural springs or lakes on the Wahluke Slope, but irrigation runoff has created several large, artificial wetlands that diversify the habitats available to wildlife in this area.

A human use history—more intense than on the ALE—that includes farming, livestock grazing, and military training, has left its mark on the Wahluke Slope in the form of large areas dominated by cheatgrass. The Wahluke Slope contains, and buffers from surrounding agriculture, the Hanford Reach, including the spectacular, unique and fragile White Bluffs with their unique caliche soils. (The vegetation of the Hanford Reach is discussed separately below.) The most notable plant communities on the Wahluke Slope are large expanses of big sagebrush/needle-and-thread grass (5,681 acres), antelope bitterbrush/Indian ricegrass dune complex (9,314 acres), and spiny hopsage/Sandberg's bluegrass (1,161 acres) found on the flats above the White Bluffs. Large areas of big sagebrush/Sandberg's bluegrass on the lower slopes of the Saddle Mountains are also noteworthy.

Significant element occurrences exist within each of the community types. Because these types generally occur on potentially arable soils, extensive occurrences have been converted to agricultural uses almost everywhere else they once existed.

3.9.1.3 Riverlands/McGee Ranch

In 1996, additional inventory work was conducted on that portion of the Hanford Site that is located to the north and west of State Route 24 and south of the Columbia River. This approximately 8,970-acre area—formerly designated the McGee Ranch/Riverlands Unit—is dominated by the eastern portion of Umtanum Ridge. Umtanum Ridge is of particular conservation interest because, of all the east-west corridors in central Washington, it spans the widest variety of climate and vegetation zones. Umtanum Ridge runs west from the Central Plateau of the Hanford Site, through the Yakima Training Center and state-managed wildlife areas, to the foothills of the Cascade Mountains. It is a key physiographic feature that links the

best remaining examples of shrub-steppe habitat in the state of Washington. This area also helps connect the ALE to the Columbia River and Wahluke Slope.

The condition of the plant communities in the Riverlands ranges from poor to good. The predominant potential plant community types present include big sagebrush/bluebunch wheatgrass, big sagebrush/needle-and-thread, big sagebrush/Sandberg's bluegrass, and stiff sagebrush/Sandberg's bluegrass. Most of the communities in poorer condition are associated with the gentle south-facing slopes of Umtanum Ridge that had been heavily grazed and patchily burned in the past. Two areas qualified as element occurrences. The steep slopes on the north side of Umtanum Ridge support a big sagebrush/bluebunch wheatgrass potential plant community type in good condition. In the midst of this element occurrence, there is a second community, a stiff sagebrush/Sandberg's bluegrass potential plant community type that also is in good condition in places. The status of these areas needs to be reevaluated because, after the inventory was completed, a fire originating from the Yakima Training Center burned much of the McGee Ranch/Riverlands in late August 1996.

3.9.1.4 Hanford Reach

Eight riparian and three island upland community/cover types are identified in the Hanford Reach, including six occurrences of significant low-elevation wetlands. The assemblage of plant species changes from the river edge upward through the shoreline profile. The communities are clearly defined in some areas. In others, ecotones may be blurred due to hydrology, topography, overlapping habitat requirements, and susceptibility to invasion by weedy species. These factors combine to create shifting mosaics of species, most pronounced low in the riparian profile. Plant communities are identified to the degree practicable. Where dominant species are not confined to a specific zone, each zone is characterized by its physical features.

Although the Hanford Reach is free-flowing, changes in its hydrology from upstream dams have likely altered some riparian communities and substrates. For example, much of the substrate previously mapped as sand (ACOE 1976) is now cobble. Thus, some communities may reflect a transient state. Because data is lacking to describe successional pathways, only the existing vegetation is described.

Six areas along the south shore and islands of the river are identified as significant occurrences of Columbia Basin low-elevation riparian wetlands—China Bar, Islands 2-5, Locke Island, White Bluffs Slough, 100-F Area Slough, and the Hanford Town sites Slough. Although not all of these sites are pristine, such wetlands are of statewide conservation importance because most comparable sites have been permanently flooded by the reservoir system.

3.9.2 Microbiotic Crusts

Throughout much of the shrub-steppe region, a living crust covers some or all of the soil between plants. This soil crust—referred to as microbiotic, cryptobiotic, or cryptogamic—is composed of algae, fungi, lichens and mosses. Microbiotic soil crusts are especially well developed in relatively undisturbed areas, such as occur in portions of the Monument. More than ten species of organisms can be present on as little as 0.8 square-inches of soil. As a unit, these assemblages are often compact and fragile. Although the ecological role of the microbiotic crust is not well understood, it clearly plays an important role in shrub-steppe ecosystem functions by reducing erosion, contributing nitrogen and organic carbon to the soil, and increasing infiltration of precipitation into the soil. Intact crusts can also enhance native seedling establishment in arid ecosystems (St. Clair et al. 1984), and the presence of intact biological crusts may inhibit the establishment of cheatgrass and other invasive species (Belnap et al. 2001, Kaltenecker et al. 1999).

The presence of a biological soil crust can influence the surface hydrology of a site. In many sites, it appears that infiltration rates increase with the presence of a crust, although this depends on a number of factors, including soil type, crust composition, and climate.

Lichens, bryophytes, cyanobacteria and green algae in the crust fix atmospheric carbon, contributing to the overall productivity of a plant community. Free-living cyanobacteria and many lichens in the crust are capable of fixing atmospheric nitrogen, which is subsequently released into the soil and used by vascular plants and fungi, contributing to enhanced productivity (Belnap et al. 2001; Evans and Belnap 1999). In some cases, vascular plants that grow in areas of well-developed crust have higher accumulations of essential plant nutrients than in sites that lack a crust (Belnap et al. 2001; Ridenour and Calloway 1997).

Most biological soil crusts are fragile and readily disturbed, with susceptibility to disruption related in part to site factors such as soil type, local climate, and the vascular plant community (Belnap et al. 2001). Over the past century, most biological crusts in the Pacific Northwest have been heavily altered and sometimes destroyed by livestock, agricultural practices, wildfire, invasive species, and off-road vehicle use. There is evidence that the biological soil crusts in the Pacific Northwest, including those in the area of the Monument, evolved in low-disturbance environments, where impacts by large herbivores and fire were much less severe than at present.

An early study of microbiotic crust looked at seventeen sites representing a wide range of plant associations, ecological conditions, and soil types in the lower elevation portions of the Hanford Site. That study identified thirty soil lichen and eight moss species; three of the lichen species had not previously been described.

However, comparison with data from other studies conducted in shrub-steppe indicates that the Monument supports an even more diverse and unique crust flora. A recent study conducted in

cooperation with TNC biological diversity inventories found fifty-four lichen taxa growing as part of the terrestrial soil crust community. Thirty-six of these taxa have been identified to species, while the identifications of the remainder are conditional at present. Of these, four taxa have tentative species identifications and fourteen have been identified to the genus only. Twenty-six lichens are common and widespread to locally common across the Monument, and the remaining taxa are uncommon to rare.

In addition to the terrestrial lichens, at least twenty-six taxa of saxicolous lichens were collected growing on rock outcrops, rocks, or stones. Most collections of saxicolous lichens have been identified to genus only; five taxa are still of unknown identity. Not enough information is available to assess the distributions of saxicolous lichens.

Eleven lichen taxa are epiphytic on the bark of shrubs and trees. Most have been identified to genus, with species identification pending. Most of the epiphytic lichens appear to be relatively widespread, at least where sagebrush is present. Four lichen species are found on two substrata. *Lecanora muralis* and an unknown, *Xanthoria*-like lichen are both primarily saxicolous, but are also found on soil. *Physconia enteroxantha* is found commonly on both bark and soil, and *Candelaria concolor*, primarily epiphytic, is occasionally found on soil.

3.9.3 Upland Community Types

3.9.3.1 Big Sagebrush/Bluebunch Wheatgrass

This potential community type is characterized by big sagebrush, bluebunch wheatgrass, Sandberg's bluegrass, diverse forbs, and where relatively undisturbed, a robust microbiotic crust. As the climatic climax community, it is widespread in many (loamy) soil types, although frequently with a high cheatgrass cover. Where fire has recently burned, sagebrush is generally absent. Under more mesic conditions, Cusick's bluegrass can be a common component.

The ALE supports the largest expanse of this type in the Monument. It covers nearly 30,000 acres in a broad band between 900 feet and approximately 2,500 feet in elevation, much of it in excellent ecological condition. In fact, the element occurrence of this type in the ALE is the largest known example in the world.

The Wahluke Slope supports only small occurrences, mostly at high elevation on the Saddle Mountains or in other, mostly small, areas with loamy (versus sandy) soil. Over much of the Wahluke Slope, precipitation is too low and soils are too sandy for bluebunch wheatgrass. In some large areas with apparently appropriate soils and climate, this community type may have been replaced by the big sagebrush/cheatgrass type or big sagebrush/Sandberg's bluegrass type as a result of over-grazing and fire. Although it covers nearly 10,000 acres on Central Hanford,

this community type is limited in distribution to relatively deep soil areas on the north slope of Umtanum Ridge in the McGee Ranch/Riverlands Unit; to small areas mostly near basalt in the northern portion of Central Hanford; and to an area along the Columbia River on the eastern portion of the Monument. The latter occurrence represents an unusual sandy phase of the community type that is ecotonal with the big sagebrush/needle-and-thread potential plant community type. With the exception of the McGee Ranch/Riverlands Unit, which has an element occurrence on the north slope of Umtanum Ridge, at most locations the condition of the community ranges from poor to marginal, with marginally good conditions on the north-facing slopes and shallower soils of basalt areas.

3.9.3.2 Big Sagebrush/Sandberg's Bluegrass

It seems likely that in Washington, this plant community type is confined to locations too dry for bluebunch wheatgrass to become established and on soil that is finer textured than is typical for needle-and-thread types. It may also occur as a so-called *zootic* (literally, *from animals*) climax where grazing has eliminated larger, later-growing bunchgrasses. In general, in the Hanford Site a high cover of big sagebrush and low forb diversity is characteristic of this type. Spiny hopsage may occur, especially at drier sites, with cover ranging from widely scattered individuals to a few locations at which it was co-dominant with big sagebrush.

On the ALE, this type covers more than 9,000 acres, nearly all of it in two large patches in the northwest corner between Dry Creek and the Benson Ranch. Elevation ranges from about 700 feet to 1,000 feet. Condition ranges from poor to good, with some areas supporting relatively little cheatgrass and a continuous microbiotic crust. This plant community type also occurs in large areas of the Wahluke Slope, totaling more than 9,000 acres scattered around the site in four large patches. As with the ALE, condition varies with site history.

Within Central Hanford, this type occurs mostly south of Gable Mountain and areas farther to the west, where silt, rather than sand as at most lower elevations, dominates Pleistocene flood sediments (Gaylord and Stetler 1994). In these areas, recorded precipitation is the lowest of the Hanford Site (Hoitink and Burk 1995). Two areas qualify as element occurrences—a strip along a north-facing slope on the eastern end of Umtanum Ridge and an area south of Gable Mountain.

Although vegetation resembling this type exists over a large area, especially in Central Hanford, it is difficult to distinguish from degraded occurrences of other types in which the larger bunchgrass taxa have been eliminated by historic use and/or fire. Therefore, the possibility cannot be discounted that the big sagebrush/Sandberg's bluegrass potential plant community type is actually more widespread in Central Hanford than indicated here.

3.9.3.3 Big Sagebrush/Needle-and-Thread

This community is present in a range of soils, from those with a significant component of sand (sandy loam) to stabilized dunes. Big sagebrush is the dominant shrub, although bitterbrush commonly occurs at varying levels. Thickspike wheatgrass may occur in the understory with the needle-and-thread. Where it is intermixed with bluebunch wheatgrass, needle-and-thread grass is thought to increase with disturbance. In the Hanford Site, it is least abundant in the ALE where loamy soils generally predominate. It is limited there to small occurrences near the lower elevation boundary of the big sagebrush/bluebunch wheatgrass community.

Big sagebrush/needle-and-thread grass communities occur in several areas on the Wahluke Slope. The most prominent of these areas are: a large area along the eastern boundary, south of State Route 24, where much of the shrub cover has been eliminated by a recent fire; along the crest of the Saddle Mountains where it intergrades with big sagebrush/bluebunch wheatgrass; and above the White Bluffs in the southeastern corner of the site. Much of the now-degraded lower elevations on the Wahluke Slope probably supported this type before being converted to cheatgrass by grazing and fire. Although much of this community type has been degraded by grazing and fire, some areas retain significant native character. These include some of the area south of State Route 24 and the southeastern portion of the Hanford Site; that large examples of these communities exist at all is due to the protection afforded by the Hanford Site. Nearby sites that once supported this community have been converted to irrigated agriculture.

This plant community type also occurs on sandy-textured soils throughout Central Hanford and in the Riverlands. It often intergrades with other types, including the bitterbrush/Indian ricegrass dune complex in the eastern portion and a sandy phase of the big sagebrush/bluebunch wheatgrass type in the southeastern section. Portions of the area mapped as this type have had more than one fire during recent decades. In these areas, the cover of the indicator shrub and grass species usually are low. The cover and diversity of mosses and lichens in the microbiotic crust are variable, but generally low. Areas in better ecological condition (i.e., with a high cover of needle-and-thread grass and microbiotic crust) occur mostly in the eastern portion of Central Hanford, often on stabilized sand. Compared to other plant communities and soil types in Central Hanford, plant communities on sandy soils seem the most resilient to disturbance.

3.9.3.4 Bitterbrush/Indian Ricegrass Dune Complex

This community type occurs on active dunes and other extremely sandy soils. As opposed to relatively cool and moist western and northern portions of the ecoregion where it grows in loamy soils, bitterbrush is only found in nearly pure sand within the hotter and drier central Columbia Basin. Plant composition is highly variable, changing with subtle shifts in substrate and presumably time as an active dune becomes stable (or vice versa), but sagebrush is generally absent. As such, the boundaries of this type are fluid and difficult to map. Succession and

stabilization of a dune site apparently leads to the development of other potential plant community types (probably most often the big sagebrush/needle-and-thread type). As a result, the dune complex encompasses several related successional cover types, each composed of taxa adapted to different degrees of sand accumulation, loss and stability.

On the Wahluke Slope, the antelope bitterbrush/Indian ricegrass dune complex covers large areas directly above the White Bluffs. Along with the occurrences in Central Hanford, it makes up the most extensive, highest quality occurrence of this type known in the state of Washington.

This community type occurs in only two small patches in the ALE. Most of this area is far from pristine, with native grasses often replaced by cheatgrass and tumbleweeds. However, because it has been replaced by agriculture nearly everywhere else it once occurred, even small occurrences are ecologically important.

3.9.3.5 Big Sagebrush/Cheatgrass

This designation represents areas with extensive cheatgrass and other exotic species cover with or without big sagebrush in which the original/native potential plant community type could not be determined, or where it has likely been permanently replaced. This is the situation over much of Central Hanford, and indeed in highly degraded or sandy soil areas throughout Hanford, where identification of potential plant community types is difficult. Particular difficulties are faced in identifying plant community types where historic disturbances is the most intense (especially on historically farmed locations). Much of the documented, unexplained big sagebrush die-off is located in this area. Vegetation within this designation has highly variable shrub cover, a high cover of cheatgrass, frequently a significant cover of Sandberg's bluegrass, and usually a low cover of microbiotic crust. This designation represents vegetation in a degraded condition; however, there is considerable variability in the amount and rate of successional changes of areas mapped as this designation. Some areas appear to be recovering towards native vegetation, whereas other areas appear to be permanently modified.

3.9.3.6 Sand Dropseed/Sandberg's Bluegrass

This plant community type is characterized by a lack of shrubs and dominance by the two grass species for which it is named. Areas mapped as this type are located in the northern and northeastern portions of Central Hanford, within the lowest elevation upland plant communities near the Columbia River, and in similar locations scattered throughout the Wahluke Slope. Sand dropseed is found along roadways and other highly disturbed areas scattered throughout the northern portion of Central Hanford. It is difficult to determine whether the species is present because of disturbance, or if its presence represents a potential plant community type. It is only mapped as a possible potential plant community type adjacent to the river, usually within the

river's probable maximum flood area (Cushing 1995). The cover of Sandberg's bluegrass is often sparse and that of cheatgrass high. Overall plant diversity within the type is low, and many components are weedy. The climax status of the type is uncertain. When sand dropseed occurs without Sandberg's bluegrass, it probably represents a climax riparian community type (Johnson and Simon 1987) that occurred historically in a zone disturbed by floods frequent enough to exclude other bunchgrasses and shrubs.[74]

3.9.3.7 Spiny Hopsage/Sandberg's Bluegrass

The spiny hopsage/Sandberg's bluegrass community occurs on dry sites with fine-textured soils and likely represents an unusual variant of the big sagebrush/Sandberg's bluegrass community. (One possible explanation for the absence of sagebrush is intermittent pooling of water [Downs et al. 1993].) Sandberg's bluegrass is the dominant grass, although cheatgrass is a major or dominant component in most areas of the Hanford Site. Forb diversity and crust cover are generally low. This type occurs as pure stands of spiny hopsage on the Wahluke Slope and Central Hanford and mixed with big sagebrush in loamy soils throughout drier areas of the Hanford Site. On the Wahluke Slope, it occurs mostly in the central portion of the White Bluffs, but it can also be found in scattered locations in the southwest portion.

3.9.3.8 Winterfat/Sandberg's Bluegrass

This unusual community has winterfat as the dominant shrub and Sandberg's bluegrass as the major grass. It occurs on Warden or Kennewick silt loam soils (notably calcareous) around 800 feet in elevation in the ALE and Wahluke Slope. Overall species diversity is low in this community, although Piper's daisy, a rare plant, frequently occurs. The largest occurrence on the Monument is on the lower slopes of Rattlesnake Mountain where it occurs in a five-by-one-mile area on small ridges separating the numerous small draws that come off the mountain; the intervening draws typically support big sagebrush/bluebunch wheatgrass or needle-and-thread communities. A second, smaller occurrence is on the Wahluke Slope near the northwest site boundary north of State Route 24.

3.9.3.9 Stiff Sagebrush/Sandberg's Bluegrass

Stiff sagebrush grows on thin soils over fractured basalt. This plant community type occurs on the crest of the Saddle Mountains, in a tiny occurrence on ridge crests in the Cold Creek Valley,

[74] It should be noted that there have been no floods since at least 1948 that approach the probable 100-year flood event.

and intermittently on shallow soils over basalt on Umtanum Ridge. The cover of soil mosses and lichens is consistently high. The ecological condition of the type is generally marginal.

3.9.3.10 Desert Buckwheat (Various)/Sandberg's Bluegrass

These communities are characterized by various desert buckwheats (thyme, Douglas', rock), Sandberg's bluegrass, a microbiotic crust, and diverse forbs. They typically occur on ridge tops above 1,500 feet in elevation; the only occurrences in the Hanford Site are on ridge tops throughout the ALE. These communities are generally in good ecological condition and are important habitat for butterflies.

3.9.3.11 Three-tip Sagebrush Communities

At higher elevations in the ALE (primarily above 2,000 feet), three-tip sagebrush begins to occur with, or replaces, big sagebrush as the dominant shrub. Unlike big sagebrush, three-tip sagebrush resprouts following fire; it is therefore frequently the only shrub present in what would otherwise be mixed bunchgrass communities. Bluebunch wheatgrass is typically the dominant grass, but when Idaho fescue is present (typically on steep north slopes), the community is named for it (i.e., three-tip sagebrush/Idaho fescue). Cusick's bluegrass is also often present. These community types are characterized by high vegetation cover and diverse forbs. Most sites in the Monument are in good ecological condition.

3.9.3.12 Low Elevation Alkaline Vernal Pools

Shallow vernal pools occur on Gable Mountain, Gable Butte, and the eastern end of Umtanum Ridge on basalt shelves and dips that form internal drainages. Each pool is dominated by herbaceous vegetation that differs according to the depth, size and condition of the pool. Surrounding potential plant community types include big sagebrush/Sandberg's bluegrass and big sagebrush/bluebunch wheatgrass. Historic livestock use has affected the pools, and they are mostly moderately to severely degraded. Several rare plant species are present, and on this basis the pools, especially those on Gable Butte, are still a high priority for conservation.

3.9.4 Riparian and Hanford Reach Plant Communities

Only the summaries of the major plant communities of the wetlands, springs and riparian areas in the Hanford Site and within the Hanford Reach are described here. Descriptions of all the identified communities are available in Wilderman (1994) and Salstrom and Easterly (1995).

3.9.4.1 Willow Riparian Complex

This riparian community is characterized by diverse shrubs and trees that include a substantial component of, or dominance by, willows. Because of its association with water and its value as wildlife habitat, this type is a very important component of the Monument. It occurs on the ALE in the vicinity of Rattlesnake Springs, Snively Canyon, and Benson Springs, although composition varies among the three sites. Small groves of narrowleaf willow occur sporadically above the high waterline throughout the Hanford Reach. Within these groves, the willows usually form thickets averaging five feet in height, and the understory is commonly dominated by reed canarygrass.

Unfortunately, the spring complexes on the ALE were severely damaged by the 24 Command Fire and have yet to fully recover. It will likely take several years to return to the condition described above.

3.9.4.2 Non-Persistent Riverine Emergent Wetland

Backwater areas and sloughs often form in the lee of cobble bars where silt has been deposited; this silt provides for wetland communities. The largest wetland systems are associated with the most developed cobble bars, such as on the lee side of Locke Island. Others are scattered throughout the north shore. This habitat system is thought to be rare elsewhere along the Columbia River, but may have been common before the extensive construction of hydroelectric dams (Downs et al. 1994). These systems are rich in species diversity, both within and between sites. Dominant species include common spikerush, needle spikerush, alkali bulrush, western lilaeopsis, broadleaf cattail, and various rushes. Three species that occur abundantly and consistently within these wetlands are currently considered sensitive in Washington—slender flatsedge, false pimpernel, and Owyhee mudwort. On the Monument, this plant community type is often relatively pristine.

3.9.4.3 Unconsolidated Shore, Cobble

A collar of mostly bare cobble occupies most of the lowest portion of the shoreline. This zone is heavily disturbed due to the almost daily inundation during the growing season from waterflow manipulation upriver at Priest Rapids Dam. A number of forbs, including the rare species persistentsepal yellowcress, occur in this zone. On flat profiles, this zone intergrades into low shrub communities. Farther up the riparian profile, but below daily high water, the rhizomatous shrubs Indian hemp and western goldentop commonly form a perimeter thicket. Indian hemp is confined to this zone but occurs irregularly. Western goldentop is omnipresent, but also occurs in adjacent zones. Occasionally, particularly on slopes of more than 15%, this zone is absent or replaced by a monoculture of reed canarygrass.

3.9.4.4 Irrigation Run-off Created Wetlands

This artificial community type includes lakeshores, riparian areas, and wetlands on the Wahluke Slope that have been converted from shrub-steppe due to accumulated run-off from irrigated agriculture. The largest examples are just south and five miles south of State Route 24 in the eastern end of the Monument and around Saddle Mountain Lake on the western end. Small examples occur periodically along the White Bluffs due to water seepage through the Bluffs. Communities in these wetlands are typically dominated by non-native species, such as tamarisk and Russian olive, but also support native willows and cattails and black cottonwood. Although artificial, these areas can provide valuable wildlife habitat in an otherwise arid landscape, especially for amphibians, birds and bats.

3.9.4.5 Island Upland

Three communities are recognized on islands within the Hanford Reach: the northern wormwood/sand dropseed community occurs where upland areas are seasonally flooded but above frequent high water; the flatspine burr ragweed/Indian ricegrass community occurs on a small dune system on an unnamed island at the head of Wahluke Bend; and a cheatgrass community (see discussion above on unknown potential communities) covers portions of Locke Island. Patches of thickspike wheatgrass and Great Basin wildrye occur within this zone.

3.9.5 Plant Species of Interest

The Hanford Site and the Monument support numerous plants of special interest to the FWS and the states of Oregon and Washington in addition to those described later under Section XX (Endangered, Threatened, Rare, or Sensitive Plant Species). Two of these species, Umtanum desert buckwheat and White Bluffs bladderpod, are known only from the Monument, although extensive searches outside Monument boundaries have not been conducted.

3.9.5.1 Awned Halfchaff Sedge

Awned half chaff sedge is a state threatened wetland species that ranges from California to Washington and the southeastern United States (Hickman 1993). It was not previously known on the Hanford Site prior to 1994; in 1994, it was found in thirteen locations along the Hanford Reach, all below high water. These locations are considered one population.

3.9.5.2 Canadian St. John's Wort

Canadian St. John's wort ranges from British Columbia to Quebec, southward through Colorado, Illinois, Iowa, New Jersey, and Pennsylvania. It is generally rare in western North America and has a scattered distribution in Washington; Canadian St. John's wort is a state sensitive species. Three new populations of Canadian St. John's wort were located within the Hanford Reach in 1994, two on Central Hanford, and one on the Wahluke Unit. The Hanford Site populations represent a southern range extension in the Pacific Coast region. It is also a departure in the type of habitat the taxon typically inhabits in western North America—a wetland adjacent a large river in arid shrub-steppe, as opposed to a pond or lakeside in montane or forested regions.

3.9.5.3 Chaffweed

Chaffweed is a diminutive, annual herb in the primrose family. It is unusual in the shrub-steppe region, although it ranges from California to British Columbia and is widespread in eastern North America, South America, and Europe. It is listed as rare in British Columbia and Alberta. On the Hanford Site, chaffweed is located on the Hanford Reach in two riverine emergent wetlands in conjunction with several other rare plant taxa. Its habitat is shores, seepage areas, vernal pools, and other moist areas from the coast to inland valleys.

3.9.5.4 Columbia Milkvetch

Columbia milkvetch is considered sensitive in Washington and is a federal species of concern. It is a local endemic and is found in Benton, Kittitas and Yakima Counties in south-central Washington. It was once thought to be extinct but has since been found to be relatively common on the Yakima Training Center and other locations within its limited range (Sauer and Rickard 1979). Nine occurrences are known on the Hanford Site. The Yakima and Umtanum Ridge populations represent small range extensions to the south and east of its previously known range.

Most of the Hanford populations grow in big sagebrush/bluebunch wheatgrass and big sagebrush/Sandberg's bluegrass plant community types, mostly in well-drained sandy and gravelly loams, lithosols and cobbly sand. The sites are frequently in early seral stages following disturbance. Columbia milkvetch has been found on the sides and medians of lightly used gravel roads, and its density and frequency has been found to increase after fire; the fires of 2007 may be of benefit for this species.

3.9.5.5 Coyote Tobacco

Coyote tobacco is a native annual forb that is easily recognized by its glandular foliage and white, tubular flowers. Its range is typically east of the Cascades from southern British Columbia and northern Idaho and Montana to Baja California, New Mexico, and northwest Mexico. In Washington, coyote tobacco has a scattered distribution, with present occurrences known in Douglas, Grant, Kittitas, Klickitat and Yakima Counties. Historic sites include Chelan and Franklin Counties.

Habitat for this species is noted as dry sandy bottomlands, dry rocky washes, and other dry open places. Coyote tobacco occurs in areas that are prone to periodic disturbances, caused by either erosion or human activities.

This state sensitive species was recorded on the ALE in 1999 in an area that had burned in 1998. The germination of this plant seems to be stimulated by smoke residues. Until this recent collection, this species had not been recorded near Hanford for nearly 100 years.

Due to the amount of disturbance to its habitat, both natural and human-caused, coyote tobacco is associated with several aggressive exotic species that have invaded the habitat and presumably compete for resources. This, combined with the relatively large number of historical collections of the taxon in Washington and the few currently known sites, suggests that the species may be in decline in the state.

3.9.5.6 Desert Cryptantha (Miner's Candle)

Desert cryptantha is a regional endemic that is most common on the Snake River Plains of Idaho, extending into a few counties in adjacent Nevada, Oregon, and Utah, and disjunct to Yakima County, Washington. In Washington, it is a sensitive species. There have been no new collections during the last fifty years in Washington. Desert cryptantha was found on Yakima Ridge within the ALE on a sparsely vegetated, south-facing slope with big sagebrush and winterfat. The population was not vigorous, even during an unusually wet year. There may be no germination in a dry year. Due to the superficial similarities between desert cryptantha and other annual cryptantha species, other populations on Yakima Ridge or in the Hanford Site may have been overlooked.

3.9.5.7 Desert Dodder

Desert dodder ranges from California to Arizona, Baja (California), Nevada and Utah (Hickman 1993). The Idaho and Washington populations are disjunct from the range of the species. In 1984, the single known population in Washington was collected on private land in the Cold

Creek Valley in Benton County just west of the western boundary of the Monument. It is likely that this population has since been destroyed by conversion into a wheat field; however, new populations have been identified on the Monument; three populations were located adjacent to the White Bluffs in the Wahluke Unit.

The plant is a parasite on big sagebrush and on Hanford is found within the big sagebrush/ Sandberg's bluegrass community.

Desert dodder is listed as threatened in Washington. Potential threats include vehicular traffic, road maintenance, wildfire, grazing and agricultural conversion of habitat. The populations in the Monument are located within fifty feet of a small dirt road that is accessible to the public.

3.9.5.8 Desert Evening Primrose

Desert evening primrose is found throughout much of the western United States; Washington is considered peripheral to its main range (WNHP 1997). There are a total of three recently documented occurrences and one occurrence that was located before 1985 known from outside the Hanford Site (WNHP 1995). Field surveys conducted in 1995 located five new populations, two each in Central Hanford and the ALE and one in the Saddle Mountain Unit. Two populations are located along the Columbia River, above the high water level on nearly flat river terraces. The desert evening primrose population at the southern base of Yakima Ridge in the ALE is the largest population of plants found in the Hanford Site. While the surrounding area is quite weedy, the immediate area is relatively high-quality.

Desert evening primrose favors dry, open habitats, occurring as individuals or colonies on clay soils, rocky slopes composed of shales, volcanics, sandstones, bluffs and exposed rocky ridges. The taxon also colonizes roadcuts in grasslands and sagebrush.

Desert evening primrose is considered sensitive in Washington. The population on the ALE is probably stable because the area is off limits to the public and grazing. Populations adjacent to the river are vulnerable to changes in hydrology and disturbances due to river-related recreational activity. These populations and those on the gravelly White Bluffs over the river are also vulnerable to competition with aggressive, weedy plants accentuated by physical disturbance.

3.9.5.9 Dwarf Evening Primrose

Dwarf evening primrose is considered sensitive in Washington, where is it has a scattered distribution and is a regional endemic (WNHP 1997). The taxon was believed to range from central Washington to eastern Oregon and adjacent southern Idaho (Hitchcock and Cronquist

1973). Fourteen occurrences have been located on the Hanford Site, including locations in the White Bluffs in the Wahluke and Saddle Mountain Units and on and around Gable Mountain in Central Hanford. The newly located populations on the White Bluffs make it one of the largest known concentrations of dwarf evening primrose plants in its range.

Dwarf evening primrose grows in gravelly soils in the big sagebrush/Sandberg's bluegrass association in conjunction with other rare plant species, including Snake River cryptantha, white eatonella, White Bluffs bladderpod, desert evening primrose, and bristly pectocarya.

Illegal use of off-road vehicles in the publicly accessible Wahluke Unit threatens two previously known occurrences. Off-road vehicle use affects these occurrences not only by physically damaging plants, but also more significantly by rutting and eroding slopes. Another threat to these and all populations on the bluffs are hydrologic changes (i.e., increase in irrigation) up slope of the bluffs, which could result in seepage and slumping of the exposed face of the bluffs.

3.9.5.10 Fuzzytongue Penstemon

Fuzzytongue penstemon is listed as sensitive in Washington, where it is locally endemic to the Columbia Basin. It is found in Chelan, Douglas, Klickitat, and Yakima Counties. Its general habitat is open, often rocky places in the foothills and lowlands (Hitchcock and Cronquist 1973). On the Hanford Site, two populations grow on the White Bluffs near the southern boundary of the Wahluke Unit. One of the populations has approximately 400 plants on the steep, west-facing slopes of a series of six canyons, while the other has more than 200 plants in two sub-populations. Associated plant communities are relatively high-quality. Fuzzytongue penstemon grows in conjunction with a number of rare plant species, including White Bluffs bladderpod, dwarf evening primrose, and Snake River cryptantha. Populations are in an area of the Wahluke Unit that is open to the public; they could eventually be affected by irrigation-related slumping of the White Bluffs if there is substantially degradation from irrigation. Illegal off-road vehicle use has also been documented in the area.

3.9.5.11 Geyer's Milkvetch

Geyer's milkvetch (variety *geyeri*) is considered threatened in Washington, where it is disjunct from its main range (WNHP 1997). The general habitat of Geyer's milkvetch includes depressions in mobile or stabilized dunes, sandy flats, valley floors, draws in gullied hills, and margins of alkaline sandy playas (Barneby 1989). It is generally a Great Basin and Snake River Plains species, known from southeast Oregon to California and Nevada and eastward through southern Idaho to Utah and Wyoming. Prior to a 1994 survey, two occurrences of the plant were known from Grant County, both verified since 1984 (WNHP 1997). During the 1994 field season, four populations of Geyer's milkvetch were located in the Saddle Mountain Unit.

3.9.5.12 Gray Cryptantha

Gray cryptantha is considered sensitive in Washington, where it is a regional endemic. It is found in the Columbia and lower Yakima Rivers in the western Columbia Basin and from Wenatchee, Washington, to The Dalles, Oregon. Prior to a 1994 survey, there were only thirty-six known occurrences in Washington, twenty-four of which had not been visited since 1984, and four of which were in the Hanford Site. The 1994 survey found ten new populations in the Hanford Site (eight in the Wahluke Unit, one in Central Hanford, and one in the Saddle Mountain Unit).

Gray cryptantha grows on swales and slopes of somewhat- to moderately well- vegetated sand dunes and other sandy habitats in the White Bluffs and the Hanford Dune Field. It is usually found with the bitterbrush/Indian rice-grass dune complex plant association. Associated plant species include antelope bitterbrush, Indian ricegrass, and needle-and-thread grass. Most populations have a low to moderate cover of weedy plants. Populations of gray cryptantha are located on Central Hanford and the Wahluke and Saddle Mountain Units. The size of the populations varies dramatically, ranging from 0.1 acre to more than 600 acres.

Off-road vehicle use, irrigation-related groundwater changes, stabilization of sand dunes by weedy plants or changes in sand deposition, and agricultural conversion of habitat all pose threats throughout its range. Six of the eight new populations found in the Hanford Site are accessible to the public; illegal off-road vehicle use was observed in the vicinity of half of the populations. Several of the populations are located in areas where irrigation-related groundwater movement could or is causing slumping of the White Bluffs and the sand dunes immediately up-slope of the bluffs. A significant number of sand dunes and sandy areas on private lands in the area have been converted to orchards and agriculture, contributing to the rarity of this taxon.

3.9.5.13 Great Basin Gilia (Sand Gilia)

Great Basin gilia is a sensitive species whose range includes Great Basin areas in Oregon, California, Colorado, Idaho and New Mexico. Before being located on the Hanford Site during the 1995 field season, it was not known in Washington; it is now considered sensitive in Washington State. Seven populations of Great Basin gilia were located at widely varying places on the Hanford Site, including the gravelly bluffs north of Vernita Bridge, the basalt sand dunes north of Gable Mountain, Umtanum Ridge, and the White Bluffs. Although widespread, most populations were small and discrete. One of the White Bluffs populations is the largest known in Washington with several hundred plants.

The habitat preference for Great Basin gilia is open sandy or rocky areas where vegetation is generally low. The plant association is loosely describe as big sagebrush/Sandberg's bluegrass. Weedy species such as cheatgrass and Russian thistle are sometimes sub-dominant. Both habitat

and substrate type show substantial variation. On the Hanford Site, small, isolated populations of Great Basin gilia are found in different high-quality habitat areas where there is often an array of rare plant species (Columbia milkvetch, Piper's daisy, Umtanum desert buckwheat, Hoover's desert-parsley, dwarf evening primrose, white eatonella, bristly pectocarya, White Bluffs bladderpod, Snake River cryptantha, Suksdorf's monkey-flower, loeflingia and rosy calyptridium).

3.9.5.14 Hoover's Desert-Parsley

Hoover's desert-parsley is a local endemic found only in Benton, Grant, Kittitas and Yakima Counties in south-central Washington. Prior to 1995, there were twenty-four known occurrences, eight of which had not been visited since 1985. One of these occurrences is on the steep, north-facing basalt talus slopes of Umtanum Ridge in the Hanford Site (WNHP 1995). During the 1995 survey, nine new populations of Hoover's desert-parsley were found; they have been combined into one occurrence. Populations on the Monument and in Central Hanford are near populations of Columbia milkvetch (sensitive) and Umtanum desert buckwheat (endangered). Hoover's desert-parsley is considered sensitive in Washington and is a federal species of concern (WNHP 1997).

In the Hanford Site, Hoover's desert-parsley is found on a substrate of loose active basalt talus, averaging three to eight inches in diameter. The vegetation community is generally big sagebrush/bluebunch wheatgrass.

3.9.5.15 Loeflingia

Loeflingia—a widespread western and southwestern species with a number of recognized varieties—had a known range from northern Baja California and the southern coast of California, through the San Joaquin Valley, and north to Santa Cruz County, California (Hickman 1993). The 1994 survey changed that. The Hanford Site populations are disjunct from the range of the species by at least 300 miles and from the range of the variety by approximately 800 miles. In Washington, loeflingia is threatened.

On the Hanford Site, five small populations were found on low basalt sand dunes to the north and south of Gable Mountain, generally in small swales and depressions in sparsely vegetated, but relatively stable, dunes with big sagebrush. A high percentage of basalt in the sand produces sand that is darker and with strikingly different vegetation than that of the light-colored dunes of the Hanford Dune Field to the southeast of Gable Mountain. These basalt sand dunes are normally quite barren, but a high diversity of annual species was seen in 1995 after unusually high winter and spring rainfall. Each population was invariably associated with Suksdorf's monkey-flower (sensitive). Rosy calyptridium, another California annual that had not been

collected north of Harney County, Oregon, was also found in association with loeflingia at several sites. It was also found with one population of Great Basin gilia, an annual species not previously known in Washington.

3.9.5.16 Persistent-sepal Yellowcress

Persistent-sepal yellowcress ranges from California north to Washington, distributed in two distinct regions—along the Columbia River in Oregon and Washington and south-central Oregon to northern California. The population on the Hanford Reach is the most vigorous in Washington and perhaps throughout the range of the species. Twenty-two occurrences are found in three counties in south-central and southwestern Washington, all adjacent to the Columbia River. Sixteen of the occurrences are located along nearly forty miles of the Hanford Reach. These populations range from fourteen to more than 200 plants, on approximately 0.01 to 3.0 acres. The WNHP has merged these sixteen populations into one WNHP occurrence.

Persistent-sepal yellowcress is a regional endemic that is considered endangered in Washington and is a federal species of concern (WNHP 1997). In Oregon, it is included on List 1, which contains taxa that are endangered or threatened throughout their range (Oregon Natural Heritage Program 1993). For the last several years, extensive research, monitoring and surveys have been done in Oregon and Washington; a status report on this species was recently prepared by the WNHP (Salstrom and Gehring 1994).

Persistent-sepal yellowcress grows in damp to wet soils near all types of bodies of water, but in Washington it is restricted to the riparian areas adjacent to the Columbia River near the Hanford Site and below the Bonneville Dam. Populations can be ephemeral due to changes in hydrology. On the Monument, plants are found at or near the lower edge of the vegetated zone on riverbanks in open, lightly vegetated gravel, cobble and sandy areas, especially gravel bars on shallow-water sections. Vegetative cover at these sites is generally sparse.

All along the Columbia River, persistent-sepal yellowcress faces several threats. On the Monument, many of the sites where the populations occur are inundated until mid-summer and may also be inundated daily throughout much of the remainder of the growing season, depending on upstream hydropower project management. According to Harris (1992), flows of less than 100,000 cfs at Priest Rapids Dam are needed to expose populations on the Hanford Reach. These lower flows do not become common until August, and daily higher flows are common throughout the growing season, resulting in regular inundation of the populations even after growth is initiated in August. In addition, all of the new sub-populations are publicly accessible by boaters and other recreational users. At least one sub-population could be threatened by erosion if irrigation use increased on the Wahluke Slope above the White Bluffs. In some locations, the riparian habitat of persistent-sepal yellowcress is being invaded by white mulberry seedlings and shrubs.

3.9.5.17 Piper's Daisy

Piper's daisy is a regional endemic that is found only in the Columbia Basin of Washington and is considered sensitive in Washington. Prior to 1994, there were sixty-five known occurrences in Washington, thirty-six of which have not been visited since 1985 (WNHP 1995); seven of these populations were found on the Hanford Site. The 1994 survey found fifteen new populations—ten on the ALE, one on Central Hanford, and four on the Wahluke Unit. Concurrent with TNC surveys, workers at the PNNL also found several new populations on Umtanum Ridge and in the ALE.

Piper's daisy occurs most commonly in the winterfat/Sandberg's bluegrass plant community type and to a lesser extent in the big sagebrush/bluebunch wheatgrass plant community type. The taxon is most common in undisturbed areas of the brush-steppe. It appears that the Rattlesnake Mountain populations are more or less continuous over more than 12,000 acres. A smaller population on Yakima Ridge is less vigorous. The density and extent of the populations varies widely. The dense concentrations are most prevalent on low ridges in the winterfat/ Sandberg's bluegrass plant community type. Two very small populations were located on the Wahluke Slope south of Saddle Mountain in the Wahluke Unit, also in a winterfat/Sandberg's bluegrass plant community type.

The Rattlesnake Mountain populations are thriving and do not have any present threats. The Wahluke Slope populations are in a highly disturbed habitat that is accessible to the public. Piper's daisy is a sensitive species in the state of Washington.

3.9.5.18 Rosy Calyptridium

Rosy calyptridium ranges from central Oregon to California and east to Nevada and south-central Idaho. Before being located on the Hanford Site, the plant was not known in Washington and had not been collected north of Harney County, Oregon; it is considered a state threatened species in Washington. Two populations and several sub-populations of rosy calyptridium were found in Central Hanford north of Gable Mountain in dark, basalt-derived sand and in silt substrate associated with small, subtle depressions or swales. Because the species is an annual, population numbers and exact location is likely to vary from year to year according to weather conditions. It is estimated that there are less than 250 plants, all located within one mile of each other. Because the terrain is flat and relatively undifferentiated, and because plants are not likely to germinate every year, populations may be difficult to relocate. Therefore, marking vulnerable and difficult to relocate populations is recommended. Further surveys are likely to identify additional populations in the vicinity of Gable Mountain.

On the Hanford Site, rosy calyptridium's habitat is gravelly soils and sagebrush shrublands within the big sagebrush/Sandberg's bluegrass community. Vegetation cover at most sites is

generally low. Associated plants species include Sandberg's bluegrass and assorted native and exotic annual species. Rosy calyptridium grows in conjunction with Suksdorf's monkey-flower (sensitive) and two other taxa new to Washington, loeflingia and Great Basin gilia.

3.9.5.19 Scarlet Ammannia (Grand Redstem)

Scarlet ammannia is a wetland species that ranges from California to the central United States and Mexico, but that has been reported in Klickitat County, Washington; it is considered threatened in Washington. On the Monument, it is found in sixteen locations along the Hanford Reach in the upper margins of the seasonally inundated zone below the high water mark; these locations are now considered one population. Elevations range from 360 feet to 420 feet, and slopes are generally 1% to 3%.

The riverine wetlands in which scarlet ammannia occurs have been designated riverine emergent non-persistent wetlands. They are completely submerged during the early portions of the growing season (March through June) and submerged periodically during the later portions of the growing season (July through September). These unique wetlands have a very high diversity of native wetland plants and a low cover of weedy plants. Many of the native wetland plants that occur in these wetlands are annuals. Plants associated with this community include rushes, spike rushes, toothcup, scarlet ammannia, and flatsedges.

All previous collections of this species were made before dams were built on the Columbia and Snake Rivers. Changes in the hydrologic regime as a result of upstream hydropower project management, boating, and other recreational uses of these sensitive riparian wetlands pose threats to the high-quality native wetlands. Purple loosestrife could also pose a threat to habitat unless controlled.

3.9.5.20 Shining Flatsedge

Shining flatsedge, on the Washington Watch List, is peripheral here to its main range. It is also included on review lists in Idaho and Oregon. Prior to the 1994 field season, there were nine occurrences in Washington—five of which have not been verified since 1985—including two on the Hanford Site. The species is found along stream banks and other wet, low places in valleys and lowlands; it is tolerant of alkaline conditions. In Washington, shining flatsedge is known exclusively from the more arid regions of the state in riverine wetlands, in small embayments, and in backwaters of the Columbia River. (See the discussion of scarlet ammannia for details and management issues.) In 1994, shining flatsedge was found in eighteen new locations in wetlands on the Hanford Reach. Based on consultations with the WNHP, it was decided to merge these eighteen subpopulations and the six previous WNHP occurrences into one large population, including approximately forty miles of the Hanford Reach.

3.9.5.21 Small-Flower Evening Primrose

Small-flower evening primrose is listed as sensitive in Washington, where it has a scattered distribution in the Columbia Basin. On the Hanford Site, it generally occurs on very dry, often barren, and sometimes disturbed sites. Six populations were located: three on Central Hanford, on and near Gable Mountain and Umtanum Ridge; two on the ALE in the Cold Creek Valley and Rattlesnake Springs; and one on the Saddle Mountain Unit on the gravelly bluffs north of Vernita Bridge in Grant County. All six populations are relatively small.

Small-flower evening primrose populations grow in conjunction with a number of rare plant species, including Umtanum desert buckwheat, dwarf evening primrose, Columbia milkvetch, desert evening primrose, Piper's daisy, Great Basin gilia, loeflingia, and rosy calyptridium.

3.9.5.22 Snake River Cryptantha

Snake River cryptantha ranges from central Washington and eastern Oregon to northeastern California and northern Nevada and east throughout the Snake River Plains of Idaho and western Montana, where it generally grows in dry, open sites, often in stony or shale soils. In Washington, it is a sensitive species. Four populations were located on the Hanford Site during a 1994 field survey (one in the ALE and three in the Wahluke Unit). The largest population is located on the sparsely vegetated White Bluffs in the Wahluke Unit; the population is discontinuously eight miles long with many thousands of plants. Associated vegetation includes big sagebrush, Sandberg's bluegrass, winterfat, dwarf evening primrose (threatened), and White Bluffs bladderpod (endangered). Threats to this species are similar to threats to all species found within the White Bluffs—off-road vehicle use, irrigation-related groundwater changes, and agricultural conversion of habitat.

3.9.5.23 Suksdorf's Monkey-Flower

Suksdorf's monkey-flower is found throughout the western United States in open, moist or rather dry places, from the valleys and foothills to moderate- or occasionally rather high-elevation meadows in the mountains. Suksdorf's monkey-flower is a sensitive species in Washington. Washington is considered peripheral to its main range (WNHP 1997); prior to 1995, there were six occurrences in Washington, from five counties in eastern Washington (WNHP 1995). None of these occurrences have been verified since 1985 (WNHP 1995). Prior to the 1995 field survey, no occurrences were known from the Hanford Site. The 1995 survey found six populations in the vicinity of Gable Mountain in dark, basalt-derived sand and silt substrate associated with swales or vernal pools. The size of the new populations ranges from forty to more than 1,300 plants. The depressions in the topography presumably collect a slightly higher amount of precipitation runoff during the winter and spring months. Because of the

annual habit of the species and the dynamic, patchy nature of its habitat within the dark sands north and south of Gable Mountain, the actual and potential habitats of Suksdorf's monkey-flower were combined and mapped as a special habitat area (Hall 1998). Three new populations were associated with sets of vernal pools. A yellow starthistle infestation appears to be a problem at some of these pools. Because the terrain is so flat and plants are not likely to germinate every year, there is a concern that some populations may be quite difficult to relocate.

3.9.5.24 Toothcup

Toothcup is a threatened wetland species whose full range is from California to Washington, the eastern United States, and South America. It is included on the sensitive list in Montana and List 3 in Oregon. It has an R1 designation in British Columbia. Toothcup was last collected in Washington in 1948, and most collections were made prior to 1900. All of the riverine collections were made before dams were built on the rivers. Its general habitat is wet places and lake and pond margins. On the Monument, it is uncommon, found in five locations in wet ground below the high water mark along the Columbia River (Sackschewsky et al. 1992).

3.9.5.25 White Eatonella

White eatonella's main range includes California, Idaho, Oregon, and Nevada (WNHP 1997). In Washington, it is considered threatened; in Idaho it is included on a list of monitor species (taxa that are common within a limited range, as well as taxa that are uncommon but have no identifiable threats). Prior to the 1994 biodiversity inventory, there were no known occurrences on the Hanford Site. All three populations found on the Monument are in the Saddle Mountain Unit in the gravelly bluffs just north of the Columbia River in the vicinity of the Vernita Bridge.

White eatonella's general habitat is dry, sandy, or desert volcanic areas, often with sagebrush. While the substrate at other Washington occurrences is typically red basalt gravel, the substrate at the Hanford Site populations is open, loose, gray gravel, where it grows in conjunction with dwarf evening primrose (threatened), bristly pectocarya (watch), and Great Basin gilia. The slopes on which white eatonella grow are relatively undisturbed and have a relatively low cover of weedy species. It is possible there are more populations in the Hanford Site.

3.10 Wildlife

The Monument blends a desert environment with one of the largest river complexes in the country, providing an exceptionally wide variety of habitats within a relatively small assemblage

of public lands. Each of these two sharply contrasting environments—desert and river—has its own diverse wildlife populations.

3.10.1 Aquatic Wildlife

To address the aquatic wildlife found in the Monument, it is important to first define the basis of support for this wildlife—the aquatic systems available and the primary food sources of plankton and aquatic plants.

3.10.1.1 Aquatic Systems

Natural aquatic habitats in the Monument include the Columbia River that flows along the northern and eastern edges of the Hanford Site, small spring-streams and seeps located mainly on the ALE in the Rattlesnake Hills, and wetland habitats. For an additional discussion of aquatic habitat, see Section 3.9, "Plant Communities," above.

3.10.1.1.1 Columbia River

The Columbia River is the dominant aquatic ecosystem in the Monument and supports a large and diverse array of plankton, benthic invertebrates, fish and other communities. It is in part because this last free-flowing stretch of the river is so biologically productive, the NPS recommended that it be added to the NWSRS.

No tributaries enter the Columbia River during its passage through the Monument; however, there are several irrigation water return canals that discharge into the river along the Franklin County shoreline. The WB-10 Ponds and Canal empty into the Columbia River near the White Bluffs Boat Launch, the Ringold Springs enter at Ringold, and the Esquetzel Canal enters the river near the southern boundary of the Monument across from McNary National Wildlife Refuge islands. The presence of irrigation drainage ponds on the Wahluke Slope in Grant County indicates that groundwater seepage enters the river along the north shoreline opposite the 100-B/C to 100-D Areas, as well as the eastern shoreline bordering Franklin County.

3.10.1.1.2 Springs and Spring Streams

Small interrupted streams, such as from Rattlesnake and Snively Springs, contain diverse biotic communities and are extremely productive (Cushing and Wolf 1984). Rattlesnake Springs, on the western side of the Monument, forms a small surface stream that flows for about 1.6 miles

before disappearing into the ground as a result of seepage and evapotranspiration. Base flow of this stream is about 0.4 cubic feet per second, and water temperature ranges from 36° to 72°. Rattlesnake Springs is of ecological importance because it provides a source of water to terrestrial animals in an otherwise arid part of the Monument. Snively Springs, located farther west and at a higher elevation than Rattlesnake Springs, is another source of drinking water.

Primary productivity at both springs is quite high. Productivity at Rattlesnake Springs is greatest during the spring and coincident with the maximum periphyton standing crop. Seasonal productivity and respiration rates are within the ranges reported for arid-region streams. The major rooted aquatic plant, which in places may cover the entire width of the stream, is watercress. Dense blooms occur and are not lost until a large flash flood occurs. Isolated patches of bulrush, spike rush, and cattail occupy less than 5% of the streambed. Aquatic insect production in the springs is fairly high compared to mountain streams (Gaines 1987). The macrobenthic biota varies from site to site and is related to the proximity of colonizing insects and other factors. The 24 Command Fire of 2000 has had little direct impact on the stream ecology, even though the riparian transect along the lower two thirds of the stream was heavily damaged by the fire (FWS Burned Area Emergency Rehabilitation Plan 2000).

Although Rattlesnake Springs is a net exporter of organic matter during much of the growing season, it is subject to flash floods and severe scouring and denuding of the streambed during winter and early spring, making it an importer of organic materials on an annual basis (Cushing and Wolf 1984).

Secondary production is dominated by detritus-feeding collector-gatherer insects (mostly *Chironomidae* and *Simuliidae*) that have multiple cohorts and short generation times (Gaines et al. 1992). Overall production is not high and is likely related to the low diversity found in these systems related to the winter spates that scour the spring streams. There is an indication that insects in these spring streams depend on both autochthonous (originating within the stream) and allochthonous (originating outside the stream) primary production as an energy source, despite significant shading by exotic species of trees and shrubs (Mize 1993).

3.10.1.1.3 Wetlands

Several areas in the Monument are considered wetlands. The largest wetland area is the riparian zone bordering the Columbia River. The extent of this zone varies but includes extensive stands of willows, grasses and other plants. The zone is extensively affected by water-level fluctuations, which are both seasonal (from precipitation and discharges from upstream water storage dams) and daily (from power generation at dams upstream of the Monument).

Other wetlands can be found within the Saddle Mountain and Wahluke Units. Wetlands in these areas consist of fairly large pond habitat resulting from irrigation runoff. These ponds have

extensive stands of cattails and other emergent aquatic vegetation surrounding the open-water regions. They are extensively used as nesting sites by waterfowl and support populations of warmwater fish that have been introduced by the irrigation network.

Some wetlands exist in the riparian zones of some of the larger spring streams on the ALE. These are not extensive and usually amount to less than 2.6 acres in size, although the riparian zone along Rattlesnake Springs is probably about 1.2 miles in length and consists of peach leaf willows, cattails and other exotic plants. The 24 Command Fire killed many of the large trees found along this riparian zone.

3.10.1.2 Plankton

The Columbia River is a very complex ecosystem because of its size and biotic diversity. Streams in general, especially smaller streams, usually depend on organic matter from outside sources (e.g., terrestrial plant debris) to provide energy for the ecosystem. However, large rivers, particularly the Columbia River with its series of large reservoirs, contain significant populations of primary energy producers (e.g., algae and plants) that contribute to the basic energy requirements of the biota. Phytoplankton (free-floating algae) and periphyton (sessile algae) are abundant in the Columbia River and provide food for herbivores, such as immature insects, which in turn are consumed by predators.

Plankton populations in the Hanford Reach are influenced by communities that develop in the reservoirs of upstream dams, particularly Priest Rapids Reservoir, and by manipulation of water levels by dam operations in upstream and downstream reservoirs. Phytoplankton and zooplankton populations at the Hanford Site are largely transient, flowing from one reservoir to another. There is generally insufficient time for characteristic endemic groups of phytoplankton and zooplankton to develop in the Hanford Reach.

3.10.1.2.1 Phytoplankton

Phytoplankton species identified in the Hanford Reach include diatoms, golden or yellow-brown algae, green algae, blue-green algae, red algae, and dinoflagellates. Studies show diatoms are the dominant algae in the Columbia River phytoplankton, usually representing more than 90% of the populations. The main genera included *Asterionella*, *Cyclotella*, *Fragilaria*, *Melosira*, *Stephanodiscus* and *Synedra* (Neitzel et al. 1982). These originate in the upstream reservoirs and so are typical of those forms found in lakes and ponds. A number of algae found as free-floating species in the Hanford Reach are actually derived from the periphyton; they are detached and suspended by current and frequent fluctuations of the water level.

Peak concentrations of phytoplankton occur in April and May, with a secondary peak in late summer/early autumn. The spring pulse in phytoplankton density is probably related to increasing light and water temperature rather than to availability of nutrients since phosphate and nitrate nutrient concentrations are never limiting. Minimal numbers are present in December and January. Green algae (*Chlorophyta*) and blue-green algae (*Cyanophyta*) occur in phytoplankton communities during warmer months but in substantially fewer numbers than diatoms. There have not been any phytoplankton studies conducted in the Hanford Reach in recent years.

3.10.1.2.2 Periphyton

Communities of periphytic species (benthic microflora) develop on suitable solid substrate wherever there is sufficient light for photosynthesis and adequate current to prevent sediment from covering the colonies. Production peaks in spring and late summer. The dominant genera are the diatoms—*Achnanthes*, *Asterionella*, *Cocconeis*, *Fragilaria*, *Gomphonema*, *Melosira*, *Nitzchia*, *Stephanodiscusi* and *Synedra*.

3.10.1.2.3 Zooplankton

Zooplankton populations in the Hanford Reach are generally sparse. Crustacean zooplankters are dominant in the open-water regions; dominant genera are *Bosmina*, *Diaptomus*, and *Cyclops*. Densities are lowest in the winter and highest in the summer, with summer peaks dominated by *Bosmina*. Summer densities range up to 4,500 organisms per cubic foot. Winter densities are generally less than fifty organisms per cubic foot (Brandt et al. 1993). *Diaptomus* and *Cyclops* dominate in winter and spring, respectively. There have been no recent studies of zooplankton in the Hanford Reach.

3.10.1.3 Macrophytes

Macrophytes are sparse in the Columbia River because of strong currents, rocky bottoms, and frequently fluctuating water levels. Rushes and sedges occur along the shorelines of the slack water areas, such as the White Bluffs Slough, the slough area downstream of the 100-F Area, and Hanford Slough. Reed canary grass is a common non-native species found along these shoreline areas. Macrophytes are also present along gently sloping shorelines that are subject to flooding during the spring freshet and daily fluctuating river levels (below Coyote Rapids and the 100-D Area). Commonly found plants include duckweed, native rooted pondweeds, and Canadian waterweed. Where they exist, macrophytes generally have considerable ecological value. They provide food and shelter for juvenile fish and spawning areas for some species of warmwater game fish. However, one macrophyte in particular—Eurasian milfoil, an exotic

macrophyte—has increased to nuisance levels and may encourage increased sedimentation of fine particulate matter. These changes could have a significant impact on trophic relationships in the Columbia River.

3.10.1.4 Benthic Organisms/Aquatic Invertebrates

Benthic organisms are found either attached to, or closely associated with, the substratum. These and other aquatic invertebrates are vital parts of ecosystems. They are so responsive to environmental conditions that their patterns of diversity and abundance have been used to develop an index of biological integrity for streams in parts of the United States. On a local note, aquatic insects are a key element supporting the salmon population in the Hanford Reach.

All major freshwater benthic taxa are represented in the Columbia River. Insect larvae such as caddisflies, midge flies, and black flies dominate; insect larvae numbers were sometimes as high as 2,000 per square foot (Davis and Cooper 1951). The dominant caddisfly species are *Hydropsyche cockerelli*, *Cheumatopsyche campyla*, and *Cheumatopsyche enonis*. Peak larval insect densities are found in late fall and winter, and the major emergence is in spring and summer (Wolf 1976). Stomach contents of fish collected in the Hanford Reach from June 1973 through March 1980 reveal that benthic invertebrates are important food items for nearly all juvenile and adult fish; there was a correlation between food organisms in the stomach contents and those in the benthic and invertebrate drift communities.

To increase understanding of the aquatic invertebrates of the Monument, TNC conducted a biodiversity inventory (Soll et al. 1999). This inventory conducted reconnaissance-level surveys of aquatic invertebrates of the Columbia River, some tributary water sources, and the two spring streams in the ALE and surveyed published literature for historical records of aquatic invertebrates. This was the first study from this area of Washington to examine tributaries to the Hanford Reach. With one exception, the benthic fauna of the four tributaries inventoried represented a microcosm of the river.

The results of this survey and the literature review clearly indicated that the diversity found in terrestrial invertebrate species in the Monument was also found in the aquatic systems. An additional fifty-two taxa of aquatic macroinvertebrates were identified, including twenty-one not previously documented in the Hanford Reach, bringing the number known to 151. Because this was a reconnaissance-level survey with limited sampling, these findings are not likely to represent the full diversity of aquatic insects on the site. This study greatly expanded knowledge of the invertebrate fauna of Rattlesnake Springs and Snively Springs on the ALE, especially of *Trichoptera*, *Odonata* and *Hemiptera*. Thirty taxa of benthic invertebrates were collected from Rattlesnake Springs and twelve from Snively Springs, with twenty-five and eight representing new Hanford Site records, respectively. This brings the known total for the two sites to forty-three and twenty-four, respectively.

Other benthic organisms include clams, limpets, snails, sponges and crayfish. Early Hanford studies found crayfish numbers in shallow water areas ranged from 0.2 to 1.1 individuals per square foot of river bottom, with a diet primarily of vegetation (Coopey 1953).

3.10.1.5 Fish

The Hanford Reach represents a nationally and internationally important fisheries resource; Chinook salmon from the Hanford Reach are an integral component of international fish treaties (i.e., harvest quotas) with Canada. However, even though the Chinook salmon is by far the most famous species in the Hanford Reach, there are a wide variety of other fish species important to the ecology of the Monument. Gray and Dauble (1977) listed forty-three species of fish in the Hanford Reach; the brown bullhead, collected since 1977, and the blue catfish, described in 2004, brings the total number of fish species to forty-five (Appendix O).

3.10.1.5.1 Salmonids

The Hanford Reach is significant for the remaining habitat it provides several species of anadromous salmonids. Of special note, the Hanford Reach is the only remnant of the major mainstem spawning habitat complex in the Columbia River system for fall Chinook salmon.[75] Construction of eleven hydroelectric dams on the Columbia River and six dams on the Snake River between 1939 and 1975 blocked access and inundated most mainstem spawning sites historically used by fall Chinook salmon. These fall Chinook represent a relatively healthy population of the most inland fall Chinook salmon stock in the Pacific Northwest and California (Huntington et al. 1996). Up to 80% of the total run of adult fall Chinook salmon returning to the mouth of the Columbia River spawn in the Hanford Reach (Dauble and Watson 1990).

The Hanford Reach also serves as a migration corridor for other species and stocks of anadromous salmonids—sockeye salmon, spring/summer Chinook salmon, coho salmon, and steelhead trout—and provides important rearing habitat for juvenile steelhead trout and sockeye

[75] Hanford Reach fall-run Chinook salmon are of economic and cultural importance to commercial fisheries in British Columbia and southeast Alaska, in-river commercial and tribal fisheries, and ocean and in-river sport fisheries. This stock is also a principal component of the international Pacific Salmon Treaty between the United States and Canada. As a result, Hanford Reach fall-run Chinook are subject to management recommendations by the Pacific Salmon Commission developed pursuant to the United States-Canada Pacific Salmon Treaty of 1999, management recommendations developed by the Pacific Fishery Management Council, and management agreements and plans under U.S. v. Oregon (Columbia River Fish Management Plan).

salmon from upstream production areas.[76] These species are of considerable economic importance to the Pacific Northwest.

Steelhead trout also spawn in the Hanford Reach. The steelhead fishery in the Hanford Reach (State Route 395 Bridge to Priest Rapids Dam) consists almost exclusively of summer-run fish. The WDFW estimates sport catch for the 1998-1999 season (the last numbers available) as 1,066 fish. About 90% of this harvest occurred from May through July (WDFW 2000). The majority of these fish (98%) were marked hatchery fish.

Although the fall Chinook population is considered healthy, it, and all other anadromous fish runs, are severely impacted by river fluctuations associated with upstream dam operations.[77] Of primary concern are impacts to rearing juvenile fall Chinook. Juvenile fall Chinook salmon, as well as other resident and anadromous fish species, use shallow, low-velocity nearshore areas for rearing, feeding, cover and protection from predators. The highly unnatural streamflow fluctuations that occur in the Hanford Reach due to upstream dam operations (load following) are known to cause significant mortality of juvenile fishes and macroinvertebrates. Typical project operations result in fluctuations as great as 6.9 feet/hour and 13-14 feet in a 24-hour period in the Priest Rapids Dam tailrace during the fall Chinook salmon emergence and rearing period (Nugent et al. 2002). When streamflows drop, rearing fish can be either stranded on gently sloped shorelines and gravel bars, or entrapped in shallow depressions created by the receding water (Anglin et al. 2006; Geist 1989; Wagner 1995; Ocker 1996; Nugent et al. 2002). Mortality results from direct stranding and desiccation on the substrate, entrapment in isolated pools and resulting lethal water temperatures, and predation on fish trapped in pools. Annual loss estimates for juvenile fall Chinook salmon from stranding or entrapment ranged from approximately 45,000 to 1,630,000 dead fish per year between 1999 and 2003 (Nugent et al. 2002; Anglin et al. 2006). These loss estimates were developed for an 8.7-mile section of the Hanford Reach. A comprehensive survey for the entire Hanford Reach, including the original survey area, was conducted in 2003. The reduced monitoring area mortality estimate was 155,000 dead fish, and the mortality estimate for the entire Hanford Reach was approximately

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[76] In May 2004, the NOAA-Fisheries (then the National Marine Fisheries Service) issued a Biological Opinion related to the continuing operation of the Priest Rapids Hydroelectric Project, which was later adopted by the FERC. The Biological Opinion includes a list of forty alternatives or actions that the Grant PUD needed to take to avoid jeopardizing Upper Columbia River spring Chinook salmon. Of note, the list included the immediate funding and implementation of the White River and Nason Creek spring Chinook salmon supplementation programs and required establishment of the Priest Rapids Coordinating Committee, which is responsible for determining program adjustments.

[77] The Hanford Reach Fall Chinook Protection Program, formalized in April 2004, was developed by the Chelan, Douglas and Grant County PUDs; BPA; WDFW; NOAA-Fisheries; and CCT. The FWS and Yakama Nation subsequently signed the agreement. Controlling river flows to protect fall Chinook impacts the timing of hydropower produced at all seven dams upstream from the Hanford Reach. The Grant PUD estimates that the cost of the Hanford Reach Fall Chinook Protection Program averages $4.3 million per year in lost power production for the Priest Rapids Hydroelectric Project.

1,300,000. These estimates include only direct mortalities and do not account for delayed mortality of fish found in entrapments that were still alive, or fish that had been removed by avian and terrestrial predators.

Streamflows in the Hanford Reach are intentionally managed at Priest Rapids Dam during the fall-run Chinook spawning season (October-November) with the stated goal of confining spawning activity to lower river elevations.[78] This management action results in lower daytime flows that range from approximately 45,000 to 70,000 cfs. The corresponding nighttime flows range from approximately 150,000 to 200,000 cfs to evacuate Priest Rapids Pool. As a result, suitable spawning habitat is shifted to different areas twice every day, primarily as a function of the wide range of depths and velocities associated with day/night streamflow conditions. This management strategy was developed based on the results of a monitoring study conducted on Vernita Bar (Chapman et al. 1986) and did not include observations for the majority of the spawning sites downstream of Vernita Bar. The impacts of this management strategy on spawning behavior, carrying capacity, redd superimposition, and overall productivity in the Hanford Reach needs further study.

Streamflows are also managed at Priest Rapids Dam during the fall Chinook rearing season (March through mid-June) to control flow fluctuations that result from electrical power demand (load following; Hanford Reach Fall Chinook Protection Program 2004). However, the target hourly flow fluctuations specified cause stranding and entrapment of both juvenile fall-run Chinook salmon and resident fish species. In addition, water level fluctuations alter the amount of juvenile fall-run Chinook rearing habitat on an hourly basis, possibly stimulating downstream movement at an inappropriate time and displacing juveniles into less desirable habitat in the McNary Reservoir.

3.10.1.5.2 Shad

American shad, another anadromous species, may also spawn in the Hanford Reach. The upstream range of the shad has been increasing since 1956 when less than ten adult shad ascended McNary Dam. Since then, the number of shad ascending Priest Rapids Dam has risen to many thousands each year, and young-of-the-year fish have been collected in the Hanford Reach. Shad are not dependent on the same conditions that are required by the salmonids for spawning and apparently have found favorable conditions for reproduction throughout much of the Columbia and Snake Rivers.

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[78] Grant PUD, the owner of the Priest Rapids Hydroelectric Project, reached an agreement in December 2005 with the DOI (including the FWS), NOAA-Fisheries, WDFW and CCT on issues related to steelhead; spring, summer and fall Chinook salmon; sockeye salmon; and coho salmon. (An agreement was reached with the Yakima Nation on August 14th, 2006.) This agreement has been submitted to the FERC and is expected to be recognized in the terms of the new license for the Priest Rapids Project.

3.10.1.5.3 White Sturgeon

The Hanford Reach also provides significant breeding habitat for several resident fish, such as the white sturgeon. The white sturgeon is a long-lived species reaching up to fifteen feet in length and 1,000 pounds or more[79] that requires swiftly flowing water to reproduce. White sturgeon spawning habitat downstream of the Hanford Reach is limited to small areas just below each hydroelectric project. Within the Hanford Reach, white sturgeon spawning has been recently documented just below Priest Rapids Dam and at a second location above the Vernita Bridge (NPS 1994). Other locations are probable (Fickeisen et al. 1980). The Hanford Reach and the lower Columbia River downstream of Bonneville Dam support the largest white sturgeon populations in the Columbia River system.

3.10.1.5.4 Other Fish Species

Other fish of importance to sport fishermen are mountain whitefish, smallmouth bass, crappie, catfish, walleye, and yellow perch. In addition to white sturgeon, mountain whitefish, and sandroller are two native species that may be present in much higher numbers in the Hanford Reach than in impounded areas.

Large populations of rough fish are also present, including carp, redside shiner, suckers, and northern pikeminnow (formerly known as squawfish). Because northern pikeminnow feed on juvenile salmon, the WDFW has established a bounty program on adult pikeminnow to bolster salmon runs. Northern pikeminnow removed from the Hanford Reach are usually turned in at bounty stations located at Columbia Point in Richland and at the Vernita Bridge Rest Area.

3.10.2 Riparian Wildlife

Riparian areas provide nesting and foraging habitat and escape cover for many species of birds and mammals. Shoreline riparian communities are seasonally important for a variety of species. Willows trap food for waterfowl (e.g., Canada geese) and birds that use shoreline habitat (e.g., Forster's terns), as well as provide nesting habitat for passerines. Terrestrial and aquatic insects are abundant in emergent grasses and provide food for fish, waterfowl and shorebirds.

Numerous bird species occasionally use riparian areas, while other species are fully dependent on those areas—common species include American robins, black-billed magpies, song sparrows, and dark-eyed juncos. Upland gamebirds that use this habitat include ring-necked pheasants and

[79] These are historic numbers. Fish of this size are rare—if not non-existent—today, although there are reports of sturgeon this size in Hells Canyon on the Snake River.

California quail. Predatory birds include common barn owls and great horned owls. Species known or expected to nest in riparian habitat include Brewer's blackbirds, mourning doves, black-billed magpies, northern orioles, lazuli buntings, eastern and western kingbirds, and western wood peewees. Bald eagles have wintered in the Hanford Site since 1960 and use riparian trees for perching and roosting. Great blue herons and black crowned night herons are associated with trees in riparian habitat along the Columbia River and use groves or individual trees for perching and nesting. On occasion, great blue herons have constructed nests in the large metal powering towers that are present on the shores of the Columbia River.

The Monument is located in the Pacific Flyway, and the Hanford Reach serves as a resting area for neotropical migrant birds, migratory waterfowl, and shorebirds (Soll et al. 1999). During the fall and winter months, ducks (mallard, pintail, ring-necked, canvas back, bufflehead, goldeneye) and Canada geese rest on the shorelines and islands along the Hanford Reach. The area between the Hanford town sites and Vernita Bridge is closed to recreational hunting, and large numbers of migratory waterfowl find refuge in this portion of the river. Other species observed during this period include American white pelicans, egrets, double-crested cormorants, coots and common loons.

Mammals occurring in riparian areas of the Monument include rodents, bats, furbearers (e.g., mink and weasels), porcupines, raccoons, skunks and mule deer. River otters are occasionally observed in the Hanford Reach. Beavers and muskrats rely on shoreline habitat for dens and foraging. In the spring, mule deer use Columbia River islands for fawning and nursery areas. During the summer, mule deer rely on riparian vegetation for foraging. The Columbia River and Rattlesnake Springs provide foraging habitat for many species of bats which feed on emergent aquatic insects, including myotis, small-footed myotis, silver-haired bats, and pallid bats.

3.10.3 Terrestrial Wildlife

The shrub and grassland habitat of the Monument supports a variety and abundance of wildlife that is surprising given the harsh climate. For a discussion of terrestrial wildlife habitat(s), see Section 3.9, "Plant Communities," above.

3.10.3.1 Terrestrial Invertebrates

Many species of insects occur throughout all habitats in the Monument. Because of their extraordinary diversity and intimate interactions with vegetation, insects are one of the most sensitive measures of ecosystem quality and function; however, data is often lacking with which to make comparative judgments among sites.

The Hanford Site likely represents the closest approximation to a pre-European colonization insect fauna as can be found in eastern Washington. The diverse insect fauna of the Monument was one of the resources called out in the Presidential Proclamation establishing the Monument. The source of the Monument's insect diversity and unique character can be attributed to the size, diversity and relatively undisturbed condition of its native vegetation and other natural habitat characteristics. Several groups of insects appear to be associated with areas of extensive microbiotic soil crusts; mite and *Collembola* (springtail) fauna are abundant where the crust is intact and are virtually nonexistent where the crust has been destroyed. The distribution of snow scorpionflies exhibits the same contrast: The larvae of these small insects feed on moss and are not found in areas where the crust has been degraded or destroyed.

Entomological studies of the site indicate that the Hanford Site is unusual in its lack of introduced or pest species and in its abundance of native taxa. For example, wild bees are the most commonly encountered *Hymenopterans* in the Monument, an indication of the predominance of native vegetation on the site. In the surrounding urban and agricultural landscape, the introduced domesticated honeybee is most common. Agricultural pest species, such as corn earworm, alfalfa looper, celery looper, and numerous cutworms, make up the bulk of trap samples outside of the Hanford Site; these taxa are collected only in small numbers in the Hanford Site. The native arthropod fauna of the Hanford Site provides one of the few remaining areas where potentially beneficial native insects may be sought and, perhaps, found.

In 1994 and 1995, terrestrial invertebrate inventories were conducted, concentrating on particular insect groups, including leafhoppers and their relatives, true bugs, beetles, bees and wasps, true flies, and butterflies and moths. During 1996 and 1997, inventory efforts concentrated on moths and other night-active insects attracted to light traps and on butterflies. Surveys in 1998 broadened the sampling methods to include pitfall traps. These five years of insect inventory work in the Hanford Site represent the most intensive survey of its kind of any large geographic region in Washington and one of the few studies of its type conducted in the Pacific Northwest.

Almost 40,000 specimens have been collected and identified or made available for identification through these efforts by TNC. Thus far, 1,509 species-level identifications have been completed, and at least 500 more are expected. The actual number of insect species may reach as high as 15,500. Through the insect biodiversity inventory, a total of forty-one species and two subspecies new to science have been identified and designated by world-recognized authorities. Additionally, numerous other specimens that have been collected but not yet identified may represent species new to science. The TNC surveys have resulted in the identification of 43 new taxa and 142 new findings in the state of Washington (Soll et al. 1999).

Butterflies, grasshoppers and darkling beetles are among the most conspicuous of insect species identified from specimens collected (Soll et al. 1999). Of particular interest are the butterflies and moths. Butterflies and moths (*Lepidoptera*) are one of the few groups of insects that are commonly included in biodiversity studies. Although other groups of insects offer as much

potentially valuable information, butterflies and moths are indeed noteworthy for their use in estimating diversity. This is primarily because of their association with host plants. With few exceptions, butterflies and moths are plant feeders, and many are monophagous (i.e., one host plant used as food) or restricted to a limited number of related host plants. Thus, a diverse lepidopteran fauna often corresponds to a diverse flora. On the Hanford Site, forty-nine taxa of butterflies have been identified; eight of these taxa are identified as monitor species by the state of Washington (WDFW 1998). To date, a total of 318 species of moths have been collected; twenty of these species are new to science, and fourteen species represent new state records for Washington.

Shrub-steppe habitat has a relatively distinctive arthropod fauna, which appears to vary with the amount of disturbance and degradation within the habitat. Based on invertebrate collections thus far, it appears that shrub-steppe habitats in the Wahluke and Saddle Mountain Units are more degraded than that of the ALE. Several arthropod species that were encountered in habitats south and west of the Columbia River (e.g., snow scorpionflies [*Mecoptera: Boreidae*] and a winter scarab [*Aphodius*] new species [*Coleoptera: Scarabaeidae*]) were not found north of the river. The species richness of ground-dwelling beetles is also less in the Wahluke and Saddle Mountain Units. It should be noted that invertebrate collections on the ALE were made prior to the 2000 wildfire that severely altered some shrub-steppe habitats (Evans et al. 2002). Fire has been associated with reductions in total invertebrate family richness as well as in total taxa richness of predatory, detritus-feeding, and ground-dwelling invertebrates in shrub-steppe environments at Hanford (Karr 2000).

Despite extensive and fruitful entomological diversity studies, very little is known concerning the arthropod fauna of the Monument. Species new to Washington State and new to science continue to be found. Such discoveries are likely to continue and accelerate if longer-term studies can be conducted, especially if surveys are focused on less-studied taxa. Large numbers of specimens in some of the lesser-known groups (e.g., spiders) have been collected and processed, and it is hoped that the identification and evaluation of these organisms will add significantly to an understanding of the biological diversity of the Monument. For these reasons, it is important to maintain representative native plant communities and generalized habitats, such as the few springs and riparian zones present in the Monument.

The key point about insect diversity in the Monument, however, is not that any single species is found here and no place else; rather, it is that so many species, including rare or rarely collected species, are found here. These findings indicate that the Monument still retains an assemblage of microhabitats large enough to support what at one time was a fauna typical of the arid interior West. The high diversity of insect species reflects the size, complexity and relatively undisturbed quality of the shrub-steppe habitat.

3.10.3.2 Amphibians and Reptiles

Before 1995 no comprehensive surveys had been completed on the herpetofauna of major portions of the Hanford Site. In 1995 and 1998, inventory efforts focused on a preliminary site-wide inventory to document the amphibian and reptile species present and the habitats they are using, with follow-up surveys of promising areas. An emphasis was placed on locating species of conservation concern. A total of twelve species of reptiles and five species of amphibians have been documented in the Monument (Appendix N).

Four species of amphibians and nine species of reptiles were found during the 1995 inventory. Three species—Woodhouse's toad, tiger salamander, and night snake—are Washington State monitor species. One species—the northern sagebrush lizard—is a federal species of concern. The tiger salamander was documented in the Hanford Site for the first time in 1998. Compared to other inventory research areas, few rare amphibian and reptile species were located by the inventory effort. Significantly, however, each of the typical shrub-steppe species was present in appropriate abundance, in sharp contrast to their absence or decline in other areas. Especially noteworthy was the linkage of sagebrush lizard with areas of mature sagebrush and sandy soils.

The side-blotched lizard is the most abundant reptile species occurring in the Monument. Short-horned and sagebrush lizards are reportedly found in the Monument but occur infrequently. The most common snake species include gopher snake, yellow-bellied racer, and Pacific rattlesnake. The Great Basin spadefoot toad, Woodhouse's toad, Pacific tree frog, tiger salamander, and bullfrog are the only amphibians found in the Hanford Site (Soll et al. 1999; Brandt et al. 1993).

3.10.3.3 Birds

The FWS is the principal federal agency charged with protecting and enhancing the populations and habitat of more than 800 species of birds that spend all or part of their lives in the United States. Additionally, the primary responsibility for administrating the Migratory Bird Treaty Act of 1916, its amendments, and subsequent acts lies with the FWS. Because migratory birds often cross geographical and political boundaries, their conservation depends upon actions taken by the FWS in concert with a host of participating partners, both domestic and foreign, public and private. The primary goal is to conserve migratory bird populations and their habitats and to ensure that the public continues to enjoy both consumptive and non-consumptive uses of migratory birds and their habitats (see pacific.fws.gov/mbsp/).

In addition, the FWS has been an integral partner in development of plans for bird conservation efforts under the North American Bird Conservation Initiative (NABCI). The NABCI is a tri-national initiative of the United States, Canada and Mexico to develop and implement plans for the long-term health of all bird species in all habitat regions of North America. To facilitate the initiative, the natural habitats of the continent have been mapped into sixty-seven Bird

Conservation Regions (BCR). The resulting spatial framework has been in use by the NABCI since late in 1999. Its units have nothing to do with political boundaries. Rather, each comprises a set of related and contiguous ecosystems. Region 9, the Great Basin/Columbia Basin Region, for example, is a large and complex ecological region that stretches from southern Nevada to the central interior of British Columbia. The Monument is part of BCR Region 9.

Birds are conspicuous components of the biota of an area. Their visibility, variety and abundance appeal both to scientific investigations of biodiversity and to the aesthetic, recreational and conservation interests of the general public. Thus, compared to other taxonomic groups, bird status, trends and distribution within a particular geographic area tend to be relatively well documented. Furthermore, the habitat factors responsible for species presence, absence and abundance are better understood for birds than for most other groups. These characteristics make bird inventories particularly informative about both the ecological quality of a site and its conservation importance relative to a broader region (TNC 1999).

Approximately 258 species of birds have been documented on or near the Monument, thirty-six of which are common and forty are accidental visitors (see Appendix P). The Monument provides habitat for year-round residents, migratory species that breed on the site, winter residents, and migrants that are passing through to or from breeding grounds. The upland habitats of the Monument contain regionally significant breeding populations of steppe- and shrub-steppe-dependent birds and are important to bird conservation in the Columbia Basin Ecoregion. Additionally, riparian/wetland habitat areas (including springs and seeps) contain the highest diversity of bird species in the Monument. These areas provide important stopover habitat for migratory birds, as well as breeding and post-breeding habitat for many resident species. Finally, riverine habitat along the Hanford Reach, such as islands, bluffs and sandbars, are important for a variety of nesting birds, including swallows, falcons, owls, geese, gulls, terns and waterbirds, as well as wintering habitat for a variety of species.

Mature sagebrush stands are perhaps the most important habitat in the Monument because large blocks of sagebrush in good condition are a dwindling resource in the Columbia Basin Ecoregion. Many bird species (forty-one; Soll et al. 1999) that depend on big sagebrush/ bunchgrass or bunchgrass habitats are considered sagebrush obligate species (see Table 3.1). This means that they require sagebrush to complete some part their life cycle (i.e., breeding, nesting, successful reproduction). Many species rely on sagebrush as part of their diet or for nesting, resting or hiding cover. Some species, such as the western sage grouse, now a federal candidate species for listing as threatened, were commonly hunted in the recent past.[80] Non-

[80] Greater sage grouse were historically abundant in the Hanford Site; however, populations have declined since the early 1800s because of the conversion of sagebrush-steppe habitat. Although surveys conducted by the WDFW and PNNL during late winter and early spring 1993, and biodiversity inventories conducted by TNC in 1997, did not observe greater sage grouse in sagebrush-steppe habitat at ALE, sage grouse have been observed in 1999, 2000 and 2002. The area around and including the Monument is identified as a unit for the recovery of sage grouse in the Washington State Sage Grouse Recovery Plan (WDFW 2004).

game species, such as the state candidate loggerhead shrike and sage sparrow, have fallen victim to habitat conversion and degradation.[81] The Monument provides a regional stronghold for several species of these migratory birds. Other examples of sagebrush obligate species that have significant populations in the Monument include Brewer's sparrows and sage thrashers, which are more common in the three-tip sagebrush communities at higher elevations. Although not generally considered a sagebrush-obligate species, horned larks and meadowlarks are the most abundant breeding birds in the sagebrush/bunchgrass habitats.[82]

Table 3.1. Steppe and Shrub-Steppe Obligate Species of the Columbia Basin Ecoregion.

Common Name	Scientific Name	Federal Status	State Status	Sagebrush Obligate	Hanford Abundance
Insects					
Sheridan's green hairstreak	*Callophyrys sheridanii neoperplexa*		Monitor		Rare
Reptiles					
Striped whipsnake	*Masticophis taeniatus*		Candidate	Yes	Rare
Birds					
Brewer's sparrow	*Speizella breweri*			Yes	Common
Sage grouse	*Centrocercus urophasianus*	Former candidate	Candidate	Yes	Rare
Sage sparrow	*Amphispiza belli*		Candidate	Yes	Common
Sage thrasher	*Oreoscoptes montanus*		Candidate	Yes	Rare
Mammals					
Pygmy rabbit	*Brachylagus (Sylvilagus) idahoensis*	Former candidate	Endangered	Yes	Extirpated
Sagebrush vole	*Lagurus (Lemmiscus) curtatus*		Monitor	Yes	Uncommon
Washington ground squirrel	*Spermophilus (Citellus) washingtoni*		Monitor		Undocumented

Native grasslands of the Columbia Basin Ecoregion have declined more than 85% since European settlement and have been described as an endangered ecosystem (Noss 1995). The large expanses of native bunchgrass in the Monument are a unique habitat and provide hunting, nesting and resting areas for a number of bird species. Native bunchgrass habitat is used for

[81] The Saddle Mountain and Wahluke Units together provide the greatest contiguous tract of suitable, occupied habitat for breeding sage sparrows in the state of Washington (Stepniewski 1994).

[82] Surveys conducted during 1993 (Cadwell 1994) reported the occurrence of western meadowlarks and horned larks more frequently in shrubland habitats than in other habitats in the Hanford Site.

foraging by a variety of raptors, including Swainson's hawks, golden eagles, prairie falcons, short-eared owls, red-tailed hawks, ferruginous hawks, sharp-shinned hawks, and rough-legged hawks, among others.[83] Meadowlarks, horned larks, and grasshopper sparrows, are some of the ground-nesting birds that are commonly found in bunchgrass habitat in the Monument. Burrowing owls and northern harriers have also been documented nesting and feeding in bunchgrass habitat. Long-billed curlews also prefer grassland habitats for nesting and foraging. Common upland gamebird species that occur in shrub and grassland habitat include chukar, gray partridge, California quail, and ring-necked pheasant. Chukars are most numerous in the higher elevations on the Hanford Site.

Riparian habitat is a scarce but important resource for birds in the Monument. The sharp contrast with the adjacent shrub-steppe habitat, the presence of trees, and the abundant cover make these areas focal points for predator and prey. Although the total area occupied by riparian habitat is small, the avian diversity there is higher than the surrounding shrub-steppe. Riparian habitats are used by neotropical migrants—such as western wood peewees, Say's phoebes, and western kingbirds—and resident downy woodpeckers and northern flickers. Trees are rare in the Monument landscape and therefore provide an important resource for a number of birds. Raptors will perch, hunt from, or nest in trees in the riparian zone, or they may be attracted by the presence of prey species. Barn owls, long-eared owls, great-horned owls, red-tailed hawks, sharp-shinned hawks, American kestrels, and Swainson's hawks regularly use riparian zones. Chukar, California quail, and mourning doves find abundant cover from predators in the riparian zones. Red-winged and yellow-headed blackbirds breed along watercourses. Songbirds documented using the Monument's riparian zones include ruby-crowned and golden-crowned kinglets; warbling vireos; and orange-crowned, yellow-rumped, and MacGillivray's warblers, among others. In the winter, riparian zones are used by dark-eyed juncos, white-crowned sparrows, Townsend's solitaires, and other species (LaFramboise and LaFramboise 1998).

Riverine habitat along the Hanford Reach is used extensively by mallards, Canada geese, and other waterfowl for wintering and the island habitats for nesting. Great blue herons, great egrets, black-crowned night-herons, and other water-related birds have been noted using the river corridor and islands. Double crested cormorants, American white pelicans, several species of gulls, and terns also use these areas. This riverine habitat provides essential wintering habitat for bald eagles, American white pelicans, and many species of waterfowl.

Thirty-eight bird species recorded during recent surveys, including eighteen known to breed within the Monument, are considered species of conservation concern at a state or federal level, or are known or suspected to be declining. Several of these species are closely associated with sagebrush/grassland habitats. Further, many birds, especially migratory species, rely on riparian

[83] In 1994, nesting by red-tailed, Swainson's, and ferruginous hawks included forty-one nests located across the Hanford Site on high-voltage transmission towers, trees, cliffs and basalt outcrops. In recent years, the number of breeding ferruginous hawks (a Washington State threatened species) in the Hanford Site has increased, a result, in part, to their use of steel powering towers in the open grass and shrubland habitats for nesting.

vegetation or other water-based habitats for some or all of their life cycle. These species have declined as the Columbia River has been converted into a series of reservoirs, and the vegetation along smaller creeks, springs and rivers has been degraded by agriculture and domestic livestock grazing. The remaining habitats offered by the Monument play an important role in preserving this species into the future.

3.10.3.4 Mammals

The Monument provides for an abundance of mammals, although the number of species (species diversity) is limited as compared to more temperate habitats. A total of forty-four species of mammals have been conclusively documented in the Monument; however, it is quite possible that others (such as additional bat species) use the refuge but have not yet been documented. There was a reported sighting of a cougar on the ALE by biologists during an elk relocation effort in March 2000, supplementing other anecdotal accounts of cougar on the Hanford Site. Species present include large game animals such as Rocky Mountain elk and mule deer; predators such as coyotes, bobcats and badgers; and small herbivores like deer mice, harvest mice, ground squirrels, voles, black-tailed jackrabbits, and the Great Basin pocket mouse, the most abundant mammal in the Monument.

There are twelve mammal species potentially present in the Hanford Site that are identified as species of conservation concern (see Tables 3.2 and 3.3) and several species that are important because of their status as game animals (elk, mule deer, and white-tailed deer) or their significance to local Native American tribes. Recent inventories by TNC (1995-1999) specifically targeted searches for species that had not been previously documented in the Hanford Site, as well as federal and state species of concern.

Small mammals present in the Hanford Site have been well documented (TNC 1999; Downs et al. 1993; Fitzner and Gray 1991; Rickard and Poole 1989). Fourteen native, non-bat, small mammal species were documented during biodiversity inventories (TNC 1999). Surveys for Ord's kangaroo rat, Merriam's shrew, and pygmy rabbit have, to date, been negative. However, potential habitat for these species exists in the Monument. In 1998, for example, inventory work confirmed the presence of the state candidate Washington ground squirrel just north of the crest of the Saddle Mountains and along State Route 24 on the Wahluke Slope. This was the first time this species has been documented to occur in the Monument. Still, even previously documented species (i.e., Merriam's shrew, sagebrush vole, and Townsend's ground squirrel) seem to be limited in their distribution in the Monument. The limited distribution of Merriam's shrew and sagebrush vole demonstrates the importance of the ALE, Umtanum Ridge, and other remnant high-quality big sagebrush/bluebunch wheatgrass and three-tip sagebrush plant communities.

Despite the limited results regarding the number of species observed, many findings from the small mammal inventory are noteworthy. By habitat area/plant community type, capture rates

and biodiversity were highest in native shrub-steppe, in particular the bitterbrush/Indian ricegrass dune complex and big sagebrush/needle-and-thread communities. Both of these community types have received the highest protection priority ranking assigned by the WNHP. The capture rates within these two community types were eight to twelve times higher than the rate observed in disturbed communities dominated by cheatgrass. Native habitats provide greater structure for thermal and hiding cover, as well as greater forage availability and nutrition (foliage and seed crops), to mammals than disturbed communities.

A total of nine bat species are documented in the Hanford Site. It is possible that one other species also occurs; the California myotis has been noted as possibly occurring in the Hanford Site. The western pipistrelle, pallid bat, and western small-footed myotis are identified as species of conservation concern by the FWS and the WDFW. The White Bluffs, Columbia River, ponds, mature trees, and all cliff structures are important for bats at in the Monument.

Deer and elk are important for recreational hunting opportunities and are culturally important to Native American tribes. Other tribally important species include, but are not limited to, American beaver, muskrat, common porcupine, and coyote. These larger mammal species also depend on mature shrub habitats for thermal cover in both winter and summer (shade), and many use mature shrub for forage (browse). Grasslands are critical for grazing animals, such as elk, and natural springs are an extremely important habitat for providing fresh water to the majority of mammal species in the Monument.

3.10.4 Unique/Rare Habitats and Associated Wildlife

One of the greatest values of the Monument is its blend of a wide variety of habitats within a desert environment. Unique/rare habitats in the Monument include bluffs, dunes and islands. In addition, while not rare within the Columbia Basin, the White Bluffs, Umtanum Ridge, and Gable Mountain include rock outcrops that occur infrequently on the Hanford Site. Plant communities dominated by buckwheat and Sandberg's bluegrass most often occupy these basalt outcrops.

Bluffs provide perching, nesting and escape habitat for several bird species on the Monument. The White Bluffs and Umtanum Ridge provide nesting habitat for prairie falcons, red-tailed hawks, cliff swallows, bank swallows, and rough-winged swallows. In the past, Canada geese used the lower elevations of the White Bluffs for nesting and brooding. Bald eagles use the White Bluffs for roosting. Bluff areas provide habitat for sensitive species (i.e., peregrine falcons) that otherwise may be subject to impact from frequent or repeated disturbance. Trees that do not normally occur in arid steppe habitat supply nesting, perching and roosting sites for bird species; raptors like ferruginous and Swainson's hawks use trees for breeding in areas that previously did not support breeding populations. Ferruginous hawks also nest on electrical transmission line towers.

Dune habitat in the Monument is unique in its association with the surrounding shrub-steppe vegetation type and its vegetation component. Snow buckwheat and Sandberg's bluegrass/ cheatgrass communities dominate the large dune area north of the Energy Northwest complex along the Columbia River shoreline. Here, the terrain of the dune habitat rises and falls between ten and sixteen feet above ground level, creating areas that range from 2.5 to several hundred acres in size. These dunes are vegetated by bitterbrush, scurfpea and thickspike wheatgrass. The dune fields provide habitat for mule deer, burrowing owls, and coyotes, as well as many transient species, and are very important for maintaining large populations of sagebrush lizard in the Monument.

Islands afford an additional arrangement of upland and shoreline habitat for avian and terrestrial species. Island habitat accounts for approximately 1.8 square miles and 39.9 miles of river shoreline within the main channel of the Hanford Reach. Islands vary in soil type and vegetation and range from narrow cobble beaches to extensive dune habitats, further increasing habitat complexity. Characteristic shoreline vegetation on the islands includes willow, poplar, Russian olive, and mulberry.[84] Species occurring on the island interior include buckwheat, lupine, mugwort, thickspike wheatgrass, giant wildrye, yarrow and cheatgrass.

Except for several plant species, the islands accommodate many of the same wildlife species that occur in mainland habitats. Islands provide resting, nesting and escape habitat for waterfowl and shorebirds. Use of islands for nesting by Canada geese has been monitored since 1950. While fluctuating annually, the nesting success of Canada geese is quite high and is attributed to restricted human use of islands during the nesting season, suitable substrate, and adequate forage and cover for broods (Eberhardt et al. 1989). In recent years, geese have used the downstream islands in the Hanford Reach for nesting as a result of coyote predation in the upper islands. Islands also accommodate colonial nesting species, including California gulls, ring-billed gulls, and Forster's terns. Island areas ranging from 0.05 to 0.08 square miles accommodate colonial nesting species that may range in population size of upward of 2,000 individuals. Mule and white-tailed deer also use the islands during calving as protection from coyotes. Unfortunately, operation of the Priest Rapids Dam upstream of the Hanford Reach creates daily and seasonal river level fluctuations that may limit community structure and overall shoreline species viability along the shoreline interface.

3.11 Threatened and Endangered Species

The Endangered Species Act (ESA) provides protection and recovery efforts for plant and animal species listed as threatened or endangered. T&E plants and animals identified in the

[84] Before regulation of river flows by dams, trees were not found along river shoreline habitat, with the exception of small willows.

Monument, as listed by the federal government and Washington State, are shown in Table 3.2 (see also Map 20 and Section 3.12.2). The upper Columbia River steelhead (endangered) and spring-run Chinook salmon (endangered) are currently the only species found on the federal list of threatened and endangered species that are regularly present on the Monument. The Columbia Basin pygmy rabbit was emergency listed as federally endangered in November 2001; however, they may be extirpated from the Monument. No other federally listed threatened or endangered species are known to occur regularly in the Monument, although several additional species of both plants and animals are under consideration for formal listing by the federal government and/or the state.[85, 86]

3.11.1 Plants

There are no plant species listed by the federal government as threatened or endangered, although three species—persistent-sepal yellowcress, Umtanum desert buckwheat, and White Bluffs bladderpod—are under consideration for formal listing. One additional species, northern wormwood, is a candidate for listing, and although there are no known occurrences on the Hanford Site, TNC believes islands in the Hanford Reach could support populations.[87]

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[85] **This footnote applies to both plants and animals (see Section 3.11).** Federal candidate species are those that may warrant listing as endangered or threatened. The FWS defines a candidate species as a species for which there is sufficient information on file relative to status and threats to support issuance of a proposed listing. The NOAA-Fisheries defines a candidate species as a species for which concerns remain regarding their status, but for which more information is needed before it can be proposed for listing. On February 28, 1996, the FWS redefined the federal candidate species category (61 FR 7595). As a result, several former categories of candidate species were eliminated; the previous Candidate 1 category is now the only remaining category. Many species previously included in the now eliminated categories are presently tracked as species of concern by state and local offices of the FWS. Thus, the conservation standing of these species is still of concern to the FWS; however, their identification as such is no longer being published in the *Federal Register*, and they do not receive any formal recognition or protection under the ESA. Lists of species of concern are generated and maintained through partnerships between the FWS and appropriate federal and state agencies and private organizations. Plant species identified herein as federal species of concern are based on a list provided by the Spokane Office of the FWS.

[86] The FWS reviews the status of candidate species for ESA listing on an annual basis. The results of these reviews are posted on the FWS homepage (www.fws.gov). Anadromous fish are reviewed and listed by the NOAA-Fisheries (www.nwr.noaa.gov).

[87] Legal protections for species of concern differ between plant and animals. Although legal protections for federally listed or proposed (for listing) plant species, insofar as they address plants found on federal property, are similar to that for animals, protection is limited on non-federal lands (i.e., state and private) to situations in which either federal funding or the requirement for a federal permit is involved. Legal protection for state-listed species in Washington is even more limited. There are no Washington State laws that specifically recognize endangered or threatened plants or afford them any protection on any lands; however, the WNHP does identify and track the status of species deserving of such status (WDNR 1994).

Table 3.2. Federal or Washington State Threatened and Endangered Species on the Monument.

Common Name	Scientific Name	Federal[a]		State[a]
Plants				
Awned halfchaff sedge	*Lipocarpha aristulata*			T
Desert dodder	*Cuscuta denticulata*			T
Geyer's milkvetch	*Astragalus geyeri*			T
Great Basin gilia	*Gilia leptomeria*			T
Scarlet ammannia	*Ammannia robusta*			T
Loeflingia	*Loeflingia squarrosa* var. *squarrosa*			T
Persistentsepal yellowcress	*Rorippa columbiae*	SC		E
Rosy calyptridium	*Calyptridium roseum*			T
Toothcup	*Rotala ramosior*			T
Umtanum desert buckwheat	*Eriogonum codium*	C	E	
White Bluffs bladderpod	*Physaria tuplashensis*	C	T	
White eatonella	*Eatonella nivea*			T
Fish				
Bull trout	*Salvelinus confluentus*	T	C	
Spring-run Chinook	*Oncorhynchus tshawytscha*	E	C	
Steelhead	*Oncorhynchus mykiss*	E	C	
Birds				
American white pelican	*Pelecanus erythrorhychos*			E
Ferruginous hawk	*Buteo regalis*	SC		T
Sandhill crane	*Grus canadensis*			E
Western sage grouse	*Centrocercus urophasianus phaios*	C	T	
Mammals				
Pygmy rabbit[c]	*Brachylagus idahoensis*	E	E	

Notes:

[a] E = Endangered (species in danger of extinction within all or a significant portion or its range).
T = Threatened (species likely to become endangered in the foreseeable future).
C = Candidate (species that are believed to qualify for threatened or endangered species status but for which listing proposals have not been prepared).
SC = Species of concern (species that are not currently listed or candidates under the ESA but are of conservation concern within specific FWS regions).

[b] Currently under review for change in status.

[c] Probably extirpated.

Within the state of Washington, *rare plant species* refers to any vascular plant species listed by the WNHP as endangered, threatened, or sensitive in the state. Fifteen plant species occurring on the Monument and previously without a conservation status were assigned a status that ranges from Review Group 1 to endangered. Four additional species were upgraded (i.e., assigned to a category of increased conservation concern), and four others were downgraded. Because these definitions apply to vascular plant taxa, they can be applied at the taxonomic rank of either subspecies or variety, as well as to species. In the remainder of this section and the EIS, the term

taxon (or the plural *taxa*) is used when not otherwise referring specifically to a species. The status categories are listed and described below.

- ***Endangered.*** The taxon is in danger of becoming extinct or extirpated (i.e., locally extinct) in Washington within the near future if factors contributing to its decline continue.

- ***Threatened.*** The taxon is likely to become endangered in Washington within the near future if factors contributing to its population decline or habitat degradation or loss continue.

- ***Sensitive.*** The taxon is vulnerable or declining in numbers and could become endangered or threatened in Washington without active management or removal of threats.

Twelve species of Hanford Site plants are listed in Washington State as threatened or endangered, nine within the Monument and two in Central Hanford. Many of the listed threatened plants are limited in range and dependent on protection of specific habitat types and associations. Several are perennial plants that exist is discrete locations, while others are annual plants that require specific climatic conditions, disturbance patterns, and habitat features in order for populations to be maintained. Umtanum desert buckwheat, which occurs in localized small populations on Umtanum Ridge, and the White Bluffs bladderpod, which occurs on the White Bluffs, are found only in the Hanford Site and nowhere else in the world (Soll et al. 1999). Persistentsepal yellowcress occurs in the wetted zone of the water's edge along the Hanford Reach and in Washington is limited to this portion of the Columbia River and one other site below Bonneville Dam. Several other of the state-listed threatened and endangered plant species (awned halfchaff sedge, scarlet ammannia, and lowland toothcup) are restricted to wetlands in the riparian zone of the Columbia River. Three of the state-listed plant species (Geyer's milkvetch, white eatonella, and desert dodder) have been found at upland sites on the Wahluke Slope. Loeflingia and rosy calyptridium, both state threatened species, are small annuals that have been found in relatively undisturbed sagebrush areas around Gable Mountain on Central Hanford.[88]

Two additional species of listed plants are considered as possible inhabitants of the Hanford Site. Northern wormwood (federal candidate) is a Washington State endangered species. It is known to occur near Beverly; however, surveys by TNC (Soll et al. 1999) did not find any occurrences along the northern shoreline of the Columbia River. TNC believes the only remaining portions of the Hanford Site that could support northern wormwood are islands in the Hanford Reach.

[88] The highest rare plant densities occur on the eastern end of Umtanum Ridge, the McGee Ranch/Riverlands Unit, basalt-derived sands near Gable Mountain, the White Bluffs, Rattlesnake Mountain, Yakima Ridge, and within riparian communities along the Hanford Reach.

Similarly, Wanapum crazyweed is only found near the western end of the Saddle Mountains and could also be found in the Hanford Site. This plant is a federal species of concern and is listed as endangered by the state of Washington.

None of the species known to be present on the Hanford Site that are on the rare plant species list are presently federally listed. Several, however, are identified as federal candidates for listing or are species of concern (see Table 3.3).

Plant species of concern are best protected by protecting locations in which they occur or could potentially occur. In large measure, this can be accomplished by protecting areas that contain intact native plant communities.

3.11.2 Animals

Steelhead and salmon are regulated as Evolutionary Significant Units (ESU) by the National Oceanic and Atmospheric Administration-Fisheries (formerly the National Marine Fisheries Service) based on their historic spawning areas. The upper Columbia River ESU steelhead was listed as endangered in August 1997, and the Mid-Columbia ESU steelhead was listed as threatened on March 25, 1999. The upper Columbia River ESU spring-run Chinook salmon was listed as endangered in March 1999. These adult steelhead and Chinook salmon migrate upstream through the Hanford Reach to spawn in upriver tributaries, and juveniles pass through the Hanford Reach on their outward migration to the sea. A salmon and steelhead management plan (DOE 2000) for Hanford Reach steelhead and upriver Columbia River ESU spring-run Chinook was developed as required by Section 7(a)(2) of the Endangered Species Act (ESA).

Although the current distribution of pygmy rabbit in Washington does not include the Hanford area, it has been reported as residing on the ALE (Fitzner and Gray 1991). However, this observation is based on only one reported sighting in 1979; this species has been searched for on the Hanford Site but has never been conclusively observed.

Other federally listed species have been reported in very rare instances on or near the Hanford Site. The bull trout, a state candidate species and federal threatened species, has been reported in the Hanford Reach, but its natural habitat is mountain streams; anecdotal accounts of bull trout in the Hanford Reach are likely individuals moved downstream during the spring freshet. The Washington ground squirrel, listed as a candidate species by both the state and federal governments, was recently documented just north of the crest of the Saddle Mountains. Peregrine falcons are occasionally seen in the Hanford Site during migration but are no longer listed as a state or federal endangered species.

Table 3.3. Washington State Candidate and Sensitive Animal Species on the Monument.

Common Name	Scientific Name
Molluscs	
Giant Columbia River limpet (aka Shortface lanx)	*Fisherola* (*Lanx*) *nuttalli*
Giant Columbia River spire snail[a]	*Fluminicola* (*Lithoglyphus*) *columbiana*
Fish	
Bull trout[c,f]	*Salvelinus confluentus*
Mountain sucker[f]	*Catastomus platyrhynchus*
Leopard dace[f]	*Rhinichthys flacatus*
River lamprey[f]	*Lampetra ayresi*
Spring-run Chinook[b]	*Oncorhynchus tshawytscha*
Steelhead[b]	*Oncorhynchus mykiss*
Insects	
Columbia River tiger beetle	*Cicindela columbica*
Birds	
Burrowing owl[a]	*Athene cunicularia*
Common loon[g]	*Gavia immer*
Flammulated owl[f]	*Otus flammeolus*
Golden eagle	*Aquila chrysaetos*
Lewis' woodpecker[f]	*Melanerpes lewisii*
Loggerhead shrike[a]	*Lanius ludovicianus*
Peregrine falcon[a,g]	*Falco peregrinus*
Merlin	*Falco columbarius*
Northern goshawk[a,f]	*Accipter gentilis*
Sage sparrow	*Amphispiza belli*
Sage thrasher	*Oreoscoptes montanus*
Western grebe	*Aechmorus occidentalis*
Reptiles	
Sagebrush lizard[a]	*Sceloporus graciosus*
Striped whipsnake	*Masticophis taeniatus*
Mammals	
Black-tailed jackrabbit	*Lepus californicus*
Merriam's shrew	*Sorex merriami*
Townsend's ground squirrel	*Spermophilus townsendii*
Washington ground squirrel[d,f]	*Spermophilus washingtoni*
White-tailed jackrabbit	*Lepus townsendii*

Notes:

[a] Federal species of concern.
[b] Federal endangered.
[c] Federal threatened.
[d] Federal candidate for listing.
[e] Probable, but not observed, in the Monument.
[f] Reported, but seldom observed, in the Monument.
[g] State Sensitive (i.e., taxa vulnerable or declining) and could become endangered or threatened without active management or removal of threats.

Washington State lists the American white pelican and sandhill crane as endangered and lists the ferruginous hawk, greater sage grouse, and bald eagle as threatened. Sage grouse were sighted on ALE in 1999 and 2000 but have been observed only once since then. Pelicans have become residents but are not known to nest here, and sandhill cranes have been occasionally observed in the Hanford Reach during spring migrations. Ferriginous hawks are known to nest and maintain breeding territories in several areas, including rock outcroppings, cliffs and metal transmission towers; the nesting population at Hanford represents roughly 20% to 25% of the breeding population in Washington State (Downs et al. 1993, Fitzner et al. 1994).

There are several Washington State candidate species that have been reported in the Hanford Site. Decline of shrub-steppe habitat statewide has resulted in the designation of black-tailed and white-tailed jackrabbits, Townsend's and Washington ground squirrels, and Merriam's shrew as state candidate species.

3.12 Special-Status Species and Communities

The Monument is home to many sensitive plant communities and species that are not officially listed by federal or state agencies as threatened or endangered but are of management concern within the state of Washington. This includes plant communities; rare plants, invertebrates, amphibians, reptiles, fish, birds and mammals; species new to science; and recreational/ commercially important species. Special-status species are species that are known to occur in the Monument, have historically occurred in the Monument, or have potential habitat that exists in the Monument.

3.12.1 Plant Communities

See also Section 3.9, "Plant Communities."

The Monument contains many endemic plant communities and species that have been lost or significantly reduced throughout all or a significant portion of their range. Map 17 shows approximate locations of sensitive plant communities and identified element occurrences in the Monument. Many plant communities have been ranked as either important, locally or statewide, or globally significant because of their rarity, or other factors making them very vulnerable to extirpation and extinction. Sensitive plant communities have been defined as those that are native plant communities within the Columbia Basin Ecoregion and have been identified as either state ranked, globally rare, or ecologically significant within western shrub-steppe environments; have been significantly diminished throughout their range due to past and present management actions (grazing, agricultural development, urbanization, wildfire) and serve as

important habitat for resident and migratory wildlife species; and could be significantly damaged or lost through major disturbances (i.e., wildfire) and require some additional protection considerations within the CCP. This loss would be significant within the context of regionally important plant communities for the longevity of wildlife species and potential reintroduction sites for listed species. Additionally, significant disturbance within these plant communities would lead to the rapid spread of non-native invasive species that would further threaten their ecological integrity and importance for effective wildlife habitat.

In 1994, TNC evaluated the ALE and Wahluke Units for each occurrence of a plant community type considered by the WNHP to be an "element" (i.e., a high-quality representative of a native plant community type) (TNC 1995a). Each element was evaluated as to its condition, size and proximity to disturbance vectors such as roads, power lines, off-road vehicle trails, or livestock grazing. Three factors formed the basis for the condition evaluation.

- The degree of invasion by non-native plant species.

- The composition of the community compared to descriptions by Daubenmire (1970), the WNHP, or other occurrences of the same element.

- The degree of soil disturbance and amount of microbiotic crust cover. TNC identified as potential element occurrences only those that met high-quality standards associated with the evaluation factors described above. The WNHP subsequently reviewed TNC evaluation results and made the final determination as to which occurrences qualified as element occurrences.

A total of forty-eight separate terrestrial plant communities, representing seventeen elements recognized by the WNHP, qualified as element occurrences. The seventeen elements constitute about 40% of all the terrestrial elements found in the Columbia Basin of Washington (WDNR 1995). Only three elements are common to both the ALE Unit and the Wahluke Unit. This indicates that to protect the full range of element diversity, both the ALE Unit and the Wahluke Unit must be considered. The element occurrences occupy about 45,170 acres of the ALE Unit and about 15,540 acres of the Wahluke Unit. The large sizes and excellent conditions of the big sagebrush/bluebunch wheatgrass community (ALE Unit) and the bitterbrush/Indian ricegrass sand dune complex (Wahluke Unit) are especially noteworthy (TNC 1995a).

TNC conducted additional fieldwork along the south shore of the Hanford Reach during 1995. As a result, six potential element occurrences of low elevation riparian wetlands were identified (Salstrom and Easterly 1995). The WNHP subsequently determined that all six qualified as element occurrences.

Table 3.4. Sensitive Plant Communities.

Species	Density Levels Recorded
Shrubs	
Stiff sagebrush (*Artemisia rigida*)	1,2,3
Big sagebrush (*Artemisia tridentata*)	1,2,3
Saltsage (*Atriplex nuttallii* var. *falcata*)	1
Grey rabbitbrush (*Ericameria nauseosus*)	1,2
Green rabbitbrush (*Chrysothamnus viscidiflorus*)	1,2
Snow buckwheat (*Eriogonum niveum*)	1,2
Rock buckwheat (*Eriogonum sphaerocephalum*)	1,2,3
Winterfat (*Eurotia lanata*)	1,2,3
Spiny hopsage (*Grayia spinosa*)	1,2,3
Antelope bitterbrush (*Purshia tridentata*)	1,2,3
Grayball sage (*Salvia dorrii*)	1,2,3
Grasses	
Crested wheatgrass (*Agropyron cristatum*)	1,2,3
Cheatgrass (*Bromus tectorum*)	2,3
Prairie junegrass (*Koeleria cristata*)	1,2,3
Indian ricegrass (*Achnatherum hymenoides*)	1,2,3
Bulbous bluegrass (*Poa bulbosa*)	2,3
Sandberg's bluegrass (*Poa secunda*)	2,3
Bluebunch wheatgrass (*Pseudoroegnaria spicata*)	1,2,3
Sand dropseed (*Sporobolus cryptandrus*)	1,2,3
Needle-and-thread grass (*Hesperostipa comata*)	1,2,3
Forbs	
Carey's balsamroot (*Balsamorhiza careyana*)	2

Notes:

The densities recorded were: 1 = low cover (present to approximately 5%); 2 = irregular or clumpy, intermediate cover; and 3 = relatively even, moderate to dense cover. Where density levels of 3 were not recorded, levels 2 and 3 were not distinguished and cover greater than about 5% was recorded as level 2.

Poa secunda and *Bromus tectorum* are widespread in most of the drier cover types within shrub-steppe, with the latter particularly dominant on south-facing slopes. While attempts were made to indicate their relative distributions, in many (most) cases they varied on a fine scale. Extrapolations were therefore made from trends observed on the landscape, and accuracy will generally be greater on a landscape scale rather than at any one mapped polygon.

3.12.2 Rare or Sensitive Plants

See also Section 3.11.1.

During three years of fieldwork by TNC and others, a total of 112 populations/occurrences of twenty-eight rare plant taxa, as defined by the state of Washington (see Section 3.11.1), were

located in the Hanford Site. Twenty-three of these taxa were not previously known to exist in the Hanford Site. In addition, numerous populations of seventeen taxa were not previously known in Washington State or were otherwise of botanical interest and potentially of conservation and management concern. When rare plant occurrences located before 1994 are included, a total of 127 populations/occurrences of thirty rare plant taxa are now documented on the Hanford Site. This is a tremendous amount of rare plants, both in terms of species richness and abundance, to occur in an area the size of the Hanford Site. A complete list of all taxa observed in the various management areas in the Hanford Site during the 1994, 1995 and 1997 field surveys is provided in Caplow and Beck (1997). This list of 508 plant taxa includes eighty-five plant taxa unknown in the Hanford Site before 1994 surveys and can be considered an addendum to Sackschewsky and Downs (2001). The highest rare plant densities occur on the eastern end of Umtanum Ridge, the McGee Ranch/Riverlands Unit, basalt-derived sands near Gable Mountain, the White Bluffs, Rattlesnake Mountain, Yakima Ridge, and within riparian communities along the Hanford Reach.

During 1997, eight special habitat areas were delineated. These areas encompass habitat for populations of certain rare plant species, generally annuals, whose locations are patchy, whose habitat is dynamic (e.g., dune fields), and whose occurrence may vary over time in response to changes in weather patterns. Special habitat areas are mostly located in proximity to the basalt ridges of Central Hanford. Among the most interesting special habitat areas are three previously undocumented clusters of approximately twenty vernal pools. Each cluster contains one or more rare plant species. Vernal pools in Washington are little known or studied, and their occurrence in Hanford is significant. The Hanford Site pools are located on the eastern end of Umtanum Ridge, near Gable Butte, and on Gable Mountain.

Table 3.5 lists Washington State plant species of concern that are currently listed as sensitive or are in one of three monitored groups. In addition to the eleven species that are identified as threatened or endangered in Washington State, thirty-two species of rare plants have been documented to be present in the Hanford Site (forty-three rare plant species total). These species are either Sensitive, Review Group 1, Review Group 2, or Watch List in the state of Washington. Four of these species are considered by the FWS to be species of concern in the Columbia River Basin Ecoregion.

Map 17 shows the approximate locations of populations of the plant species of concern. The map is not intended to represent all areas where plant species of concern may be present; rather, the figure shows only general locations where the presence of individual plant subpopulations or populations have been documented. Even areas that have been surveyed potentially could contain other plant species of concern. For example, certain rare annual and/or early flowering plants that are sensitive to the drought conditions that were present during the early part of 1994 may have been missed during the TNC surveys (TNC 1995a). Those areas searched by TNC during 1994, 1995 and 1997 are depicted in TNC (1995a), Caplow and Beck (1996), and Hall (1998), respectively. These reports also can be referenced for more detail about specific species.

Table 3.5. Washington State Plant Special Status Species on the Monument.

Common Name	Scientific Name	State Listing[a]
Annual paintbrush	*Castilleja exilis*	W
Annual sandwort	*Minuartia pusilla* var. *pusilla*	R1
Beaked spike-rush	*Eleocharis rostellata*	S
Bristly combseed	*Pectocarya setosa*	W
Canadian St. John's wort	*Hypericum majus*	S
Chaffweed	*Centunculus minimus*	R1
Columbia milkvetch	*Astragalus columbianus*	S[b]
Columbia River mugwort	*Artemisia lindleyana*	W
Coyote tobacco	*Nicotiana attenuata*	S
Crouching milkvetch	*Astragalus succumbens*	W
Desert evening-primrose	*Oenothera caespitosa* ssp. *caespitosa*	S
Dwarf evening primrose	*Camissonia* (*Oenothera*) *pygmaea*	S
False pimpernel	*Lindernia dubia* var. *anagallidea*	W
Fuzzytongue penstemon	*Penstemon eriantherus* var. *whitedii*	S
Giant helleborine	*Epipactis gigantea*	W
Gray cryptantha	*Cryptantha leucophaea*	S[b]
Great Basin gilia	*Gilia leptomeria*	S
Hedge hog cactus	*Pediocactus nigrispinus*	R1
Hoover's desert parsley	*Lomatium tuberosum*	S[b]
Medic milkvetch	*Astragalus speirocarpus*	W
Desert cryptantha (miner's candle)	*Cryptantha scoparia*	S
Mousetail	*Myosurus clavicaulis*	S
Piper's daisy	*Erigeron piperianus*	S
Porcupine sedge	*Carex hystericina*	W
Rattlesnake Mountain milk-vetch	*Astragalus conjunctus* var. *rickardii*	W
Robinson's onion	*Allium robinsonii*	W
Rosy balsamroot	*Balsamorhiza rosea*	W
Scilla onion	*Allium scilloides*	W
Shining flatsedge	*Cyperus bipartitus (rivularis)*	W
Small-flowered evening-primrose	*Camissonia* (*Oenothera*) *minor*	S
Small-flowered nama	*Nama densum* var. *parviflorum*	W
Small-flowered hemicarpha	*Lipocarpha* (*Hemicarpha*) *aristulata*	T
Smooth cliffbrake	*Pellaea glabella* var. *simplex*	W
Snake River cryptantha	*Cryptantha spiculifera* (*C. interrupta*)	S
Southern mudwort	*Limosella acaulis*	W
Stalked-pod milkvetch	*Astragalus sclerocarpus*	W
Suksdorf's monkey flower	*Mimulus suksdorfii*	S
Thompson's sandwort	*Eremogone franklinii* var. *thompsonii*	R1
Winged combseed	*Pectocarya penicillata*	W

Notes:

[a] S = Sensitive (i.e., taxa vulnerable or declining) and could become endangered or threatened without active management or removal of threats.

R1 = Review List 1, taxa for which there are insufficient data available to support listing as threatened, endangered, or sensitive.

R2 = Review List 2, taxa with unresolved taxonomic questions.

W = Watch List, taxa that are more abundant and/or less threatened than previously assumed.

[b] FWS Columbia Basin federal species of concern.

3.12.3 Plant Species New to Science

In addition to the overall diversity of rare plant species and the abundance of rare plant occurrences/populations in the Hanford Site, one of the highlights of the rare plant surveys was the discovery of two plant species and one variety of a species that are new to science—Umtanum desert buckwheat, White Bluffs bladderpod, and Rattlesnake Mountain milk-vetch, respectively.

3.12.3.1 Rattlesnake Mountain Milkvetch (Basalt Milkvetch)

Rattlesnake Mountain milkvetch, variety *rickardii*, a relatively common milkvetch on the north-facing slopes and summit of Rattlesnake Mountain, has been determined to be a new variety. For many years prior to this determination, it was mistakenly referred to as the variety *reventiformis* (Yakima milkvetch). On the Monument, the milkvetch is scattered in bunchgrass areas along the main ridges of Rattlesnake Mountain where the population includes several tens of thousands of plants. However, the population remains incompletely mapped. The two known locations of the plant are both in Benton County—the large population on Rattlesnake Mountain and a small population in the Chandler Butte portion of the Horse Heaven Hills. The Monument's population is entirely within the boundaries of the ALE, where it benefits from very limited access and low disturbance. Maintenance of public ownership and current access levels are the most likely methods to ensure the long-term survival and viability of this plant.

3.12.3.2 Umtanum Desert Buckwheat

Previous to the 1995 biodiversity surveys, this species had never been described. Currently it is listed as endangered by the state of Washington and identified as a candidate for listing by the FWS. Despite some mortality from a fire in 1996, there is an estimated population of 5,200 plants. Some individual plants are estimated to be well over 100 years old. Several state-listed species—Hoover's desert-parsley, Columbia milk-vetch, and Piper's daisy—occur within the vicinity of the newly discovered population, as does a population of Great Basin gilia, previously not known in Washington.

Umtanum desert buckwheat appears to be restricted to a discontinuous mile-long strip generally less than 100-feet wide on the McGee Ranch. This is within an area receiving little use and is officially not accessible to the public. However, fences in the area are regularly cut and trespassing occurs. A portion of the site has visible petrified wood, and there are signs of collecting within the buckwheat population. Long-term demographic monitoring was initiated on this species in 1997.

3.12.3.3 White Bluffs Bladderpod

This species was first described on the Hanford Site in 1994 biodiversity surveys. It is listed as threatened by the state of Washington and identified as a candidate for listing by the FWS. The total count of adult plants in 1997 was estimated to be 50,000 plants spread across an eight-mile-long occurrence. Several other rare plant populations exist in the immediate area, including dwarf evening primrose, Piper's daisy, Snake River cryptantha, and desert dodder.

The White Bluffs are a unique exposure of the Ringold Formation; the bluffs are made of soft Pliocene lacustrine deposits of clay, sand and silt (Newcomb 1958). The top is capped in many places by a harder calcium carbonate (caliche) layer (Lindsey 1994). White Bluffs bladderpod appears to be restricted to this caliche layer. Most of the population is outside the Hanford Reach corridor (technically 0.25 mile on either side of the river).

The primary threats to the bladderpod population are erosion, conversion of habitat, weed invasions, or slumping of the bluffs due to illegal off-road vehicle use or irrigation. Infestations of yellow starthistle, a noxious weed, are located within the middle portion of the bladderpod population. The protection of this population, and thus the species, requires that these issues be addressed in any management action. Long-term demographic monitoring was initiated on this species in 1997.

3.12.4 Invertebrates

See also Section 3.10.3.1, "Terrestrial Invertebrates."

A large effort to document and identify invertebrate biodiversity was conducted by TNC during a biodiversity inventory effort in 1995-1999. These surveys focused on terrestrial invertebrates, lepidoptera (butterflies and moths), and some aquatic invertebrates, including some molluscs. Insect diversity is high, the result of the size, complexity and relatively undisturbed quality of the shrub-steppe habitat.

Umtanum Ridge and the shorelines of the Hanford Reach have been identified previously, because of their butterfly diversity, to be of particular importance for Washington butterfly conservation (Pyle 1989). Results from TNC surveys indicate Rattlesnake Ridge also supports a fauna, similar to Umtanum Ridge, of uncommon butterflies (TNC 1995a).

Aquatic invertebrate species of concern are currently limited to those found in the Hanford Reach (Frest and Johannes 1993). (However, a spring area on Umtanum Ridge also contains an endemic land snail not known from any other location.) Detailed ecological and distributional information about the shortface lanx and Columbia pebblesnail in the Columbia River Basin can be found in Neitzel and Frest (1993). Frest and Johannes (1993) speculate that the relatively

sparse nature of Hanford's mollusc fauna (both freshwater forms and land snails) is due to the presence of only a few streams in a large area that possess few continuous or seasonal connections. Moreover, they also speculate that human modification of the spring/stream systems during the early part of the twentieth century may have caused certain species to be extirpated from the Hanford Site.

3.12.5 Amphibians and Reptiles

See also Section 3.10.3.2, "Amphibians and Reptiles."

A TNC biodiversity inventory focused surveys to attempt to document the biodiversity of amphibians and reptiles on the Hanford Site; this inventory is the most comprehensive account to date of herptofauna. Although distribution and abundance are not comprehensively recorded, relative abundance and habitat associations can be used to guide conservation and management of these species. Five species of concern occur in the Hanford Site (Table 3.3). All species can be found in the upland shrub-steppe habitat; however, Woodhouse's toad is generally found near water. The striped whipsnake is at the northern extent of its range; however, it has been recorded in the Vantage area (Nussbaum et al. 1983), on the Saddle Mountain Unit, and in 1996, after a long period without observation, in the Monument west of State Route 24 (DOE 2001).

3.12.6 Fish

See Section 3.10.1.5, "Fish."

3.12.7 Birds

See also Section 3.10.3.3, "Birds."

Thirty-eight bird species recorded during recent surveys, including eighteen known to breed on the Hanford Site, are considered species of conservation concern at a state or federal level, or are known or suspected to be declining. Several of these species are closely associated with sagebrush/grassland habitats. Further, many birds, especially migratory species, rely on riparian vegetation or other water based habitats for some or all of their lifecycle, which is disrupted by water fluctuations from upstream dams.

Appendix P provides information on the temporal occurrence of birds of conservation concern in the Monument. By knowing when species tend to arrive and leave the Monument, and when the sensitive periods of their life cycle (such as nesting) occur, activities can be better planned

to avoid impacts on these species. Because most of the bird species that constitute the Monument's characteristic avifauna are migratory, direct impacts on these species potentially can occur away from the Monument (e.g., in wintering areas), as well as when they are here. Indirect impacts, however, such as losses of habitat, can occur at any time of year.

The Monument is recognized as an important area for maintaining viable populations of shrub-steppe-dependent birds within the Columbia Basin Ecoregion, especially for sagebrush obligate species such as the sage sparrow. Although specific sighting information is important to establish use of particular habitats by specific species, not all areas have been surveyed, and use can be dynamic. The approach taken in this management plan to address most avian species of concern is to identify the distribution and extent of the habitat most likely used by those species. Thus, conservation of most individual avian species of concern can be accomplished by conserving the habitats identified in Map 17, the Monument's habitats of concern.

Until recently, the bald eagle was considered a federally threatened species in the state of Washington; it is considered 'recovered' and has been removed from the endangered species list, although it will require five years of post de-listing monitoring (50 CFR 17). The bald eagle is a regular winter resident and forages primarily on waterfowl and spawned salmon along the Columbia River; an average of forty eagles use the Hanford Reach each winter (Fitzner and Weiss 1994). Bald eagles have not nested along the Hanford Reach, although for the last several years unsuccessful nesting attempts have been documented. Access controls are in place along the river while eagles are present to prevent their disturbance. The DOE developed a site management plan (Fitzner and Weiss 1994) to mitigate eagle disturbance.

3.12.8 Mammals

See also Section 3.10.3.4, "Mammals."

Forty-four species of mammals have been documented on the Hanford Site (TNC 1999; Fitzner and Gray 1991). Additional species have ranges that extend to the vicinity of the Hanford Site; therefore, it is possible that some of these species may be present in suitable habitat. At present, there are twelve mammal species of concern that are potentially found on or near the Hanford Site (Table 3.3). One species, Ord's kangaroo rat, though not yet documented in the Hanford Site, may be present, especially on the Wahluke Slope. The pygmy rabbit has not been observed on Hanford since the early 1980s and may be extirpated; although suitable habitat is present, recent searches for pygmy rabbits have not resulted in any positive indication that rabbits are present (Cadwell 1994; TNC 1997). The remainder of the species noted as special-status species all occur on the Hanford Site and are characteristic shrub-steppe species (Rickard et al. 1988).

3.12.9 Recreationally/Commercially Important Species

Species that are important culturally (either recreationally, commercially, or to Native Americans) are important from a resource management perspective. Table 3.6 provides a tentative list of recreationally/commercially important species for the Monument. The list is by no means complete and is intended to be dynamic. The table is composed mainly of species identified by the WDFW as important recreational and/or commercial species (WDFW 1996).

Table 3.6. Recreationally/Commercially Important Species On or Near the Monument.

Name	WDFW Priority Species[a]	Distribution and/or Habitat Association[b]	Abundance[b]
Birds			
Chukar (*Alectoris chukar*)	Yes (3)	Upper elevations	Abundant
Ring-necked pheasant (*Phasianus colchicus*)	Yes (3)	Riparian areas	Abundant
Gray partridge (*Perdix perdix*)	Yes (3)	Upper elevations	Common
California quail (*Callipepla californica*)	Yes (3)	Upper elevations	Common
Mammals			
Rocky Mountain elk (*Cervus elaphus nelsoni*)	Yes (3)	ALE	Common
Rocky Mountain mule deer (*Odocoileus hemionus hemionus*)	Yes (3)	Entire site	Common
Fish			
White sturgeon (*Acipenser transmontanus*)	Yes (2,3)	Main channel/deep pools Columbia River	Abundant year-round
Channel catfish (*Ictalurus punctatus*)	Yes (3)	Slack areas near the upper portion of the McNary Pool	Common in spring and summer
Fall Chinook salmon (*Oncorhynchus tshawytscha*)	Yes (2,3)	Life-stage dependent; redds are located in the main channel of the Hanford Reach; juveniles use the whole Columbia River	Abundant
Coho salmon (*Oncorhynchus kisutch*)	Yes (2,3)	Main channel Columbia River	Uncommon
Rainbow trout/steelhead (*Oncorhynchus mykiss*)	Yes (3)	Main channel Columbia River	Abundant spring through fall
Sockeye salmon (*Oncorhynchus nerka*)	Yes (2,3)	Main channel Columbia River	Juveniles common spring and adults common summer
Largemouth bass (*Micropterus salmoides*)	Yes (3)	Sloughs of the Hanford Reach	Common
Smallmouth bass (*Micropterus dolomieui*)	Yes (3)	Sloughs of the Hanford Reach	Abundant
Walleye (*Stizostedion vitreum*)	Yes (3)	Main channel Columbia River	Common

Notes:

[a] WDFW (1996). See Section D.2.5.1 for definition of criteria.

[b] All habitat association, distribution, and abundance information for birds and mammals are from Fitzner and Gray (1991). Habitat association, distribution, and abundance information for fish were provided by Dennis Dauble (pers. comm. 1995) and were based on prior PNNL survey/scientific studies PNNL.

One species stands out as culturally significant: The fall Chinook salmon is of vital cultural importance to Native Americans, as well as of regional, national and international significance. Its cultural standing and regional/national/international significance make the fall Chinook salmon a species of management concern despite the fact the particular stock that uses the Hanford Reach to spawn is not listed as threatened or endangered. Historically, fall Chinook salmon spawned in the mainstem Columbia River from near The Dalles, Oregon, to the Pend Oreille River in Idaho; today the Hanford Reach is the only significant mainstem spawning habitat remaining for upriver bright stocks of fall Chinook salmon (Dauble and Watson 1990). The relative contribution of these upriver bright stocks to fall Chinook salmon runs in the Columbia River increased from about 24% of the total in the early 1980s to between 50% and 60% of the total in the 1990s; these stocks also have contributed to a higher percentage of the commercial, tribal and sport fishing catch since 1980 (Dauble and Watson 1990; NPS 1994).

3.13 Noxious and Invasive Species

Invasive alien plant species pose one of the most serious threats to the native biodiversity, wildlife habitat, and scenic values for which the Monument was created and for which the entire Hanford Site is well known. On the Monument, as elsewhere in western North America, invasive and noxious plant species compete against, and reduce habitat available for, rare plant taxa and native plant species. Weeds alter ecosystem structure and function, disrupt food chains and other ecosystem characteristics vital to wildlife (including rare and endangered species), and can dramatically alter key ecosystem processes such as hydrology, productivity, nutrient cycling, and fire regimes (Randall 1996, Brooks and Pyke 2001, Mack et al. 2000).

Thirty-six species of invasive weeds have been identified as target species for the Monument's weed management program (see Map 22). Twenty-three of these species have been documented as presently occurring in the Monument. Table 3.7 summarizes the noxious weeds that have been recorded to date on the Monument. In a large landscape with numerous target weed species, and where infestations vary from a single plant to hundreds of acres or more in size, a prioritization strategy for control and elimination of invasive plant species is essential to effectively allocate limited management resources.

The target list of invasive plant species for the Monument includes species that occur primarily in uplands, species that occur primarily in wetlands and riparian areas, and species of concern that are already widespread. Letter codes in the right-hand column of Table 3.7 indicate the weed's regulatory status in Washington State.

Table 3.7. Weed Species of Concern on the Monument.

Scientific Name	Common Name
Upland Species: Active List	
Acroptilon repens	Russian knapweed
Alhagi maurorum	Camelthorn
Bassia scoparia	Kochia
Cardaria draba	White top
Centaurea diffusa	Diffuse knapweed
Centaurea solstitialis	Yellow starthistle
Chondrilla juncea	Skeletonweed
Cirsium arvense	Canada thistle
Cirsium vulgare	Bull thistle
Convolvulus arvensis	Field bindweed
Gypsophila paniculata	Baby's breath
Lepidium latifolium	Perennial pepperweed
Linaria dalmatica	Dalmatian toadflax
Onopordum acanthium	Scotch thistle
Secale cereale	Winter rye
Sphaerophysa salsula	Swainsonpea
Tribulus terrestris	Puncturevine
Upland Species: Watch List	
Abutilon theophrasti	Velvetleaf
Anthriscus sylvestris	Wild chervil
Carduus nutans	Musk thistle
Cenchrus longispinus	Sandbur
Centaurea biebersteinii	Spotted knapweed
Euphorbia esula	Leafy spurge
Sorghum halepense	Johnsongrass
Taeniatherum caput-medusae	Medusahead wildrye
Wetland and Riparian Species: Active List	
Eleagnus angustifolia	Russian olive
Lythrum salicaria	Purple loosestrife
Myriophyllum spicatum	Eurasian watermilfoil
Phragmites australis	Common reed
Sonchus arvensis ssp. *arvensis*	Perennial sowthistle
Tamarix parviflora	Saltcedar, tamarisk
Tamarix ramosissima	Saltcedar, tamarisk
Wetland and Riparian Species: Watch List	
Amorpha fruticosa	Indigobush
Cyperus esculentus	Yellow nutsedge
Epilobium hirsutum	Hairy willow-herb
Myriophyllum aquaticum	Parrotfeather
Species of Concern Which Are Already Widely Established	
Upland	
Bromus tectorum	Cheatgrass, downy brome
Salsola tragus (aka *Salsola kali*)	Russian thistle, tumbleweed
Wetland and Riparian	
Phalaris arundinacea	Reed canarygrass

The FWS uses an integrated pest management approach to treat targeted invasive plant species in the Monument (see hanfordreach.fws.gov/documents/weeds.pdf for the draft IPSIMP).[89] Manual, mechanical, biological, cultural (e.g., prescribed fire, competitive plantings) and chemical treatment methods are used to achieve prioritized weed control objectives. Invasive species managers draw upon the full range of appropriate control technologies to develop integrated treatment plans for target species at selected sites. Treatment methodologies are based on the best information available from weed management literature and professional experience, tailored to the characteristics of the particular species and site.

3.14 Cultural Resources

The Monument Proclamation states:

> This magnificent area contains an irreplaceable natural and cultural legacy . . . one of the few remaining archaeologically rich areas in the western Columbia Plateau, containing well-preserved remnants of human history spanning more than 10,000 years.

The unique and fortuitous circumstances (establishment of the Hanford Nuclear Reservation during World War II) that preserved natural and cultural resources since 1943 also created a unique set of cultural resources with contextual integrity that may no longer exist anywhere else in the region. These remnants of past human culture and activity are invaluable and irreplaceable keys to former life ways and behavior patterns. Unfortunately, some of the resources, such as the historic town sites, homesteads and other structures, as well as Native American traditional use areas and aboriginal occupation areas, were destroyed before and during establishment and operation of the Hanford Nuclear Reservation. However, there is little doubt that without the inadvertent protection of the area through its restricted public use, many of these resources would have been damaged or obliterated.

Protection of these cultural resources—including tangible portions of sites such as artifacts, features, structures, natural resources and landscapes (e.g., traditional use and sacred areas), as well as oral and written records—is paramount to management of the Monument. In addition to the preservation of the physical geography, the Native American ethnology and oral traditions, and the Euro-American written and oral histories, are the threads that tie together the story of the cultural landscape. The opportunity to meld this interaction between the scientific data and the human story is a critical element to support the protection of the cultural resources

[89] The draft IPSIMP was made available for public review and comment concurrent with the review of the draft CCP. No comments were received on the draft IPSIMP. The IPSIMP will be finalized after the ROD is signed for this CCP, since the CCP is the overriding guidance document for all step-down plans. This is in part due to the fact that the CCP sets public use parameters, which, in turn, partially drives invasive species management.

in the Monument. Inheriting this resource brings an obligation to the FWS not only to manage the Monument for the protection and preservation of these heritage resources but also to enhance their value through public education.

Since cultural resources encompass many elements, it is helpful to use temporal divisions to distinguish and categorize these resources. The occupation and utilization of this region can be divided into two phases—the Pre-contact Period, representing Native American aboriginal occupation prior to Euro-American influence, and the Post-contact Period with Euro-American development and occupation of the area. Here, Pre-contact Period cultural resources will encompass those resources associated with Native American groups prior to 1800, and the Post-contact Period will include those resources associated with Euro-Americans after the arrival of Lewis and Clark, as well as those of Native American groups during this time frame.

3.14.1 Pre-Contact Native American Traditions

The Monument lies within the Plateau Culture Area of northwestern North America, which encompasses the Mid-Columbia area and adjoining regions. It is geographically defined as the region lying between the Rocky Mountains to the east and the Cascade Mountains to the west. The northern boundary of the Plateau Area is established by the great bend of the Fraser River, while the southern boundary is somewhat ambiguously determined by the Blue Mountains. Before the arrival of Euro-Americans, the people collectively known as the Plateau Indians occupied portions of what is today eastern Washington and Oregon, northern Idaho, western Montana, and southern British Columbia (Ray 1936). Ethnic groups occupying the greatest amount of territory in the study area were the Columbia, Walula, Wanapum and Wauykma. Other peoples whose aboriginal territories were located in the Mid-Columbia region were the Nespelem, southern Okanogan, Sanpoil, Umatilla and Yakama (Ray 1936). Other groups known to have inhabited the region from time to time—principally for gathering, hunting or trading purposes—include the Cayuse, Chelan, Colville, Kittitas, Methow, Nez Perce, Palus, Wayampam, Wenatchi, Wishram and the Lower, Middle, and Upper Spokan.

The aboriginal groups inhabiting the Plateau are further defined by two major linguistic classifications—Sahaptin and Salish. Although a strict geographical division is not apparent between the peoples speaking these languages, generally Sahaptin speakers were located in the southern portion of the Columbia Basin, and Salish-speaking peoples occupied the northern part of the region. Sahaptin dialects included the Cayuse, Nez Perce, Umatilla, Walla Walla, Walula, Wanapum, Wauykma, Wayampam and Yakama. The only Salishan speakers who may have utilized portions of the Monument are bands currently within the Colville Tribe.

Of the extant Native American cultures that currently occupy and utilize the area, much of what is now the Monument represents only a portion of their extensive aboriginal homeland. These cultures represent millennia of use. The archaeological record within the Monument goes back

at least as far as 8,000 years. A recent find on the Hanford Site of an early projectile point type dating approximately 10,000 years suggests earlier sites may exist along former shorelines of the Columbia River (Marceau 2002). Previous archaeological excavations in the surrounding region—Lind Coulee, Sunset Creek, the Marmes Rock Shelter, and the controversial "Ancient One" find in Kennewick—suggest that people occupied the areas during early Paleo-Indian periods over 10,000 years ago (Ames et al. 1998).

As indicated, a number of Plateau groups lived in, or at least utilized, portions of the Monument and its environs. Research varies on precisely which groups lived where within the Monument. Even today, there is little consensus among Native Americans in the region as to exact boundaries of their aboriginal territory. Currently, there are four federally recognized tribes (and the Wanapum, which is not federally recognized) who have aboriginal and/or ceded lands within the Monument. Following is a brief description of the tribal reservations that comprise the various tribes and bands with historical connections to the Monument. None of these tribes' reservations are within the Monument, although the ceded lands of one or more groups may be.

3.14.1.1 Confederated Tribes of the Colville Reservation

The Colville Indian Reservation is located in north-central Washington in Okanogan and Ferry Counties. Its boundaries are defined by the Okanogan River on the west, the Columbia River and Grand Coulee Dam on the south, Franklin Roosevelt Lake on the east, and latitude North 48.50 on the north. The principal reservation towns are Nespelem and Inchelium. The Colville Reservation, the second reservation established in the Mid-Columbia region, was created April 19, 1872. The original reservation encompassed an area of 2,850,000 acres; however, the boundaries were altered on July 2, 1872, to the present reservation size of 1,011,455 acres.

The original bands living on the reservation at its inception were the Callispel (Pend d'Oreille), Coeur d'Alene, Colville, Lake, Methow, Okanogan, San Poil, and Spokane. At present, the groups living on the reservation are listed as Colville, Entiat, Lake, Methow, Moses (Columbia), Nespelem, Nez Perce, Okanogan, Palouse, San Poil, and Wenatchee.

3.14.1.2 Confederated Tribes of the Umatilla Indian Reservation

The area that was the homeland to these groups (Cayuse, Umatilla and Walla Walla) included areas along the Columbia River and Blue Mountains in southeast Washington and northeast Oregon, totaling approximately 4,012,800 acres. The 1855 Walla Walla Treaty reduced this to a reservation of approximately 245,699 acres in northeast Oregon near the present town of Pendleton. After the Allotment Act and other reductions, the reservation dwindled to about 92,273 acres (Ruby and Brown 1992).

3.14.1.3 Nez Perce Tribe

The aboriginal land of the Nez Perce covered a horizontal band of land along the lower and mid-Columbia River in Oregon and Washington and extended east through Idaho into Montana, a land base estimated at 13-15,000,000 acres. The Treaty of 1855 established 7,500,000 acres for a reservation for the Nez Perce near the juncture of the present states of Idaho, Oregon and Washington just south of Lewiston, Idaho. The subsequent Treaty of 1863, enacted after gold was found along rivers near Orofino and Pierce (Idaho) within the Nez Perce Reservation, reduced the size of the reservation to a tenth of its former size. By 1887, the Allotment Act removed an additional half million acres, leaving the Tribe with its present 250,000-acre land base.

3.14.1.4 Wanapum

The mid-Columbia River between Vantage upstream of Priest Rapids and the Snake River near Pasco is the homeland of the Wanapum, who are not a federally recognized tribe. Often they are referred to as a band of the Yakama Nation. The Wanapum occupied thousands of acres in the Pre-contact Period until their lands were encroached upon by Euro-American settlement in the Post-contact Period. Because they did not enter into any treaties with the United States, they were not restricted to a reservation or allotted lands. Instead, they have a unique agreement with a local county government and the Grant County Public Utility District (PUD); the Wanapum retain forty acres of their aboriginal village of P'na (fish-weir) at Priest Rapids, as well as hunting and fishing rights within the Grant County PUD jurisdiction.

3.14.1.5 Yakama Indian Nation

The Yakama Indian Nation Reservation is located in south-central Washington south of the town of Yakima. The towns of Wappato and Toppenish are within the reservation. The reservation is bounded on the west by the Cascade Mountains, on the northeast by the Columbia River, and on the southeast by the Horse Heaven Hills. The Treaty of 1855, one of the first in Washington, created the reservation. The Yakama Nation is comprised of fourteen bands whose aboriginal territory encompassed approximately 10,800,000 acres in the Columbia Basin and surrounding territory (Pace 1977). Today the reservation encompasses about 1,367,455 acres.

3.14.1.6 Ethnographic Background

The Plateau groups shared similar traits and cultural patterns of behavior in the occupation and use of the upland and riverine habitats in which they lived; a generalized ethnographic model

is applicable to all of these inhabitants during the Pre-contact Period.[90] A brief overview of the cultural elements attributed to the groups in the Monument vicinity is presented here; further details can be found in the literature cited.

While the Monument seems a harsh environment, the area was surprisingly productive for those who knew how to use it. The cultural manifestation of the Monument environment in the Pre-contact Period revolved around adaptation to the extensive riverine and adjacent upland resources. Ancestors of the present day Colville, Nez Perce, Umatilla, Wanapum and Yakama Tribes fished for salmon; hunted deer, elk, sheep and rabbit; and collected and gathered roots, seeds and berries (Relander 1956).

Natural resources, including foods, medicines and material for tools and shelters, were gathered in the appropriate season, primarily spring to fall. The reliance on a seasonal harvest of primary subsistence items, such as anadromous fish and native root crops, promoted a non-sedentary, nomadic, non-agricultural economy. Specific environmental niches were occupied at various seasons in the process of collecting these resources. These food collection strategies also resulted in the establishment of a certain settlement pattern across the landscape, which repeated itself over thousands of year as indicated in part through the archaeological record. In general, the subsistence activities of these Sahaptins were very similar, as reflected in their economies, resource procurement and processing methods, and nature of habitation sites (Galm et al. 1985).

The year was compartmentalized and noted by the activities necessary to obtain fresh items to consume, as well as process and preserve the foods necessary to survive the remainder of the year. The harvest seasons corresponded to the maturation cycle of the foods, as opposed to particular months of the year. Temporary or seasonal camps, from which to base harvesting activities, would be established in the locale containing the resource. Although some camps, such as fishing sites, were located along the rivers, the majority of sites tended to be non-riverine and located in the uplands. The length of stay at a campsite was dependent on the duration and availability of the particular resource. People lived at various temporary campsites until they had collected a year's supply of food and other resources, and then they returned to the villages along the major rivers, where they spent the winter months.

The type of shelter used at seasonal residences was the conical mat house, which was a tipi-like formation of poles covered with layers of tule mats. It was generally erected on the ground surface rather than within an excavated pit. The conical mat house was a more mobile form of the semi-subterranean lodge. It could be set up and dismantled in a relatively short time and its parts moved when the camp moved, making it ideal for a semi-nomadic lifestyle.

[90] Early ethnographers (Ray 1936; Spier 1936 and Kroeber 1939) believed these Plateau groups were all Sahaptin language speakers.

The temporary nature of the conical mat house facilitated the high degree of mobility required by aboriginal peoples to efficiently procure widely distributed resources. These camps could be in place a few days to a few weeks, depending on the nature of the resource. For salmon runs, the fishing stations could be considered a repeated, seasonal encampment with a predictable and consistent resource, but plant resources required both differing locations and relocating camps. In addition to moving camps up in elevation as the crops ripened, rainfall, temperature and soils would determine the crop harvesting locale from year to year.

The time of year in which camps were occupied was correlated with the time the resources were in season. A variety of environmental zones were frequented for such activities. Yearly food procurement and other economic activities commenced in early spring for the first green shoots and edible roots, usually found in the foothills and upland plateau. In late February, preparations were made for travel from the villages to the locations of spring camps, and by early spring, the villages were generally deserted when people merged into groups of four or five families and traveled to those areas where the first vegetable foods were obtained.

Roots were the most important vegetable food in the aboriginal diet, and in some cases they comprised as much as 40% of the food intake (Galm et al. 1985). Some families may have collected up to 1,500 pounds of roots in a season (Hunn 1990). One of the most sought after roots for Native Americans living around the Monument were of the genus *Lomatium*, the common names being cous, desert parsley, Indian celery, and several types of biscuitroot. It still plays an integral part not only in the diet, but also in spiritual renewal and life-sustaining renewal traditions. Other important food roots were/are bitterroot, balsam root (mostly eaten as tender shoots), several wild onions (eaten as a bulb), and yellow bell (bulb). The importance of digging roots is emphasized by the distance some groups traveled to obtain them (Hunn and French 1981).

Use and preparation of the roots varied, with some eaten fresh while others were dried or steamed for long-term storage. While the plants were young and tender, they were consumed raw or boiled. Bitterroot was commonly cooked, thickened with sugar, and made into a pudding. Practically all roots were processed for storage; they were frozen, hung on strings, placed on screens and sun dried, or baked for several days in an earth oven. After processing, they were eaten dried or baked, ground into flour and made into cakes, or reconstituted by boiling. During the aboriginal period, after an abundant supply of roots and other vegetal resources had been processed, they were transported to the sites of winter villages, stored in caches that had been excavated in the ground, and used throughout the winter months until fresh foods could be obtained the next spring. Contemporary processing of root plants is much the same as in the aboriginal and historic periods.

Data from interviews conducted with a number of Native Americans show that traditional root digging grounds are still utilized within the Mid-Columbia area and in other regions throughout the Columbia Basin (Galm et al. 1985). Prominent ridges, such as Rattlesnake Mountain and the Saddle Mountains, are known as traditional spring root gathering areas. Sometimes root

digging areas are so exclusive that they are recognized as belonging to individual families. This concept appears to exemplify a conscious effort to manage and conserve such areas by ensuring that they are not over-utilized from year to year. The roots may not be the staple they were in aboriginal times, but they still form a major part of the traditional first foods or root ceremonies to ensure bountiful harvests and ecological balance and renewal.

Root digging was followed by the first salmon runs in the spring. Fishing could occur year-round, but the harvesting seasons to catch, process and store food were associated with specific migratory runs. The Columbia River system supported a host of anadromous (mainly salmon) and other fish, including sturgeon, northern pike minnow, lamprey, various suckers, and several trout species.

The Mid-Columbia area contained several fishing locales, primarily associated with small rapids, such as Coyote Rapids, and islands, such as Locke Island. However, major fishing destinations, such as Priest Rapids and Horn Rapids on the Yakima River, lie just beyond the Monument. The most notable fisheries for the entire northwest were located downstream on the lower Columbia at Celilo Falls and The Dalles. No doubt, Native American groups from the area traveled to all of these locations, either to fish or trade with other groups in the region. Traditional courtesy gave preference to "family" ties with aboriginal fishing stations, much the same as with root digging lands. These major fishing sites were visited by both northern and southern Plateau groups, including the Columbia, Nez Perce, Palus, Spokan, Walula and Yakima (Chalfant 1974). On the Monument, the Wanapum had several fishing stations and camps; elders from the Wanapum and other groups have echoed the stories of traditional, favored fishing grounds.[91]

The fishing location determined the methodology for fishing, with apparatus varying from spears to nets. Pronged spears were utilized by individual fisherman, who generally speared the fish from the riverbanks or from large boulders in the water. In addition, canoes were employed, usually at night with torches, where fish rising to the light were speared from the bow. Even within historic times, the Wanapum used canoes for fishing; the canoe currently housed at the Wanapum Dam Visitor Center Museum may be one observed and photographed in 1941 near White Bluffs. Residents of the White Bluffs town site in the 1920s and 1930s recall trading tires to the Wanapum for fish, as the Indians would burn chunks of rubber attached to poles on the bow of the canoe as torches for nighttime fishing (W. Grisham personal communication 2001).

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[91] The importance of fish to the Indians of the Mid-Columbia region, and the patterns of acquiring such resources, have undergone considerable change since aboriginal times. From the historic period to the present, salmon resources have been the source of a great deal of controversy and the subject of many management decisions with regard to Columbia River waters. Today, most traditional fisheries on the Columbia River and its tributaries have been greatly reduced by contemporary use and development of the rivers, such as the construction of dams. Fishing sites and areas that were once the habitats for salmon and other fish, such as falls and rapids, have been inundated, and higher water temperatures and over-fishing have reduced the numbers of fish. Thus, rivers that were once abundant with salmon now support relatively small populations. At present, most of the salmon fishing is done on the lower Columbia River.

Traps and weirs were often placed near the mouths or confluences of smaller streams and rivers; areas where the water was not moving swiftly tended to be desirable. Dip-netting from platforms was done near falls and rapids. Nets or seines made of native hemp fitted with stone net sinkers were used in deeper waters. Nets could also be drifted between the noses of two canoes.

The late summer/early fall harvests focused on seed and berry collecting and hunting of game animals, primarily in the uplands. These activities were typically gender specific, with men hunting and women collecting. Most of the animals taken served both as food and other products such as tools, clothing and utensils. Big game species included mule deer, white-tailed deer, elk, antelope and bighorn sheep. Waterfowl and upland birds taken were ducks, geese, sage hen and grouse. Collecting berries was a fall activity accomplished by women and often children. Berries were obtained from relatively high elevations in the forested areas of the Cascade Mountains, Okanogan Highlands, Selkirk Mountains, and other mountainous regions. Typical species harvested included chokecherry, elderberry, huckleberry, soapberry, serviceberry, thimbleberry and wild currant. Many of these are still collected by Native Americans in the region.[92]

Of particular note, tule was harvested at this point in the year. Tule grows in muddy or marshy areas along potholes, streams and rivers in the Columbia Basin. It is generally harvested in the late summer before the frost, then bundled and dried for future use in the weaving of bags and mats. Aboriginally, tule mats were used in the construction of shelters, including the conical mat tipi and the winter long house. The plant has a slender round stem which grows approximately four feet high; the stems are generally laid side by side and sewn together using a greasewood or metal needle and tule or jute string at each end, forming a mat approximately four feet wide and as long as needed. Present locations for collecting tule include several wetland areas, such as the McNary Wildlife Refuge, areas just west and north of Richland, the Soap Lake region, and just off the Monument on Crab Creek.

After the fall salmon runs and berry picking were complete, all food provisions and other transportable resources were carried back to the main village for the winter. Winter encampments were typically located in the lower elevations, often along major rivers or at the confluences with tributaries, for protection from the elements as well as access to resources such as firewood, fresh aquatic foods and water. The stored foods prepared throughout the year provided sustenance for individual families, but the community-based residential pattern also provided security for the population because any surplus or even "whatever you had," was

[92] Other resources important to Native Americans were harvested either throughout the year, or at specific times, according to need or availability. Many of these materials are still harvested. For example, Indian hemp is a native plant that is found in riverine settings along the Columbia River. The branches are cut in the fall, bundled and dried. To make hemp string, the stem is split to expose an inner fiber that is stripped out and worked with a stone tool or knife; the fibers are then rubbed back and forth between the palm of the hand and the thigh to merge and strengthen the fiber. The twine was utilized in making fishing and hunting nets, ropes and root or other food storage bags.

shared with others. Winter months were spent rejuvenating, both in the physical and spiritual sense, to prepare for the rebirth of the next year. Tools were formed or re-sharpened, nets were mended, baskets and clothing were made as necessary. Stories and oral histories were passed on, and social activities and food surplus sharing took place both intra-village and sometimes inter-village.

Early explorers and later ethnographers described several villages within the Monument. The fifty-mile stretch of the Hanford Reach contains numerous village sites, primarily attributed to the Wanapum. Some have been recorded both in early historical records as well as archaeologically. These villages, comprised of oval or circular housepits, were established along the river terraces and islands. They housed the main population concentrations, with extended family groupings in mat lodges, a community long house, and a sweathouse.

The semi-subterranean lodge, referred to as a pit house in archaeological terms, consisted of an excavated pit approximately ten to sixteen feet in diameter and four to six feet deep with a conical or flat roof. The roof was made from planks or mats made of willow branches or tules. The conical-shaped roof tended to be the one most used among Columbia Basin Indians (Ray 1939). A fire hearth was constructed in the center of the lodge and a small smoke hole left in the roof. The semi-subterranean lodge accommodated a single or an extended family. The mat long lodge was a rectangular tent-like structure. It was built upon a foundation of slanted poles tied together in pairs at the tops, forming an inverted V-shape. Additional poles were attached at the sides and then were covered with several layers of tule mats. Sometimes larger versions of these, known as *long houses*, were built to accommodate large gatherings of people for social activities such as ceremonials and council meetings (Teit 1930).[93] Other kinds of religious activities, including dances, curing rites, winter festivals, and funerals, were often conducted at the sites of winter villages. Today, these ceremonies are often held in modern long houses.

Another structure often associated with the winter village was the sweathouse. Basically, these were modified forms of other house types, incorporating similar principles of construction and the same materials (Ray 1933). The sweathouse was generally constructed on the edge of a stream or river, as after steaming for several minutes the bather would plunge into a pool of cool water. The function of the sweathouse—spiritual purification, physical cleansing, curing, and socializing—was closely intertwined with Indian beliefs and was an important aspect of the aboriginal culture. Even today, the sweathouse is an important component of Native American culture and is utilized by a number of Salish and Sahaptin peoples for traditional purposes (Turner et al. 1975; Walker 1966).

Apart from an abundance and variety of natural resources, the Mid-Columbia also offered another advantage to Native Americans—its centralized location along several rivers. Most of the vast, semi-desert region east to the Columbia was traveled and utilized for several major

[93] The use of the long house is prevalent on reservations today throughout the Plateau.

economic subsistence functions by most, if not all, of its tribal groups living on its periphery (Chalfant 1974). Trading networks between tribes allowed a wider exchange of non-local goods and provided interaction among people. Being in the Mid-Columbia provided an advantage for local groups to network with others to obtain desired commodities such as shell from the coast, obsidian from Idaho and Oregon, and buffalo from the Plains.

3.14.2 Post-Contact, Euro-American Traditions

The early exploration of the area began with the fur trappers in the early 19th century, shortly after Lewis and Clark ventured through the confluence of the Columbia and Snake Rivers just south of the Monument in 1804. David Thompson of the Northwest Company is the first documented explorer to pass through the Hanford Reach in 1811 on his way down the Columbia River in search of furs and trading possibilities. Other fortune seekers soon followed.

The discovery of gold in Idaho and Canada in the 1860s expanded the use of the Mid-Columbia and heralded beginnings of permanent development. The White Bluffs Road, likely first an Indian trail, became part of a travel system linking the river and the Caribou Trail on the north side of the Saddle Mountains. A small, transitory community emerged on the east bank of the river at the White Bluffs Road ferry crossing, which began operation in 1859. White Bluffs became a bustling supply depot for unloading goods shipped by river onto wagons for overland distribution to gold discoveries in British Columbia, Idaho and Montana. Gold fever struck the local region as well, with activity along the Ringold, Vernita and other river shorelines. By the 1870s, Chinese miners were also working the placer gravels (Sharpe 2000). As the need for supplies—especially food—grew, agriculture and stock-raising activities increased. Permanent settlement commenced in the late 1880s and 90s with scattered homesteads near water sources, primarily the river. The native bunchgrass steppe, mild winters, and open range provided a perfect environment for grazing, which attracted cattleman from other areas.

The Columbia River was a driving force for development. From the time the first explorers passed through the area, the river was the logical transportation corridor and remained the avenue to transport goods and people for nearly a century until the railroads arrived. The river was the key to settlement, providing transportation via steam-driven freighters and numerous ferries to the settlements of Wahluke, Vernita, Richmond, White Bluffs, Hanford and Ringold (Ruby and Brown 1974). More importantly, water for crops was critical, so irrigation companies formed. The development of several irrigation and land companies, supported in part by outside capital, provided the impetus to true settlement and town sites development. By 1907 the most significant irrigation development in the Hanford Reach, the Hanford Irrigation and Land Company, began construction of a major, twelve-mile ditch from the Allard Pumping Station near Coyote Rapids to the Hanford and White Bluffs communities (Parker 1986).

The anticipation of profits provided incentives for Seattle-area developers to invest in the area. The success of the venture brought the first significant regional recognition to this unknown area, based primarily on the area's mild climate, readily available and level land, perfect growing conditions for early crops, and irrigation. Orchards replaced other crops and livestock as the profitable commodity. The marketing of the new real estate and fruit crops resulted in railroad connections by 1913 with a spur line to Hanford from the Chicago, Milwaukee and St. Paul Railroad, which provided the link for shipping products to coastal markets. The rail lines also benefitted farmers through quicker receipt of supplies and equipment. Ironically, the rail lines resulting from irrigation changed the Columbia River's role as a transportation corridor; by the 1920s, steam freighters had nearly vanished from the river.

For over two decades, the towns of Hanford and White Bluffs grew and prospered. The White Bluffs area was selected as a soldiers' home location after WWI; many of these ex-soldiers provided labor to established farmers (Parker 1986). Advertisement through the realty companies and railroad land agents attracted nearly 500 families, many fleeing the Midwest in the 1920s and 30s looking for new starts. The Depression years reduced prosperity as a result of lower crop values, but many families could at least continue their own existence through subsistence farming and local economic systems. The First National Bank of White Bluffs remained open, and presumably solvent, throughout the lean years, not closing until 1942 (Harris 1972).

In 1943 these towns and the entire area changed forever. The Manhattan Project, designed to build the atomic bombs of WWII, required removal of all residents of White Bluffs and Hanford. Although some of the buildings became offices and residences for a short time, most were eventually removed along with crops, orchards and landscaping.

3.14.3 Cultural Resources Inventory in the Monument

The Monument contains some of the most diverse and extensive cultural resource areas remaining in the Mid-Columbia Plateau. The current inventory of these resources is based on a summary of archaeological, historical and ethnographic data collected from archival records, archaeological surveys, and personal communication. It does not reflect a complete inventory, as only 24% of the Hanford Site, including the Monument, has been surveyed for archeological resources (Neitzel 2005). The percentage of lands surveyed within the Monument portions of the Hanford Site is substantially lower; it is estimated that less than 5% of the total Monument has been surveyed. However, the amount of land surveyed varies by unit. The shoreline of the River Corridor Unit has been surveyed several times due to being the focus of DOE projects along the river shore as well as projects by other agencies. A DOE survey of 3,473 acres along the shoreline included a 0.25-mile strip of the eastern boundary of the over 6,000-acre dune field that is part of the River Corridor Unit (Hale 1999).

The DOE reports that 1,447 cultural resource sites and isolated finds, and 530 historic buildings and structures, have been documented on the Hanford Site (Neitzel 2005). Of these documented sites, 575 sites lie within Monument boundaries, with just over half (367) in the River Corridor Unit. Current project work has identified an additional 70 sites within the Monument, bringing the total to 645 sites in the Monument. The Hanford Site cultural resource site totals are directly related to the amount of DOE project work in each unit, as well as the size of the unit. Each management unit has the following number of sites: Columbia River Unit, 367 sites; Rattlesnake Unit, 221 sites; Saddle Mountain Unit, 23 sites; and Wahluke Unit, 32 sites (eight in the proposed Ringold Unit). Site records reflect various levels and styles of reporting, so the database is marginal at best. Comparative analysis, or even accurate site location and description, is sketchy. The bulk of the sites are pre-contact related. Only 127 sites have been evaluated for listing in the National Register; 49 have been listed. Except for the B-Reactor, which is associated with the Manhattan Project and Cold War Period, the other listed sites are associated with the Native American use and occupation. Most of the National Register sites are part of seven National Register Archaeological Districts, all of which fall in the Monument, including the Ryegrass, Hanford North, Locke Island, Savage Island, Snively Canyon, Rattlesnake Springs, and Wooded Island Districts. With the exception of the Rattlesnake Springs and Snively Canyon Districts, all are situated on the shores and islands of the Columbia River. At least a portion, if not all, of these districts fall within the Monument. In addition, two archaeological districts within the Monument—Wahluke and Coyote Rapids—are listed on the Washington Heritage Register.

3.14.3.1 Pre-Contact Archaeological Investigations

Nch'i-Wana (the Wanapum word for "big river") for thousands of years was the lifeblood of the Native Americans in the region (Hunn 1990). Without the Columbia River, survival in the harsh desert environs of the Columbia Basin would have been difficult. The Columbia River provided, and still provides, water, fish, shellfish and numerous other resources to Native American peoples. As a result, the river shores have a high density of pre-contact sites; the Hanford Reach has numerous seasonal camps, resource processing areas, and village sites (Swindell 1942).[94] This density of sites along the river and their accessibility has enticed archaeologists and collectors to the area for the past 80-100 years; the Smithsonian excavated sites in the Wahluke in 1926 (Krieger 1928). Consequently, the Hanford Reach has been studied, or at least explored, for as long or longer than any other area in the Northwest.

This extensive use and occupation of the Monument area for thousands of years has left a cultural record with both an extensive and well-preserved diversity of archaeological resources prior to Euro-American contact. However, documentation of these resources is spotty. The majority of the field work that has been undertaken in the area, primarily along the river, is the

[94] In addition, several traditional cultural properties and sacred areas are known to exist in the Monument.

result of government projects, such as ACOE dam proposals, Hanford Site development, or clean-up activities. Information is project-specific and often remains incomplete or unpublished. In addition, a few scattered university projects and field school excavations have been done but again often remain unpublished. Little fieldwork has been accomplished in the outer reaches of the Monument, and virtually none of it has been done systematically or with a specific research design. The result is that knowledge is limited for many areas and/or is disconnected.

The documented cultural chronology of the Monument, based on archaeological site information, spans the past 8,000 to10,000 years. This is not to say that earlier sites do not exist. Some of the particular types of artifacts found in the Monument area and the surrounding region represent styles (especially of projectile points) that date from as early as 14,000 ago or more. However, archaeological investigations have been limited, based primarily on large hydroelectric and transmission line project studies in the 1960s and 1970s that were focused along the river corridors. Hence, regional synopses of Plateau cultural traits have been derived principally from survey and excavations within or adjacent to the Snake and Columbia River drainage system. The reasons for this were twofold: 1) riverine terrace sites and associated rock shelters were easily accessed and often contained the extensive and deeply stratified sites necessary for the development of regional cultural chronologies; and 2) most archaeological research in the Columbia Plateau prior to 1970 was conducted to salvage archaeological materials before the river valleys were inundated by water backing up behind hydroelectric dams. (Refer to Rice 1980; Galm et al.1981; Ames et al. 1998; and Aikens 1993 for details.)

Several models have been used to explain cultural dynamics within this region. Although some of the regions for which this cultural history was developed are peripheral to the Monument, extensive excavations of riverine sites have provided the broad comparative database for the analysis of such sites in similar environs within the Monument. Table 3.8 provides a broad overview of the cultural chronology of the area. Here, the chronology of the pre-contact resources are divided into three phases—Early Period, Middle Period, and Late Period.

3.14.3.1.1 Early Period (14,000–8,000 Years Before Present)

The Early Period is often also referred to in the literature as the Paleo-Indian Period. The early part of this time frame is poorly represented in the Plateau region, with only a scattering of stratified sites with early occupation components and isolated projectile points. A geological time marker in the area frequently utilized in soil profiles is Glacier Peak ash from a volcanic eruption approximately 13,700 years ago. Unfortunately, evidence of the ash, which appears in some locations within the Monument, is rarely associated with cultural material.

The predominant artifacts are lanceolate projectile point forms used on throwing and thrusting spears. Other artifact types include large, bifacially flaked knives or point preforms, scraping tools of various kinds, gravers for working bone, and cylindrical foreshafts of bone (Chatters

1989). Regionally defined artifact types include leaf-shaped and stemmed varieties of points known as Windust and early Cascade Forms. Fluted Clovis Points (circa 12,000-10,800 Before Present [B.P.]), noted to the northwest of the Monument from the renowned Clovis cache at the East Wenatchee site, have not been found in the Monument. A single report of a Clovis-style point was reported by a local collector near Kennewick (Chatters 1989).

In the Windust Phase, 10,500-8,000 B.P., sites are generally small and exhibit low artifact densities. Tools found in sites from this period include leaf-shaped and stemmed projectile points, bifaces (knives), hammerstones, cobble and flake tools, net weights, cores, ocher and bone and antler tools. Windust-style points have been found in the Monument along the Columbia—one on the surface near the Vernita Bridge (Hazelbrook 2000), one on an island within the Hanford Reach (Woody 2003), and another at excavations in central Hanford near the 100K Reactor (Marceau and Sharpe 2001). Groundstone tools, such as mortars and pestles and cobble chopping tools, became more prevalent toward the mid to late Early Period, suggesting plant or possibly mammal bone processing.

Table 3.8. Archaeological Time Periods.

Chronological Sequence for the Mid-Columbia Basin			
Time Period	***Climate***	***Phase Names***	***Cultural Attributes***
Late Period 4,500-250 B.P.	Increased moisture initially then drying. Current climate regime by about 1,500 B.P.	Frenchman Springs Cayuse Tucannon Harder	Bow and arrow; groundstone; small-sided, basal and corner-notched points; net weights; seasonal use of areas, especially riverine areas; food storage; pit house villages; introduction of historic (contact) material by end of period.
Middle Period 8,000-4,500 B.P.	Gradual warming and drying, then cooler.	Cold Springs Cascade Vantage	Leaf-shaped and large side-notched spear points, bifaces, cobble and flake tools, plant material for cordage for bags and nets, bone, antler and groundstone tools, seasonal gathering using temporary base camps for processing resources. Both rockshelters and open camps for other occupation areas.
Early Period 14,000-8,000 B.P.	Cool and wet.	Clovis Windust Lind Coulee	Large stemmed, fluted and leaf-shaped spear points, bifaces, flake and cobble tools, bone and antler tools, diverse collection of plants, hunting and fishing with occupation in open and cave sites.

3.14.3.1.2 Middle Period (8,000–4,500 B.P.)

This time frame, often correlated to the term Archaic Period, is most noted and recognized throughout the region by the trademark artifact known as the Cascade Point. The other hallmark of the time was the eruption of Mt. Mazama (forming Crater Lake) near the beginning of this

period, about 6,700 years ago. Researchers in the mid-Columbia area often refer to this period as the Vantage Phase based on Nelson's (1969) work on Sunset Creek. It overlaps somewhat with the Early Period in this scheme and is the earliest phase (9,500-6,500 B.P.) described for the Mid-Columbia region. Diagnostic artifacts of this phase include leaf-shaped, stemmed and side-notched projectile points; hammer stones; edge-ground cobbles; core tools; and bifaces.

During the Cascade Phase, inhabitants were highly mobile, opportunistic foragers adapted mainly to riverine environments with an increased reliance on fish and less use of game (Chatters 1986; Galm et al. 1985). Middle Period sites appear primarily on river terraces within the Monument, although two Cascade-style points are noted from sites on the northern plain of Rattlesnake Mountain.

3.14.3.1.3 Late Period (4,500–250 B.P.)

The Late Period is the last record of Native American cultures prior to contact with explorers, trappers, miners and settlers. The first half of this period is basically an extension of the Middle Period, reflecting the continued use of atlatls for upland game hunting. Point styles include large, side-notched, lanceolate and triangular-shaped points with concave and expanding bases. Groundstone, bone and antler tools round out the lithic tool kit that contains bifaces, adzes, drills and other tools. Other stone and bone tools remain much the same as in the Middle Period, with the addition of the hopper mortar and an increase in bone needles and single-piece and composite harpoons. Early phases include type sites at two springs—the Cold Springs Phase and the Frenchman Springs Phase.

A major technological innovation in weaponry marks the latter half of this period with the appearance of the bow and arrow about 2,500 B.P. This is a distinctive feature with a substantial reduction in point size in the latter half of the Late Period under phase names such as Cayuse and Harder. Such points are distinguished by features such as side notches, ears, tangs and bases to facilitate hafting to arrow shafts.

This phase is also noted for the introduction of semi-subterranean, bermed pit houses and more specialized camps for hunting, root collecting, and plant processing. Populations concentrated in large, nucleated winter villages, some with fifty or more pit houses. Winter villages consisted of long, tule mat community lodges, surrounded by individual and extended family pit houses. Pit house villages are typically located in riverine settings, primarily at the confluences of major drainages, on low-lying terraces, or on larger islands within the channels. People dispersed to gather roots in the spring and to hunt in the fall and winter. This seasonal round became increasingly diverse and well-organized over time. Temporary camps were associated with seasonal procurement strategies from spring to fall. There was increased utilization of salmon, shellfish, and root crops and other plant materials in this period.

This time is probably the best represented period within the Monument. Pit house complexes are numerous on both side of the river and on several islands, although many date to the later stages of the Late Period. These pit houses are often relatively intact, with obvious surface depressions representing the living floor in more protected, undeveloped areas. Short-term, seasonally used sites do not have pit houses, but contain artifacts similar to long-term use sites (Greene 1975). The distinction between the two types of sites rests primarily with the presence or absence of pit houses and the density of artifacts, with winter sites tending to accumulate more debris. Rice (1980) reported that 53% of the recorded archaeological sites along the Hanford Reach were open camps, 26% were fishing stations, and 14% were open camps with pit houses. These findings reveal that seasonal use of the area centered on the fall fish migrations and winter villages.

3.14.4 Pre-Contact Resources

No synthesis of the Mid-Columbia archaeological record has been developed, so the exact numbers of sites within the Monument is based on DOE and Washington State Historic Preservation Office (SHPO) databases. As noted previously, much of the existing data is based on cultural resource compliance work for government agencies, including project work undertaken by the DOE since 1987, through consultants, universities and tribal cultural resource programs. Consequently, the work undertaken has been primarily within Central Hanford, not on the buffer lands (i.e., the Monument) where few projects occurred. In addition, the Mid-Columbia Archaeological Society (MCAS), a vocational group active between 1968 and 1978, conducted surveys and excavations along the river, contributing some additional information.

In contrast to other areas of the Columbia drainage, the Hanford Reach has had few major data recovery excavations. The entire Hanford Site has only had sixteen sites excavated (Marceau and Sharpe 2002). Most of these, including projects of the MCAS, were excavated thirty to forty years ago. Some of these excavations constitute minimal test excavations. Report detail for all of the work by various parties in the area varies; some surveys and excavations remain unreported, some are incomplete. Little systematic survey or excavation addressing research questions or theoretical considerations has been undertaken in the Hanford Reach. A recent notable exception is the excavation of two small seasonal camps within the Monument on the south shore of the river (Marceau and Sharpe 2002). The sites represent early spring shellfish gathering and small-to-medium game hunting/processing camps used over the past 3,000 years.

In general, recorded archaeological sites on the Hanford Reach tend to be on the alluvial flats and lower terraces near the shorelines and islands of the Columbia River. Due to the unique geomorphology of the area, there are no known rock shelters or mesa top sites, which are

typically found both upriver and down river from the Hanford Site.[95] Upland sites have been discovered on Gable Butte (Central Hanford), Rattlesnake Mountain, and near the few isolated springs such as Rattlesnake and Snively on the Monument.

The archaeological record indicates that the south bank of the Columbia River contains greater concentrations of sites than the north bank.[96] The geography of the area may be the primary determinant, as the northern bank of the Columbia River is dominated by the vertically imposing White Bluffs with over 200 feet of vertical rise directly from the river. As a result, fewer terraces and suitable village areas exist on the north side in comparison to the south side. The south bank also contains greater numbers of ephemeral drainage channels with more food resources and desirable areas for storage, shelter, water and travel (Marceau 2002). The south bank is logistically closer to a more diverse supply of upland resources. Water may also have been a consideration for the upland sites; upland sites on the south side of the Columbia River contain more inland springs and ephemeral streams than the upland areas that are located north of the river.

The majority of the total site inventory represents a wide range of Native American site types, including pit house villages, campsites, fishing stations, root gathering and resource processing camps, caches, hunting blinds, rock cairns, talus pits, hearth features, sacred locations, cemeteries, quarries and lithic tool production sites. Resource procurement and processing sites make up the bulk of the sites, but a large number of isolated artifacts are also included.[97] Many of these isolated artifacts, especially those located along the river, may be part of larger sites but have not yet been incorporated into a specific site assemblage. The riverine sites include nineteen of the twenty-three pit house sites recorded and all of the fish processing stations. One of these sites contains a concentration of over fifty pit house depressions, one of the largest such villages remaining in the region. The number of pit house depressions visible on the ground surface is substantially higher in the Hanford Reach than other parts of the Columbia, likely as a result of its remoteness, direct preservation due to the access restrictions in place since 1943, and the lack of agriculture and development along the shoreline.

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[95] No such sites have been recorded, although a few isolated areas of exposed basalt have the potential to yield these types of sites.

[96] The south bank or shore is frequently called the west bank due to bends in the river. Likewise, the north bank or shore is frequently considered the east bank.

[97] Lithic materials and minerals were important resources and were utilized during the aboriginal period as medicines, paints, cleaners and stone tools. Tools, such as projectile points, knives and scrapers, were generally manufactured out of fine-grained materials, including obsidian, cryptocrystalline silicate (chert and chalcedony), and petrified wood. However, Native Americans report that the only raw material collected from the Mid-Columbia region was chert (flint). Yakama peoples contend that they obtained this material in the Saddle Mountains, and there appear to be major lithic material quarries found during an archaeological survey of the Saddle Mountains region.

Limited archaeological excavation has occurred outside of the river corridor, and radiocarbon dating of the sites that have been studied tends to cluster in the later periods covering the past 3,000 years. This correlates with the more intensive riverine use associated with salmon fishing that was common through out the region during this time period.[98] It is likely that numerous earlier sites do exist but have not been located yet. They are likely associated with higher elevation spring areas and possibly rock shelters within the ridge systems and older terraces along the ancestral meander channels of the Columbia. Much of this topography lies either in Central Hanford, away from project work which centers near the reactors, or within the buffer zones now within the Monument.

Another type of cultural site that may be found in the Monument is a TCP. In 1990, the NPS formalized the concept of TCPs as a means to identify and protect cultural landscapes, places and objects that have special cultural significance to Native Americans and other ethnic groups. A TCP eligible for the National Register is associated with "cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community" (Parker and King 1990). Due to their sacred nature, many traditional cultural places remain unidentified. No specific TCPs have been recorded in the Monument, but certain landforms, especially Rattlesnake Mountain and the Saddle Mountains, as well as certain sites or features along and including the Columbia River, remain sacred to various tribal entities and may represent TCPs.[99]

3.14.5 Post-Contact Resources

Approximately 650 historic archaeological sites associated with Euro-American settlement—including an assortment of communities, farmsteads, irrigation features, mining features, roads, ferries and debris scatters—have been recorded on the Hanford Site. However, this is a fraction of the potential number of sites that may have existed. Few structures associated with Euro-American settlement remain in the Monument due to Manhattan Project/Cold War operations. Due to security and other reasons, many structures were razed from 1943 into the 1970s. Of those that remain, only a few are within the Monument. The known structures in the Monument consist of the Allard Pumphouse, Hanford Irrigation and Power Station, BPA Midway Substation, Bruggeman Fruit Warehouse, White Bluffs log cabin, and a stone structure near the Midway Substation.

Little remains of many structures, and much of what is left is threatened. The White Bluffs cabin, built in 1894 and potentially eligible for the National Register, was stabilized in 2001 to

[98] It is unclear why salmon fishing became more intensive at this point in history.

[99] The DOE has completed a National Register Determination of Eligibility for Rattlesnake Mountain to identify its potential as a TCP, determining that it is eligible. The Washington SHPO has concurred with this determination.

avoid potential collapse; vandals had removed a wall log causing the sod roof to sag. Of the historic communities and homesteads, a few structural features, such as foundations, irrigation ditches/canals, cisterns, landscape plantings, roadbeds and ferry landings, are all that remain to define the site. Several of those sites known in the Monument include the Wahluke, Allard, McGee, Cold Springs, Midway, Hanford and East White Bluffs settlements. The latter towns retain some platted streets, and Hanford's main street is within the Monument. Numerous farms and ranches, such as Snively, Bennett, Benson, Borden, Foster, Coonce, Splawn, Perkins, Young and Thumb, and Wiehl, existed prior to 1943, and various elements remain. However, no structures exist for any of these homesteads, primarily due to removal during use of the Hanford Site. Many of these homesteaders or their ancestors are integrally connected with the history and development of the region. Few of the structures have been evaluated for the National Register.

Artifacts and sites from the Manhattan Project and Cold War era are much better preserved; the landscape comprises cultural resources associated with plutonium production, military operations, research and development, waste management, and environmental monitoring activities that took place, beginning with the establishment of the Hanford Site in 1943 through the end of the Cold War. In 2002, the DOE released a major study of the built environment on the Hanford Site. The study was undertaken to assess the National Register significance of the remaining buildings and features to determine which ones to preserve as site cleanup progresses. A total of 530 structures and building complexes have been determined eligible for the National Register (DOE 2002).[100]

Military operations in various forms took place on the Hanford Site from WWII to the early 1960s. Evidence of resources associated with military operations, including foxholes, roads, graffiti and debris scatters, is mainly archaeological in nature. Historic military sites are scattered mostly in Central Hanford, but also include several anti-aircraft artillery sites within the Monument and three Nike missile installations on Wahluke Slope and one at the base of Rattlesnake Mountain on the ALE. The anti-aircraft artillery and Nike sites were strategic components in defense of the Hanford Site's plutonium production facilities during the 1950s and early 1960s. The Nike position on the ALE has been determined eligible for inclusion in the National Register as a contributing property within the Hanford Site Manhattan Project and Cold War Era Historic District (DOE 2002). Potential archeological resources at these sites include former gun emplacements, launch and radar sites, concrete foundations and pads, pathways/sidewalks, debris scatters, small arms firing ranges, and ammunition caches.

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[100] On March 1, 2006, the NPS initiated a study of the B Reactor and its associated Chemical Separations Building (T-Plant) to determine their eligibility and suitability for—and the feasibility of—addition to the National Park System. The Hanford Site is being studied along with sites in Oak Ridge, Tennessee; Dayton, Ohio; and Los Alamos, New Mexico. The final report is expected this spring, and early indications are that it will recommend that, at least, the B Reactor be protected, although the exact mechanism, and the agency/organization best-suited, to provide that protection is unknown.

3.15 Tribal Uses

The historic uses of the Monument by Native Americans are described in great detail in Section 3.14.1, "Pre-Contact Native American Traditions," Section 3.14.4, "Pre-Contact Archeological Investigations," and Section 3.14.5, "Pre-Contact Resources." Many of these uses continue on to this day and into the future. At present, tribal use of the Monument is limited and involves only a few activities, in part due to past closures by the DOE and concerns over contaminants. Current use primarily focuses on the gathering of medicinal and food plants, while certain areas of the Monument are also used for spiritual and ceremonial practices. It is likely that other tribal uses will be reestablished in the future as contaminant concerns are addressed, treaty issues are resolved, and resource protection plans are developed and implemented.

The FWS recognizes past and ongoing tribal activities, and through this CCP and subsequent step-down plans will work to address long-term stewardship issues for the protection of cultural resources and traditions and the enhancement of natural resources vital to the continuance of tribal uses. The existing FWS Native American Policy, stemming from Executive Order 13175, assists the FWS in accomplishing this mission of resource protection while also guiding the federal government's interactions with tribes. The FWS will:

> . . . assist Native Americans in protecting, conserving and utilizing their reserved guaranteed, or statutorily identified trust assets . . . The Service will consult with Native American governments on fish and wildlife resource matters of mutual interest and concern to the extent allowed by law. The goal is to keep Native American governments involved in such matters from initiation to completion of related Service activities.
>
> The FWS will provide Native Americans with reasonable access to FWS-managed or controlled lands and waters for exercising ceremonial, medicinal, and traditional activities recognized by the FWS and by Native American governments. The FWS will permit these uses if the activities are consistent with treaties, judicial mandates, or federal and tribal law and are compatible with the purposes for which the lands are managed.

As noted repeatedly, this CCP does not define or delineate treaty rights, trust resources, valid existing rights, and so on.[101] Those issues are best left to other planning processes, government-to-government negotiations, and the development of agreements between the FWS and tribes. What is relevant for this CCP is that the FWS will honor those rights and work with the tribes to develop the appropriate access plan.

[101] As noted previously, the FWS does not consider fulfilling treaty rights a goal, but rather an obligation. See Section 2.3.1 for a discussion.

3.16 Visual/Aesthetic Resources

The Monument is a land of stark beauty. To visitors from more temperate climates, the Monument can seem quite barren, and it is often only through time that this perception is changed. Once the visitor learns what is hidden in the Monument and what it takes to survive in this arid land, the Monument comes alive, and the appeal of the Columbia Plateau's shrub-steppe becomes manifest.

There are many things to catch the eye in the Monument, including the topography of the landscape. On one side of the Monument, Rattlesnake Mountain rises almost 3,600 feet above sea level; on the other side, the Saddle Mountains rise to 2,181 feet in the Monument. Wahatis Peak, although on BLM lands, reaches 2,621 feet above sea level and is visible from the Monument. In between, Gable Mountain and Gable Butte rise into the sky in Central Hanford. Large rolling hills are located to the west and far north. The 200-600 foot White Bluffs, steep whitish-brown bluffs adjacent to the Columbia River and above the northern boundary of the river, are a strong feature of the landscape. Elsewhere, berg mounds, arroyos and sand dunes provide additional relief to the landscape.

The view toward Rattlesnake Mountain is visually pleasing, especially in the springtime when wildflowers are in bloom. The Columbia River, flowing across the northern part of the Hanford Site and forming part of the eastern boundary, is generally considered scenic, with its contrasting blue against a background of brown basaltic rocks and sagebrush.

In the sections that follow, visual intrusions in the Monument will be cataloged. In reading through these sections, it would seem the Monument's aesthetic resources have been severely affected by previous action. In some instances, this is indeed true. However, it is important to remember that the Monument covers almost 200,000 acres and has a varied terrain. Standing on a knoll, the visitor may be able to see facilities in Central Hanford, the steam plume from Energy Northwest's nuclear power plant, transmission lines, irrigation canals, and other man-made influences. Moving 100 yards, though, may drop the visitor into canyons where no readily apparent human impacts mar the scenery. Mule deer, coyotes and songbirds of all descriptions complete the appearance of a natural landscape. The Monument is a land of contrast between the natural world and that of human creation. While the following sections mainly highlight the human-related modifications in the Monument, the Monument provides an equal opportunity to escape from these intrusions.

3.16.1 Columbia Plateau Aesthetic/Visual Characteristics

As previously noted, the Monument is located in the center of the Columbia Plateau Physiographic Province in semi-arid south-central Washington State. Topographic features have

a direct influence on the aesthetic/visual character of the Monument and the surrounding region. Major features—such as river valleys, rolling uplands, ice age features, and the Columbia River—give form to the Plateau. In addition to topography, vegetation patterns, and land uses have an influence on the region's aesthetic/visual character. Pre-settlement vegetation communities in the semi-arid Plateau were composed of an assortment of plant communities that were generally dominated by various combinations of sagebrushes and grasses, collectively known as shrub-steppe. Past land uses have changed the distribution of the shrub-steppe habitat type and have had a strong influence on the aesthetic/visual character. These land uses (including agriculture, military, conservation, residential, research, and energy production and transmission) have resulted in removing or altering shrub-steppe habitat and, in some cases, introducing new vegetation types. Intact areas of shrub-steppe habitat type are generally in undeveloped and/or protected areas of the region, such as the Monument.[102] Some of these areas retain pre-settlement aesthetic/visual character. Some new land uses have introduced new features into the landscape, such as buildings, highways, dams, and cleared areas that have influenced the region's aesthetic/visual character.

3.16.2 Monument Aesthetic/Visual Characteristics

The Monument and adjacent lands contain a number of features that influence the aesthetic/visual character of the Monument. The following discusses the existing aesthetic/visual character of the Monument.

In describing the Monument, the use of the proposed new management units is a far better way to describe the landscape than through the use of the existing management units, unlike the description of the affected environment to this point. The main reason for this is that the lands within the proposed management units are more similar in character and use than that found under the current situation. As such, the following subsections are organized by the proposed management units. Elements within each unit that influence the unit's aesthetic/visual character are briefly described, including topography, vegetation, land use, land management, and cultural modifications. To describe specific views from within each unit, key observation points (KOPs) were selected from around the Monument.[103]

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[102] Other habitat types, such as riparian, are also present and have an influence on the Monument's aesthetic/visual character, but are less prevalent than shrub-steppe.

[103] An extensive visual resources/aesthetics assessment was completed to assist in preparation of this EIS. The full visual resources report includes panoramic photographs, a brief description of uses near the KOP, visual features and visible alternations to the landscape that can be seen from the KOP, viewers, and viewer sensitivity.

3.16.2.1 Ringold Unit

3.16.2.1.1 Topography

The Ringold Unit is located in the eastern part of the Monument. The unit is bordered by the Columbia River to the southwest and steep weathered bluffs to the north. The approximately twelve-square-mile Hanford Dune Field is across the Columbia River from the Ringold Unit (part of the Columbia River Unit). The dunes are a very prominent topographic feature that can be seen from the southern parts of the Ringold Unit.

3.16.2.1.2 Vegetation

Vegetation in this unit has been heavily affected by historic uses, such as homesteading and farming. More contemporary uses and events, such as grazing, irrigation, planting non-native vegetation for wildlife benefits, and fire, have also affected the unit's vegetation patterns and appearance. There are remnant areas of shrub-steppe vegetation along with areas of riparian vegetation, but human activities and the extensive presence of non-native invasive species have resulted in a vegetation pattern that, from a biological perspective, is among the most disturbed in the Monument. From an aesthetic/visual perspective, some of the vegetation in the Ringold Unit has obviously been altered (primarily in the southern part of the unit), yet some areas have a relatively intact appearance (primarily in the north part of the unit and along the Columbia River and a major drainage ditch).

3.16.2.1.3 Land Use/Management

The Ringold Unit is managed to provide wildlife, fisheries and recreational benefits. As mentioned previously, past uses have resulted in changes to original (predominantly shrub-steppe) vegetation patterns, which has influenced the aesthetic/visual character of the unit. Fisheries management objectives resulted in the construction of the Ringold Fish Hatchery complex by the WDFW, which has a direct influence on the aesthetic/visual character of the part of the unit from which it can be seen. The complex is located immediately south of the unit and is the most visually prominent feature in the areas from where it can be viewed. In addition to wildlife and fisheries, recreation is a significant activity. Because the unit is accessible by road, is close to the Tri-Cities, has a history of being open to the general public, and can accommodate a number of recreational activities, it is a popular recreational area, and the majority of people who visit are involved in recreational activities. Recreational facilities include dirt or gravel parking areas and a primitive boat launch near Parking Lot 7. A heavily used cobblestone boat launch and an undefined/informal campground (miscellaneous campsites, ad hoc dirt roads, and fire rings) just south of the unit is on land managed by the WDFW.

Lands outside of the Monument to the east are irrigated croplands and have an agricultural character that contrasts with the scrub-shrub vegetation found in the unit. Most of the lands west of the unit across the Columbia River are included in Central Hanford, except for the area that contains the Hanford Dune Field (which is located in the Columbia River Corridor Unit). The Energy Northwest Columbia Generating Station is located approximately three miles south of the unit and can be seen from many locations within the unit, particularly during times of the year when the steam plume is visible due to atmospheric conditions.

3.16.2.1.4 Cultural Modifications

The primary cultural modifications visible to the general public are the Ringold Fish Hatchery and the informal campground, which are located outside of Monument, and two residences near the entrance to the Monument. A dirt road running the length of the unit and several associated parking lots are also significant cultural modifications. The SCBID has irrigation canals that are visible within and near the unit. Next to one of the canals is an emergency notification siren mounted on a tower that is quite visible from Ringold Road. The agricultural lands, the Energy Northwest facility mentioned previously, and the Energy Northwest Pumphouse (particularly visible at night due to security lights) are cultural modifications outside of the Monument that can be seen from parts of the Ringold Unit.

3.16.2.2 Wahluke Unit

3.16.2.2.1 Topography

There are several visually prominent topographic features seen from within and/or near the Wahluke Unit. The most visually prominent feature is the Wahluke Slope that lies to the north and east of the unit. The Wahluke Slope is an expansive south-facing slope that drops from the top of the Saddle Mountains to the edge of the Columbia River. The unit also contains dune fields, Saddle Mountain Lake, and a series of other lakes approximately twelve miles east of Saddle Mountain Lake that are known as the Wahluke Lakes and/or the WB-10 Ponds.

3.16.2.2.2 Vegetation

Shrub-steppe and riparian vegetation communities dominate the landscape in the Wahluke Unit and greatly influence its aesthetic/visual character. The unit contains extensive areas of big sagebrush mixed with needle-and-thread grass, Sandberg's bluegrass, and cheatgrass. Riparian areas are found in the vicinity of the Saddle Mountain Lake, the Wahluke Lakes, and scattered wetlands. The unit includes several low-lying areas near Saddle Mountain and Wahluke Lakes

that contain wetlands and are interesting aesthetic/visual features that contrast with the adjacent dry shrub-scrub vegetation.

3.16.2.2.3 Land Use/Management

The western part of the Wahluke Unit is part of the existing Saddle Mountain National Wildlife Refuge and is managed for wildlife and research purposes. Public access is restricted and limited primarily to research and educational activities. The eastern part of the unit is managed for multiple resource objectives. This part of the Wahluke Unit contains important migratory bird habitat and waterfowl breeding areas, along with other valuable habitat. In addition to having significant natural resource values, the eastern portion of the Wahluke Unit is also an important recreational resource. Because so much of the eastern part of the unit is open to the public and contains a road system, it offers perhaps the greatest access (and viewing) opportunities to the general public in the Monument. Recreational activities that attract visitors to the Wahluke Unit include hunting, fishing, hiking, wildlife observation, and photography.

The most visible land uses on lands outside the Monument that can be seen from the Wahluke Unit occur in Central Hanford, primarily the 100 Area facilities along the south side of the Columbia River.

3.16.2.2.4 Cultural Modifications

Cultural modifications that are visible to the general public include transmission lines that pass from south to north across the unit into the Saddle Mountain Management Unit, an abandoned railroad grade, several borrow pits, gravel storage areas near State Route 24, unpaved roads (including the remains of the historic White Bluffs Road), SCBID canals, and several unpaved parking areas. The most visible cultural modifications outside of the Monument are those associated with Central Hanford operations; those that can be seen from various parts of the Wahluke Unit to the south and west include the 100B/C, 100K, 100N, 100H and 100F facilities.

3.16.2.3 Saddle Mountain Unit

3.16.2.3.1 Topography

The most prominent visual topographic feature here are the namesake Saddle Mountains. From the southern boundary of the Saddle Mountain Unit (State Route 24), the terrain slopes steadily upward at a fairly gentle rate to the toe of the southern face of the Saddle Mountains. From this point, the terrain rises steeply approximately 400 to 500 feet to the crest. Several high points

along the crest that are within the unit reach elevations of over 2,000 feet. Wahatis Peak, approximately one mile northeast of the Saddle Mountain Unit's boundary, reaches an elevation of approximately 2,700 feet and is a very noticeable topographic feature.

Another prominent and significant feature visible from within the Saddle Mountain Unit is the Curfu Landslide.

3.16.2.3.2 Vegetation

Vegetation is varied and includes extensive areas of big sagebrush mixed with rock buckwheat/bunchgrass and Sandberg's bluegrass/cheatgrass associations. Irrigated orchards can be seen outside the Monument to the north and northeast. They contrast sharply with the dry shrub-steppe vegetation of the unit (and nearby undeveloped areas outside of the Monument).

3.16.2.3.3 Land Use/Management

The Saddle Mountain Unit is managed primarily for wildlife resources, although recreational use is also allowed. As with the eastern portion of the Wahluke Unit, the Saddle Mountain Unit can be accessed by the general public for day-use recreational activities such as hunting, horseback riding, and hiking; however, there are no developed recreational facilities in the unit.

3.16.2.3.4 Cultural Modifications

Cultural modifications within the Saddle Mountain Unit that are visible to the general public are limited and include scattered borrow pits, roads, the White Bluffs Wasteway (irrigation water return), spoil banks, and the Wahluke Branch Irrigation Canal. Transmission lines that pass from south to north through the unit are quite visible. The most visually prominent cultural modifications occur on top of the Saddle Mountains and include the foundations of Nike missile installations and roads leading to the installations. A number of Central Hanford facilities are visible in the distance to the south beyond the unit's boundaries.

3.16.2.4 Columbia River Corridor Unit

3.16.2.4.1 Topography

This unit follows the Hanford Reach of the Columbia River for over forty miles. The terrain adjacent to the Columbia River Corridor Unit varies from steep bluffs on the east and north sides

of the river, to flatter areas on the west and south sides. The White Bluffs, located in the central part of the unit, is perhaps the most dramatic area topographically within the Monument. Other aesthetically/visually prominent topographic features in the unit include the Hanford Dune Fields, a number of low-lying islands, side channels, and drainage canals that enter the river.

3.16.2.4.2 Vegetation

There is a wide variety of vegetation types within the Columbia River Corridor Unit. Riparian vegetation along the river is one of the primary characteristics of the unit; areas that support riparian vegetation include islands, low-lying areas along the river, side channels, and areas where canals enter the river. Most of the vegetation types found in the various units of the Monument can be found somewhere within the Columbia River Corridor Unit. In addition to native vegetation types, trees remaining from old farms and town sites can be viewed at various locations along the river, as can relatively recently planted rows of poplars for agricultural wind breaks on bluffs above the river.

3.16.2.4.3 Land Use/Management

As the last free-flowing reach of the Columbia River in the United States, the Hanford Reach is an important recreation resource. Many people viewing this area do so from motorized or non-motorized boats. The majority of motorized boaters access the river from one of the boat launches within or immediately adjacent to the Monument, while non-motorized boaters generally put in at Vernita Bridge and take out at the White Bluffs Boat Launch or the Ringold Fish Hatchery. These access points are important viewing sites, as recreational users spend extended time launching and trailering their boats at these locations.

Land uses outside of the Monument that are visible from within the unit include those associated with Central Hanford on much of the southern and western sides of the unit (primarily the 100 Areas and Energy Northwest facilities) and agricultural uses along parts of the southeastern portions of the unit. Electrical transmission lines pass through the unit and are visible throughout.

3.16.2.4.4 Cultural Modifications

There are relatively few cultural modifications directly in the unit. The modifications that do occur include transmission lines that cross the river, the three boat launch facilities mentioned previously and their associated access roads/parking areas, the White Bluffs log cabin, and the White Bluffs Ferry Landing. The Vernita Bridge at the north end of the unit is a prominent visual element, as are numerous transmission lines within and outside the Monument. A number

of other visually prominent modifications can be seen that are outside the Monument. The Energy Northwest pumphouse is visible on the west bank of the river, particularly at night when security lights are visible. Other modifications are in Central Hanford and include both facilities that are adjacent to the river and facilities located away from the river but visible from it. Some of the visible structures have been "cocooned," and others appear to be largely intact, although not in use.[104] The N Reactor facilities are prominent features located on the banks of the river and are the most visually dominant cultural feature that can be seen from the river. Other facilities associated with Central Hanford can be viewed from various stretches of the river.

3.16.2.5 Rattlesnake Unit

3.16.2.5.1 Topography

The most visually dominant topographic feature here is Rattlesnake Mountain, which is located along the southwestern edge of the unit. The axis of the approximately five-mile long Rattlesnake Mountain runs from southeast to northwest and rises approximately 3,000 feet from the toe of the mountain to the crest (with elevations of over 3,450 feet). The slopes of Rattlesnake Mountain are as steep as 60% and have been incised by numerous watercourses that seasonally flow into Dry Creek or Cold Creek. Although there are no permanent streams in the Rattlesnake Unit, there are several permanent, or near permanent, springs (Rattlesnake, Benson, and Snively Springs) located below Rattlesnake Mountain. West of Rattlesnake Mountain at the southwest corner of the unit are the Rattlesnake Hills. North of the Rattlesnake Hills, the eastern end of the Yakima Ridge enters the unit and is visible from State Routes 240 and 243. Most of the topography found at the lower elevations of the Rattlesnake Unit is gently rolling or relatively flat. The north edge of the unit is located several miles east of the State Route 240/State Route 24 junction and overlooks the Columbia River Valley.

Another significant topographic feature within the Rattlesnake Unit are the hundreds of ice-rafted bergmounds that cover the land surface between 600-1,000 feet in elevation above sea level (Bjornstad 2006a).

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[104] 'Cocooning' is term used to describe part of the cleanup of nuclear reactors along the Columbia River. The outer shell (building) around the reactors is removed, leaving just the 'hot' reactor core. A secure, weather-proof, 'cocoon' is then constructed around the remaining reactor core, which will remain in place for several decades as the reactor core cools. At some point in the future—an estimated seventy to eighty years—the DOE will determine the appropriate manner in which to handle the then-cooled reactor core. Unfortunately, the finish used on the cocoons to date is of a highly reflective material and can be seen for extensive distances.

3.16.2.5.2 Vegetation

Rattlesnake Mountain is reputedly the highest "treeless" mountain in the continental United States. Many of the slopes on the mountain are covered in grasses, with scattered areas of sagebrush along the mountaintop. Until major wildfires in 2000 and 2007, the unit contained one of the largest remaining areas of undisturbed shrub-steppe vegetative community in the state of Washington. In addition to areas along the mountaintop (which contains three-tip sagebrush), the other parts of the unit that contained significant areas of sagebrush (big sagebrush) are those on either side of State Route 24. As a result of the fire and historic grazing practices, many areas of sagebrush have been replaced by extensive areas of cheatgrass and other invasive species. These areas are what people looking at Rattlesnake Mountain from State Route 240 and points north and east of the mountain see as "grasslands" and give Rattlesnake Mountain much of its character. There are isolated areas of riparian vegetation near the springs mentioned previously. These relatively lush, isolated riparian areas contrast greatly with the nearby dry shrub-steppe vegetation but are not seen by the general public. Three abandoned fields located in the Snively Basin still contain large areas of grass, dominated by black rye planted in approximately 1940. However, these areas are not publicly accessible and thus are not seen by the general public.

3.16.2.5.3 Land Use/Management

Part of the Rattlesnake Unit—the ALE on the east—is an RNA managed to protect and conduct research on the natural systems found within the Monument. The western end of the unit was a buffer for the Hanford Site. The entire unit has restricted access, and as such, recreation and other types of visitation and use are limited. As a result of these policies, public opportunities to view the Rattlesnake Unit from within have been limited in frequency and location. Public access to the unit is limited to educational and research-oriented activities.

Adjacent to the Monument along the south side of State Route 240 is a proposed DOE borrow area; while this site is not yet significantly disturbed by construction, the development and operation of the borrow area may impact the visual character of the Rattlesnake Unit. This area may be disturbed by haul road construction before this EIS is issued. Lands west and south of the unit visible from the top of Rattlesnake Mountain are mostly private and used for cattle grazing or field crop production.

3.16.2.5.4 Cultural Modifications

The most visible cultural modifications in the Rattlesnake Unit that can be seen by the general public are transmission lines and roads. BPA transmission lines (and unpaved access roads) cross from east to west through the southern and northern parts of the unit. There are a number of unpaved roads, some of which are visible from State Route 240 and the top of Rattlesnake

Mountain. From the top of the mountain, the observatory and commercial telecommunications facilities, such as antennae and satellite dishes, are prominent visual features.

From State Route 24, Central Hanford has an undeveloped character, although roads and security features (fences, stations) can be seen. However, Central Hanford facilities are readily visible from Rattlesnake Mountain. The agricultural lands west and south of the unit, visible from Rattlesnake Mountain, used for cattle grazing have a somewhat natural appearance, whereas areas used for crop production have an agricultural character.

Some of the research conducted on or near the Rattlesnake Unit is world-renowned. For example, at the base of Rattlesnake Mountain is a gravitational research lab operated by researchers from the University of California at Irvine and the PNNL of Richland. The facility is located in a decommissioned Nike missile installation; also near the decommissioned Nike site is a fire staging area and storage facilities for the FWS. Just off the Monument, but readily visible from Rattlesnake Mountain, is the Laser Interferometer Gravitational Wave Observatory, which uses two aboveground, mile-long tunnels to measure gravitational events in deep space. While certainly unique, components of the Rattlesnake Unit, these facilities, and other research sites and equipment, affect the visual character of the unit.

Other cultural modifications located in the unit that are not visible to the general public include landfills, additional unpaved roads, gas wells, test wells, foundations and other features from homesteads, the decommissioned Nike missile site, and an abandoned rail line.

3.16.2.6 Central Hanford

Although not a part of the Monument, Cental Hanford greatly influences the visual character of many parts of the Monument. The 280-square-mile area contains a number of visually prominent natural and culturally modified features, some of which can be seen from the Monument and some of which cannot. The following briefly highlights some of the more prominent features that can be seen from the Monument. These features have been categorized as Natural Features and Cultural Modifications.

3.16.2.6.1 Natural Features

The two most visually prominent natural features in Central Hanford are Gable Mountain and Gable Butte. Gable Mountain is an approximately five-mile-long outcropping of basalt located in the northern part of Central Hanford. It rises between 400 and 500 feet above the surrounding terrain to an elevation of over 1,050 feet. Its height and east-west orientation provide views of the facilities in the north part of Central Hanford, such as the B, C and N Reactors, and other visual features, such as the Columbia River, Wahluke Slope, and Saddle Mountains. Views to

the south include Energy Northwest's Columbia Generating Station, the 400 Area, and other visual features such as Rattlesnake Mountain. Less imposing features to the north and south, such as roads, electrical transmission lines, borrow pits, and transmission lines, can also be seen from the top of the mountain.

Gable Butte lies approximately three miles west of Gable Mountain. At approximately ½-mile in length with an elevation of approximately 780 feet, it is a smaller feature than Gable Mountain. However, it is visually distinctive and offers broad views of the surrounding area. Views from the top of Gable Butte include most of Central Hanford and the Monument.

3.16.2.6.2 Cultural Modifications

There are several historical sites within Central Hanford that are interesting visual features. These include the Bruggeman Fruit Warehouse in the north part of Central Hanford, the White Bluffs Townsite, the Hanford Townsite, and the B Reactor. Most facilities within Central Hanford are large in scale and highly visible within Central Hanford and beyond. Because Central Hanford is located in a generally flat desert environment that offers little in the way of topographic relief or vegetation to screen the facilities, even smaller-scale facilities such as roads can be seen from great distances. In addition to scale and lack of screening, the materials used for the facilities often have colors (light or bright) and/or finishes (reflective) that accentuate their visibility. As a result, facilities in Central Hanford are visible over long distances, and virtually all of these facilities can be seen from the higher parts of the Monument, such as Rattlesnake and Saddle Mountains. Other facilities, particularly those located near the Columbia River, are also quite visible.

3.16.3 Auditory Resources

Noise is technically defined as sound waves that are unwanted and perceived as a nuisance by humans. Sound waves are characterized by frequency, measured in Hertz (Hz), and sound pressure expressed as decibels (dB). Humans have a perceptible hearing range of 31 to 20,000 Hz. The threshold of audibility ranges from about sixty dB at a frequency of 31 Hz to less than one dB between 900 and 8,000 Hz. Sound levels outside the range of human hearing are not considered noise in a regulatory sense, even though wildlife may hear at these frequencies.

Studies of the propagation of noise at the Hanford Site have been concerned primarily with occupational noise at work sites. Environmental noise levels have not been extensively evaluated because of the remoteness of most Hanford Site activities and isolation from receptors that are covered by federal or state statutes. This discussion focuses on what few environmental noise data are available. The majority of available information consists of model predictions,

which in many cases have not been verified because the predictions indicate that the potential to violate federal or state standards is remote or unrealistic.

While no areas of the Monument are free from human-generated noise—few spots in the world are entirely free from intrusions like aircraft—most of the Monument is relatively quiet and has periods when there are no noise intrusions.[105] Light aircraft and military planes do overfly the Monument; however, their numbers are limited. Other noise within the Monument can best be cataloged by lumping the units into three main areas—north of the Columbia River, the Columbia River Corridor Unit, and the Rattlesnake Unit.

3.16.3.1 North of the Columbia River (Ringold, Saddle Mountain, and Wahluke Units)

Noise in this area is generally limited, with the majority of it being generated by traffic on State Route 24. Once the visitor moves away from the highway corridor, human-generated noise comes primarily from the occasional automobile on publicly accessible Monument roads, and it is easy to move away from the limited road system on the eastern Wahluke and Saddle Mountain Units to find areas where even this noise fades away. During hunting seasons, the sounds of gunshots can be heard throughout the entire area.

On the Ringold Unit, which abuts the Columbia River, motorboat noise can be significant, especially during salmon fishing season. However, even this noise is usually mitigated by prevailing winds in the Monument. This area also has road noise, with lesser opportunities to move beyond it. Gunshots from hunting are audible in season.

Other noise sources in this area include occasional maintenance of irrigation and transmission facilities, operation of the Ringold Fish Hatchery, and cultivation of an agricultural field in the Monument. None of these sources is significant.

3.16.3.2 Columbia River Corridor Unit

The Columbia River has the greatest amount of human-generated noise in the Monument. Jetboat and other motorboat noise is possible at any time of the year and is quite high during salmon fishing seasons. As most of the major boat launches exist on either end of the Monument, motor noise tends to be greatest at the ends of the Hanford Reach (Vernita Bridge

[105] For the purposes of this EIS, noise is defined as being human-generated. Natural sounds of birds and other creatures, wind and rushing water are not considered an impact and are not cataloged here. On almost any part of the Monument, the songs of birds, the rustling of grasses, the gurgling of water, or the cries of animals might be heard, enhancing the visitor's experience.

and Ringold Fish Hatchery), although at times of peak use, the White Bluffs Boat Launch can be noisy.

There is one major, continuously affected area of noise within the Columbia River Corridor Unit—the Vernita Bridge and immediate area. Traffic over the bridge generates significant amounts of noise, and the passage of tractor-trailers creates high-decibel noise. This is also a major boat launching location, as well as an unauthorized camping area with its associated noise. The Vernita Rest Area contributes to the noise pollution, although its contribution beyond traffic is primarily through site maintenance (e.g., grass cutting, occasional construction).

In addition, there is another major source of noise pollution in the Columbia River Corridor Unit, although the source is not continuous—cleanup operations of the Hanford Site. At times, large-scale earthmoving equipment operates within the corridor, and the transitory impacts are quite large. However, these impacts are transitory, and as cleanup winds down, they will subside.

Other sources of noise include traffic and operations associated with the Midway Substation, pumping of water for Energy Northwest operations, and the occasional gunshot from hunting in season.

3.16.3.3 Rattlesnake Unit

As public access to the Rattlesnake Unit is restricted, noise impacts are lowest on this unit, being primarily restricted to the State Route 240 corridor. Once away from the public highways, it is comparatively easy to find areas where the sounds of the natural world dominate.

When the DOE borrow area becomes operational, the noise impacts may be significant in the immediate area. However, the borrow area is adjacent to State Route 240, so noise on the unit would be concentrated primarily within one corridor.

Other sources of noise on the Rattlesnake Unit include sporadic motor traffic associated with approved research and traffic and maintenance associated with communication towers, climate monitoring equipment, transmission lines, and other equipment on Rattlesnake Mountain.

3.16.4 Olfactory Resources

Air quality in the Monument is quite good (see Section 3.5). There are no permanent sources of odors on or near the Monument that affect resources or visitor experiences.

3.17 Visitor Use and Experience

The Monument provides a variety of recreation opportunities across an unusual landscape characterized by the Hanford Reach, the White Bluffs, active dune fields, rolling hills of shrub-steppe, and basalt mountains. Beginning in 1943, security protocols for the Hanford Site placed most of the now-Monument lands in a protective buffer zone, resulting in an unparalleled preservation of the Columbia Basin's natural and cultural resources. The Hanford Reach, being never dammed nor dredged, provides the only remaining example of what the Columbia River looked like before the massive public works projects of the 20th century. The Monument's wealth of natural features attract diverse recreation interests, with the most sought-after pursuits being fishing for salmon, steelhead, sturgeon and small-mouth bass; hunting for waterfowl, upland birds, and deer; non-motorized and motorized boating; wildlife observation; and environmental education. The Monument offers excellent seasonal opportunities to pursue these activities either in complete solitude, or with very low encounter rates with other people; however, such experiences are limited during popular fishing and hunting seasons.

3.17.1 Public Use Acreages

Currently, 74,392 acres of the Monument[106] are open for public use from two hours before sunrise to two hours after sunset, including the 46.5-mile stretch of the Hanford Reach within the Monument.[107] Of the remaining Monument lands, 110,383 acres are accessible only by special permit for research or educational purposes, and 10,825 acres are off-limits due to ongoing DOE environmental clean-up and restoration activities. Of course this will change depending on the final management alternative chosen in the ROD.

3.17.2 Visitor Facilities

Visitor facilities are limited, as are access points. Visitors primarily access the Monument by automobile or by boat. Visitor facilities consist of gravel and dirt access roads, parking areas, several primitive boat launches, and one concrete boat launch. Amenities such as vault toilets, garbage pick-up, and water are not provided, although portable toilets are provided seasonally at the White Bluffs Boat Launch. There are no visitation fees.

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[106] This includes 600 acres of McNary National Wildlife Refuge islands that are open to waterfowl hunting only.

[107] The Monument is only open to day use at this time, with a day being defined as beginning two hours before sunrise and ending two hours after sunset.

3.17.2.1 Public Access Roads

Access to the Monument is provided by state highways and county roads traversing adjacent to and sometimes through the Monument. Table 3-14 (Section 3.18.2.9) provides a summary of administrative, public and other road miles by management unit.

3.17.2.1.1 Wahluke Unit Roads

There are three main roads providing public access within the Wahluke Unit—Ringold, White Bluffs, and Saddle Mountain. The graveled Ringold Road runs northwest from the Wahluke Unit's southern boundary for approximately eight miles, at which point the road is closed to motorized vehicles due to public safety concerns related to erosion. Eight small parking areas are maintained along the Ringold Road to provide access to the Columbia River and adjacent upland areas. The graveled White Bluffs Road provides access from State Route 24 to the White Bluffs Boat Launch, to a dirt road accessing the WB-10 Ponds, and to an undeveloped scenic overlook with vistas of the Columbia River, White Bluffs, and Hanford Site. The graveled Saddle Mountain Road provides access from State Route 24 to the Saddle Mountain crest and adjacent public lands administered by the BLM.

3.17.2.1.2 Riverlands and Vernita Bridge Unit Roads

The paved Midway Road provides access from State Route 24 to the Riverlands Unit. State Route 24 provides access to the Vernita Rest Area, a WSDOT facility located south of the Vernita Bridge. Vehicle access to the north shore of the Columbia River is from State Route 243 via a gravel road and several primitive routes.

3.17.2.2 Boat Launches

Within the Monument, three primary boat-launching areas provide public access to the Columbia River (see Map 22). The undeveloped Vernita Bridge area consists of approximately one mile of shoreline west of the bridge on the north side of the river where people launch their boats in several locations. The White Bluffs Boat Launch consists of two narrow concrete lanes. Parking Lot 7 along the Ringold River Road provides a gravel boat launch suitable for four-wheel-drive vehicles. A fourth, seldom-used, primitive launch also exists in the Riverlands Unit, although this area is closed to public access.

Other boat launching areas can be found adjacent to the Monument. Up-river, several user-defined boat launches just downstream of Priest Rapids Dam provide access to the Monument. Immediately downstream of the Wahluke Unit, a primitive launch can be found at the Ringold

Fish Hatchery and is managed by the WDFW. Parks in the Tri-City area include thirteen developed boat launches, which provide access more than ten river miles downstream of the Monument.

The Monument also has two boat launches controlled by the DOE and used for administrative purposes. One is a concrete launch located on the south river shore across from the White Bluffs Boat Launch. The other is a primitive launch located at the historic Hanford Townsite. Public access is not allowed at either of these launches.

3.17.3 Recreation Use

Total annual recreation use in the Monument is estimated at 49,000 visits, or 30,000 visitor days.[108] Existing visitor use is described in Table 3.9. Anecdotal information indicates a trend of increased visitation since the June 9, 2000, Monument designation. Many of the recreation activities that occur in the Monument are projected to increase over the next twenty years. Table 3.10 details current and future participation in certain recreation activities currently occurring in the Monument (Cordell 1999). These activity participation trends are based on estimated changes in population, changes in the supply of recreational opportunities, and changes in demographic variables such as age, race and income.

In addition to increases in activity participation rates, population changes will also likely affect future use of the Monument. Traditionally, most visitor use of the Monument is from Washington State residents, mainly from the eastern portion of the state. It is estimated that over 80% of current visitors to the Columbia River are from counties in proximity to the study area (Benton, Franklin, Grant, Umatilla and Walla Walla) (Anderson et al. 2002). Table 3.11 details population projections for the counties adjacent to the Monument, eastern and western Washington, nearby states, and the Pacific Region. This table indicates that rapid growth is projected to continue at least until the year 2020. This growth in population will likely increase the number of visitors and recreation demand in the Monument. Another factor that will likely contribute to increased visitation in the Monument is the construction of the proposed Visitor Center, which, if funding is found, will open in 2010 or later.[109]

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[108] Recreation use is based on best professional judgement. The FWS, through the University of Idaho, conducted a visitor use and satisfaction survey, which has provided a more accurate picture of visitor use patterns and helped form this estimate. One visitor day is equivalent to twelve visitor hours.

[109] The Visitor Center is being planned and developed near the confluence of the Yakima and Columbia Rivers in the city of Richland through a partnership between the Richland Public Facilities District; Columbia River Exhibition of History, Science, and Technology Museum; Friends of the Hanford Reach National Monument; Tri-Cities Visitor and Convention Bureau; regional Native American tribes; and the FWS. The Visitor Center will provide interpretation and education programs about the Monument and other regional interests and destinations.

Table 3.9. Approximated Hanford Reach National Monument Visitation, 2004.[1]

Public Use Activity	Visitor Days[2] (Approximation)
Big Game Hunting	200
Upland Game Hunting	400
Migratory Bird Hunting	1,000
Fishing	20,000
Wildlife Observation	500
Wildlife Photography	70
Education and Interpretation	250
Hiking	330
Non-Motorized Boating	670
Motorized Boating	2,000
Commercial River Trips	1,880
Stargazing	200
Equestrian Use	330
Beach Use	1,670
Driving for Pleasure	330
Total Visitor Use	30,000

Notes:
[1] Best professional judgement.
[2] One visitor day is equivalent to twelve visitor hours.

3.17.4 Recreation Opportunities

The Monument provides for a wide variety of outdoor recreation activities. Use is currently low, but this is expected to increase as the Monument becomes better known and additional visitor facilities are provided.

3.17.4.1 Fishing

The Hanford Reach attracts anglers from around the Northwest, providing excellent opportunities to catch fall Chinook salmon, steelhead, sturgeon, whitefish and small-mouth bass. While bank and float-tube fishing is pursued by some anglers, most fishing occurs from motorboats. Jetboats are preferred by many anglers, with their low draft well suited to conditions on the Hanford Reach's shallow water sections and frequent water level fluctuations from upriver dam operations. During the fall Chinook salmon season, boat launches in the Monument and at the Ringold Fish Hatchery are at capacity, with many anglers choosing to

avoid crowds by launching from Tri-City area parks. The Vernita Bridge Unit, currently administered by the WDFW under a permit agreement with the DOE, attracts heavy use from anglers willing to trailer over rocky terrain and launch from unimproved shoreline areas. Although the DOE lease prohibits camping, visitors camp in this area year-round, with particularly heavy use during the northern pike minnow and fall Chinook salmon seasons.[110] The Vernita Bridge area has been the focus of WDFW efforts to replace the existing primitive launch areas with a developed boat launch.

Table 3.10. Pacific Region and National Outdoor Recreation Participation Trends (2000-2020).

Activity	Pacific Region[1,2]			National[2]		
	2000	2020	Percent Change[3]	2000	2020	Percent Change[3]
Non-consumptive Wildlife Activities	18.036	22.879	0.27	121.368	150.543	0.24
Sightseeing	20.165	26.270	0.30	119.07	149.688	0.26
Hiking	11.772	14.606	0.24	49.234	58.794	0.19
Walking	22.788	28.274	0.24	137.711	161.777	0.17
Motorboating	6.741	8.316	0.23	48.410	56.870	0.17
Visiting A Beach/Water	22.356	27.531	0.23	130.620	154.256	0.18
Horseback riding	2.520	3.096	0.23	14.586	17.589	0.21
Canoeing	1.272	1.560	0.23	14.382	16.215	0.13
Visiting Historic Places	14.904	18.354	0.23	93.704	116.688	0.25
Nonpool Swimming	12.296	14.964	0.22	80.443	94.501	0.17
Biking	10.388	12.642	0.22	59.696	73.472	0.23
Picnicking	16.906	20.698	0.22	102.232	122.875	0.20
Family Gathering	20.651	20.090	0.21	128.752	153.512	0.19
Primitive Camping	5.880	6.888	0.17	28.000	29.120	0.04
Fishing	7.875	9.000	0.14	59.637	71.217	0.19
Hunting	1.598	1.343	-16%	18.042	16.926	-6%

Notes:
[1] The Pacific Region is defined as Alaska, California, Hawaii, Oregon and Washington.
[2] Millions of participants.
[3] The percent change in activity participation was not tested for statistical significance.

[110] Area tribes have expressed concern that recreation use occurring in this area is harming cultural resources.

Table 3.11. County, State, and Regional Population Estimates and Forecasts Through 2020.

Area	2000 Population	Projected 2020 Population	2000-2020 Percent Change[1]
Washington Counties Near the Monument			
Adams	16,428	20,919	0.27
Benton	142,475	177,388	0.25
Douglas	32,603	44,920	0.38
Franklin	49,347	64,687	0.31
Grant	74,698	95,715	0.28
Kittitas	33,362	41,776	0.25
Walla Walla	55,180	64,856	0.18
Yakima	222,581	269,401	0.21
Washington State			
Eastern	1,306,948	1,638,199	0.25
Western	4,587,173	5,907,070	0.29
Statewide	5,894,121	7,545,269	0.28
Other Areas			
Oregon	3,397,000	4,177,000	0.23
Idaho	1,347,000	1,683,000	0.25
Alaska	653,000	838,000	0.28
Pacific Region	43,687,000	59,416,000	0.36

Note:
[1] The percent change in population was not tested for statistical significance. (Source: Washington Office of Financial Management 2002, U.S. Bureau of the Census 1997.)

The WDFW authorizes fishing tournaments for game fish on the Wallulla Pool section of the Columbia River, which includes the Hanford Reach. A typical year will see approximately ten fishing tournaments within the Hanford Reach or in the nearby vicinity, all involving bass fishing. In addition, a salmon fishing contest, not associated with the WDFW, has traditionally been held during the fall Chinook season. To date, all tournament operations have been run from Tri-City area parks.

The land base of the Monument contains one body of water that is fished regularly for bass. The WB-10 Ponds, irrigation settling ponds for the SCBID Project, are located in the Wahluke Unit and impound irrigation water before its return to the Columbia River. Fishermen must walk to the ponds, where shoreline and non-motorized boat fishing is permitted.

Fishing seasons and catch limits in the Monument are regulated by the WDFW.

3.17.4.2 Hunting and Trapping

The Monument provides regionally significant waterfowl hunting opportunities (NPS 1994). Large populations of resident waterfowl and migratory ducks and geese, coupled with good conditions for hunting, make the Hanford Reach an excellent location for waterfowl hunting. Waterfowl populations are enhanced by a longstanding waterfowl sanctuary, which includes the Columbia River and lands within ¼ mile of the river between the wooden power lines to the Vernita Bridge. This area is closed to all waterfowl hunting, and the White Bluffs Boat Launch is closed to motorboats, during the winter to reduce waterfowl disturbance from watercraft. Most waterfowl hunting occurs downstream of the sanctuary near the many sloughs and islands in the Hanford Reach and along the shorelines west of the Ringold River Road. Some hunters pursue pass shooting along the White Bluffs in the Wahluke Unit; approximately twenty waterfowl hunting pits currently exist in the vicinity, but the digging of new pits is not allowed. Waterfowl hunting also occurs on the WB-10 Ponds. Vehicles can access a parking area located approximately one mile from the WB-10 Ponds; from the parking area, non-motorized means are required to access the ponds.

The Wahluke Unit provides good opportunities for upland game hunting, including deer, pheasant, chukar and California quail. Most deer hunting occurs in the Wahluke Unit south of State Route 24, while most upland bird hunting occurs in the Ringold River Road area. The WDFW has historically operated a pheasant release program from the Ringold River Road. The Wahluke Unit is also open to elk hunting, although elk from the nearby Yakima/Rattlesnake Hills herd enter the Wahluke Unit infrequently. All hunting seasons and limits are set by the WDFW; however, the FWS enforces special firearm restrictions, allowing only shotguns, muzzleloaders and archery.

Trapping is not allowed anywhere in the Monument.

3.17.4.3 Wildlife Observation and Photography

The Monument offers excellent opportunities for wildlife and wildflower observation. Although these activities are possible year-round, the best time to see wildflowers is in the spring, while the best times to view wildlife are fall, winter and spring, with the summer less attractive due to high temperatures. More than 240 bird species and 40 mammal species spend all or part of their live cycles in the Monument. Many waterfowl inhabit the Hanford Reach, including mallard, teal, gadwall, white pelican, Canada geese, and American merganser. Colonial nesting birds include the Forster's tern, California gull, ring-billed gull, and great blue and night-crowned heron. Raptors seen include bald and golden eagle, peregrine falcon, northern goshawk, prairie falcon, American kestrel, and Swainson's, ferruginous and red-tailed hawks. Other migratory birds viewed include sage sparrow, vesper sparrow, grasshopper sparrow, loggerhead shrike, sage thrasher, Brewer's sparrow, Say's phoebe, horned lark, meadowlark,

cliff swallow, kingbird, long-billed curlew, and burrowing owl. Mammals that can been viewed include elk, mule and white-tailed deer, coyote, black-tailed jackrabbit, porcupine, beaver, badger, Great Basin pocket mouse, and ground squirrel. Reptile and amphibians seen include the side-blotched lizard, northern Pacific rattlesnake, short-horned lizard, and Great Basin spadefoot toad.

3.17.4.4 Environmental Education

With the relatively recent addition of the Monument to the NWRS, FWS-sponsored environmental education programs have been limited due to staffing constraints and a focus on Monument planning efforts. The FWS has worked with a local high school and the national Hands-On-The-Land program to provide field and classroom education programs; students are assigned to create multilingual web pages showcasing the Monument's natural resources. The FWS assists the Mattawa School District with an annual Memorial Day visit and education program to the old Wahluke townsite. Many schools, universities and nature-appreciation groups use the Monument for educational field trips and activities such as wildlife observation, native plant identification, and studies pertaining to natural history, geology, paleontology, archeology, history, astronomy and riverine, riparian and shrub-steppe habitats.

The Partners for Arid Land Ecology Stewardship (PALS) is a local environmental science education program designed to improve understanding and appreciation of the arid lands of the Columbia Basin. The PALS hosts an annual teacher's institute, often using the Monument as an outdoor classroom, to help teachers learn effective ways to educate students about local ecology.

3.17.4.5 Interpretation

Interpretation of natural and cultural resources in the Monument is currently expanding to meet increasing visitor demands. A full-color informational brochure for the Monument was published and widely distributed in 2003. In 2004, Monument boundary signs were installed at four locations along State Routes 240, 243 and 24, and orientation kiosks featuring large format maps and interpretive information were installed at all major Monument entrances and at a State Route 240 pullout. Temporary information and interpretation posters are maintained on reader boards at main public use sites throughout the Monument.

When opened, the Visitor Center will provide interpretation and education programs about the Monument and other regional tourism interests and destinations. This will occur regardless of which management alternative is chosen.

3.17.4.6 Research and Astronomy

The Monument has historically been used for numerous research projects and activities, focused primarily on the ALE. Of particular note is a research laboratory operated by the University of California. The Gravitation Physics Laboratory (GPL) is located twenty-one feet underground in the south bunker of the old Nike missile site on the ALE; the GPL is operated as a remote field facility by the University of California at Irvine and PNNL. The University of California and the University of Washington conduct state-of-the-art physics experiments into very weak gravitational interactions between masses. The site was selected over other locations within the western United States for several key reasons: seismic inactivity (from natural and human-induced vibrations), low rainfall, lack of trees, an existing and well-maintained underground facility, secure location on government property, and a partnership with a national laboratory.[111]

An observatory is located on top of Rattlesnake Mountain. Built by the Battelle Memorial Institute, the Observatory is now owned and operated by the Alliance for the Advancements of Science Through Astronomy, a non-profit organization. The organization would like to use the observatory for long-range (i.e., off-site, remote-controlled operation) education. In addition to the telescope, other instrumentation associated with the observatory monitors climatological, meteorological and seismic conditions.

3.17.4.7 Boating

Boating on the Hanford Reach has been strongly linked with angling activities; however, the scenery, abundance of wildlife, and seasonal opportunities for solitude are attracting growing numbers of visitors. Both motorized and non-motorized recreational boating occurs along the entire Hanford Reach. Non-motorized boating (e.g., canoeing, kayaking) is currently constrained due to the distance between access points and restrictions on overnight use in the Monument. The majority of motorized boaters access the river from one of the boat launches within or adjacent to the Monument, while non-motorized boaters typically launch at the Vernita Bridge and take out at either the White Bluffs Boat Launch or the Ringold Fish Hatchery. There

[111] Adjacent to the ALE is another nationally important physics experiment, the Laser Interferometer Gravitational Wave Observatory (LIGO), which is a scientific collaboration of the California Institute of Technology (Caltech) and the Massachusetts Institute of Technology (MIT). Funded by the National Science Foundation, LIGO attempts to detect ripples in space-time. Two long, perpendicular tunnels, approximately each one mile in length, have mirrors that bounce a laser beam back and forth. If the two arms have identical lengths, then interference between the light beams returning to the beam splitter will direct all of the light back toward the laser. But if space-time ripples cause the distance measured by the light beam to change as the gravitational wave passes by, the amount of light falling on the photodetector varies. Unfortunately, these mirrors are highly susceptible to localized ground disturbance, so the more activity on the ALE, the more background "noise" needs to be filtered out. A sister facility in Livingston, Louisiana, operates in unison to rule out false signals and confirm that a gravitational wave has passed through the earth.

are currently no special surface water regulations (e.g., boat speed limits, no wake zones, seasonal closures) on the Hanford Reach.

Other activities related to boating within the Monument include water-skiing, personal watercraft use, and commercial sightseeing boat tours. Most water-skiing and personal watercraft use occurs during the summer in the downstream areas of the Hanford Reach in the Ringold area. There are currently no special regulations on personal watercraft or water-skiing on the Hanford Reach.

3.17.4.8 Equestrian Use

Horseback riding occurs on all areas of the Wahluke and Riverlands Unit and is not currently confined to trails. There are no designated horse trails or developed facilities for horses in the Monument.

3.17.4.9 Bicycling

Bicycling is allowed on roads that are open to vehicles, with two additional road segments open to bicycles—the closed road between Parking Lot 8 and the scenic overlook area, and the road between the WB-10 Ponds parking lot and the ponds themselves. Similar to other types of off-road vehicle use, bicycling off-road is prohibited.

3.17.4.10 Hiking

Hiking occurs on the Wahluke Unit and is not confined to trails. There are no designated hiking trails or other developed trail features (e.g., trail heads, signboards) in the Monument. Some short, user-defined trails provide access from parking areas to popular use areas.

3.17.4.11 Commercial Uses

Commercial sightseeing tours and fishing and hunting guide services occur on the Hanford Reach and the Wahluke Unit. Currently, the number of commercial operators and the number of clientele they serve is unknown; however, anecdotal information indicates a steadily increasing demand for these services.

3.17.5 Hanford Reach Jurisdiction

Several federal, state and local agencies have jurisdiction within the river corridor. The islands within the Monument are under DOE, BLM, state and private ownership. The FWS controls seven islands immediately downstream of the Monument. The DOE retains management of the south river shoreline, while the FWS manages the north shore. The WDNR has jurisdiction over the riverbed and river shores below the mean high-water mark. The Washington Department of Parks and Recreation (WDPR) oversees boat licensing. The Benton, Franklin and Grant County Sheriff's Departments enforce boating regulations on the water, and the WDFW enforces hunting and fishing regulations on the water.

3.18 Infrastructure

Running a national monument requires a substantial amount of infrastructure, primarily in the care and management of visitors.

3.18.1 Management Resources

The operation of a national monument requires a large investment of management resources such as buildings, roads, equipment, and personnel. The sections that follow describe the current collection of resources used in management of the Monument. Many of the resources that will be needed in the future are outlined in the appendices.

3.18.1.1 Personnel

As noted earlier, the Monument has been combined with seven other national wildlife refuges—Cold Springs, Columbia, Conboy, McKay, McNary, Toppenish and Umatilla—into the Mid-Columbia River National Wildlife Refuge Complex (McRiver NWRC), with the goal being a consolidation of resources and cost savings. As a result, additional staff—and their associated expertise—from those other refuges have been made available for operation of the Monument. However, all staff are now shared across all eight national wildlife refuges, and as such, few staff are specifically assigned solely to the Monument.

The McRiver NWRC, and thus the Monument, is operating with the minimum staff needed to maintain the status quo and has lost several staff over the last few years to attrition. For example, the Monument lost its Archeologist, and the McRiver NWRC has lost a Recreation Planner; there are no immediate plans to refill these positions due to budget conditions. To fully

implement any of the alternatives, additional staff would be needed. The staffing needed—just for the Monument—to fully implement each alternative can be found in Appendix S.

The McRiver NWRC currently has the following staff available for Monument operations working primarily on the Monument. In addition, other staff located at the other national wildlife refuges are available to assist on the Monument if needed.

- Project Leader
- Deputy Project Leader
- Refuge Operations Specialist
- Natural Resource Planner
- Outdoor Recreation Planner
- Interpretation & Education Specialist
- Wildlife Biologists (3)
- Biological Technician
- GIS Specialist
- Equipment Engineer
- Administration Officer
- Administration Assistant

In addition, maintenance staff have been combined and function more as teams, rather than being assigned to specific national wildlife refuges. For example, a team of maintenance staff might work on a project on the Monument one day and at McNary National Wildlife Refuge the next. It should be noted, however, that no additional staff have been added to cover the new complex.

Firefighting personnel also cover the entire McRiver NWRC. Staffing is seasonal, with the summer seeing twenty-two to twenty-four staff. A few of these staff are permanent employees, and others are available year-round to assist with projects; the total number of staff available in the winter is usually around six to eight.

3.18.1.2 Buildings

There are a number of buildings on or adjacent to the Monument that are used by the FWS in managing the Monument. It is anticipated that these facilities will continue to be used regardless of the final management alternative chosen. The siting and design of new facilities will be influenced by the chosen alternative.

Several buildings on the ALE surplus to the DOE's needs are now being utilized by the FWS as maintenance shops through a cooperative working agreement with the DOE. The primary facilities utilized by the FWS on the ALE include a garage and utility building that are used for the maintenance, repair and storage of government equipment. Additionally, a well house, pump house, and 250,000-gallon reservoir are maintained and used to provide water for fire suppression, noxious weed control, and maintenance activities. Space within these facilities is limited and provides support to FWS activities on ALE only.

A second shop is maintained by the FWS on the western boundary of the Monument in the BPA's Midway Substation. A cooperative agreement between the BPA and FWS provides a

large facility for storage and maintenance of equipment and supplies and a satellite office space for maintenance crews and fire staff. This facility is a shared workspace with the BPA and therefore is designed to accommodate both agencies' needs. It provides an important link for the management of lands and facilities on the northern and southern halves of the Monument. This building also serves as an important staging area for equipment used in fire suppression activities.

A third building has been made available for the storage and maintenance of equipment on the northern half of the Monument at the Ringold Fish Hatchery. A cooperative agreement provides for the use of the WDFW's shop to store repair parts and supplies for FWS equipment while providing outside parking space for heavy equipment. The primary function of this facility is to support the WDFW hatchery operations at Ringold, but it also provides an important staging area for FWS maintenance operations on the Wahluke and Saddle Mountain Units.

The FWS is currently constructing a new headquarters for the McRiver NWRC in Burbank, Washington, on the McNary NWR. Most professional staff will be located there, in addition to the Monument managers. The new site will also include a new 2,350-square-foot Education Center.

3.18.1.3 Equipment

Operating a national monument requires a significant investment in equipment. For being designated as a national monument for only five years, the Monument has done a good job in securing necessary equipment. However, as use of the Monument increases, and as the CCP is implemented, additional equipment will be needed, especially for firefighting. Some of these additional equipment needs are identified in Appendix R (RONS and MMS).

Currently, the Monument owns a grader, tracked tractor, standard tractor, backhoe, 500-gallon spray truck, dump truck, two multi-terrain loaders and attachments, eight all-terrain vehicles (four with sprayers and two with broadcast seeders), two utility trucks, two disks, culti-packer, two harrows (as well as ATV harrows), batwing and three-point mower, 1,600-gallon water tanks, a fire engine, numerous trailers (including tilt-top and an eighteen-foot flatbed), two canoes, two inflatable kayaks, several boats (including a jetboat), and numerous pickup trucks and SUVS.[112] While this is a fairly impressive list of major equipment, it barely meets the current needs of managing a 195,000-acre national monument. Additional equipment will be needed to fulfill management goals and accommodate the public.

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[112] This is equipment used primarily by the Monument. As noted, through the consolidation into the McRiver NWRC, the Monument has additional equipment available if needed. Of course, Monument equipment is also shared with the other national wildlife refuges. This means that equipment is frequently in constant or extended use; failure may be more frequent, or more repair/life cycles shortened as a result.

3.18.1.4 Communications

The FWS utilizes an integrated, interagency communication system to maintain contact with field personnel, provide timely information concerning weather and operational conditions, and respond to emergencies. The Monument uses a mix of hand-held radios, base stations, and cellular phones that are integrated with local state, county and city emergency response systems.

The FWS uses radios that are multi-band, multi-channel, and operating off of a repeater system to transmit and receive messages throughout the fifty-six-square-mile Monument. Repeaters located on Wahitas Peak and Jump-off Joe Peak relay radio signals throughout the Columbia Basin for the BLM, DOE, FWS, U.S. Forest Service (USFS), Washington State Patrol, WDFW, WDNR and Adams, Benton, Franklin and Grant County Sheriff Offices. These radios are also capable of communicating with Benton County Emergency Services during a local emergency; providing direct communication between users and vehicles without transmission through the repeaters; and providing air-to-ground communication to aircraft responding to emergencies.

Cellular phones are utilized by many emergency response agencies when radio frequencies become crowded during an incident, or to maintain privacy during sensitive situations. Cellular phones and hand-held radios do have areas where they will not work in the Monument because of topographic or geologic interference. However, it is rare that both will not work in the same area.

3.18.1.5 Columbia River Boat Access

The Columbia River is the focal point of the Monument and is the most heavily used area. There are numerous ways to access the river, both on and off the Monument.

3.18.1.5.1 Monument Access

There are three sites within the Monument providing public boat access—Vernita, White Bluffs, and Parking Lot 7.

The Vernita launch area, administered by the WDFW under DOE permit, is located on the north shore of the river west of the Vernita Bridge on State Route 243. Open year-round, this primitive launch area consists of several user-defined sites along the shoreline where motorized and non-motorized boats can be launched. While overnight use is not officially allowed here, it has occurred historically, especially during salmon sport-fishing and northern pike minnow reward seasons.

The White Bluffs Boat Launch is located on the north shore of the river south of State Route 24. Open from June 30 to September 30 each year, this site provides a concrete launch with two narrow lanes. The launch is used primarily by motorboats. The launching area also serves as a non-motorized boat take-out for paddling the upper Hanford Reach float and the put-in for the lower Hanford Reach.

Parking Lot 7 is located on the north shore of the river along the Ringold River road. Open year-round, this site consists of a primitive gravel and earthen ramp which requires four-wheel drive vehicles to negotiate.

3.18.1.5.2 Administrative Access Boat Launches

The DOE controls two boat launches on the south shore of the river—a narrow, two-lane concrete launch located across the river from the White Bluffs Boat Launch and a gravel/earthen launch at the old Hanford Town sites. The launches are within the Hanford Site's secure access zone and are not open for public use.

3.18.1.5.3 Off-Monument Access

Located immediately adjacent to the Monument, the WDFW Ringold Fish Hatchery provides a primitive launching area on the north shore. Open year-round, this area also allows overnight use, although no improvements are provided. This site serves as a motorboat launch and is also used by non-motorized boaters, primarily as a take-out for floating the Hanford Reach.

Improved public boat launch options are plentiful in the Tri-Cities area, down-river of the Monument (see Map 22). The Priest Rapids Dam, located about four miles from the Monument boundary, limits boat access upstream of the Monument, although there are several unimproved spots to launch a boat just downstream of the dam.

3.18.1.6 Other Facilities

The Monument is open to the public two hours before sunrise and two hours after sunset. In 2002, two automated gate systems were installed at the main entrances to the Wahluke Unit north of Pasco and south of State Route 24, approximately twenty-two west of Othello. These two solar-powered gate systems are automatically timed to open and close to regulate visitor access to these units. However, the gates have never been used; they may not be put into service until such time as this CCP is finalized and the public has been adequately notified.

Other facilities on the Monument that assist in controlling access, protecting resources, and facilitating recreation include roads, signs, kiosks, fences and the well house, pump house, and reservoir on the ALE.

3.18.1.7 Adjacent Areas

3.18.1.7.1 Horn Rapids County Park

Benton County's Horn Rapids Park consists of 784 acres along the Yakima River near the Monument's southwestern border. The park currently provides a day use area, event facility (i.e., enclosed concrete brick building with kitchen facilities), interpretive kiosks, restrooms, tent camping and RV camping with electricity. The park's approved master plan envisions the site as a key access point for recreational activities associated with the Yakima and Columbia Rivers and the Monument.

3.18.1.7.2 Ringold Spring Fish Hatchery

The 110-acre hatchery is located about seventeen miles west of Mesa, Washington, on the north shore of the Columbia River and sits just outside the Monument's eastern-most entry point. The Ringold Fish Hatchery serves as an adult collection, rearing and release facility for spring Chinook, rearing and release for summer steelhead, and final rearing and release for fall Chinook salmon. In 1999, the hatchery added warmwater species (bass, walleye, channel catfish, tiger muskie, crappie) to its stock, making it the only warmwater hatchery in Washington.

The Ringold Fish Hatchery provides a primitive launching area for motorized boats and as a take-out point for non-motorized boats floating the Hanford Reach. Open year-round, this area also allows overnight use, although conditions are primitive.

3.18.2 Transportation

The Monument is readily accessed through state highways, county and city roads, and by boat. Additional transportation infrastructure on or directly related to the Monument includes parking facilities, bikeways and trails, public transportation facilities and services, railroads and airports. This section presents the current regulatory setting under which transportation conditions are assessed, as well as a description of the existing transportation infrastructure in the project area and surrounding region.

3.18.2.1 Transportation Jurisdictions

The Monument covers a large area that crosses multiple jurisdictional boundaries. The transportation system in the project area falls under the following jurisdictions.

- The highways that serve the project area are state routes maintained by the WSDOT. The WSDOT is divided into six regions throughout the state of Washington. In the Monument vicinity, the geographic area north of the Columbia River falls under the jurisdiction of the North Central Region, and the geographic area south of the Columbia River falls under the jurisdiction of the South Central Region.

- The state routes that serve the Monument are not designated as highways of statewide significance (described in more detail later in this section), and thus acceptable levels of traffic operations are defined by local standards. The largest area of the Monument (south and west of the Columbia River) is located within Benton County. The north portion of the Monument (north of the Columbia River) is located in Grant County, and the narrow east portion (east of the Columbia River) is located in Franklin County. The state highways that serve the Monument are located in Benton and Grant Counties and are subject to the operations standards of the counties in which they are located.

- The eastern portion of the auto tour routes proposed under Alternative D would include local one or more local roadways located in Franklin County.

- Local roadways located within the Monument are under the jurisdiction of the agency that manages the land. In most cases, this will be either the FWS or the DOE. The BPA and SCBID also own access roads and easements within the Monument.

3.18.2.2 National Highway System

The National Highway System (NHS), as defined under the Intermodal Surface Transportation Efficiency Act (ISTEA), is one component of the National Transportation System. The NHS's purpose is to focus resources on roadways that are the most important to interstate travel and national defense; roadways that connect other modes of transportation; and roadways that are essential for international commerce. The entire interstate system is a component of the NHS and includes a large percentage of urban and rural principal arterials, the defense-strategic highway network, and strategic highway connectors.

3.18.2.3 Highways of Statewide Significance

The Level of Service Bill (State House Bill 1487, enacted in 1998) required the WSDOT to identify highways of statewide significance (HSS). Criteria for establishing HSS routes includes National Highway System designation, rural highways serving statewide travel, urban routes that are links to rural HSS, principle arterial ferry routes, long-haul freight routes, and connections to ports. Improvements along HSS routes are to be considered for priority funding by the Washington State Transportation Commission.

As noted, there are no HSSs in the Monument.[113]

3.18.2.4 Roadway Level of Service

Level of service (LOS) designations are qualitative measures of congestion that describe operational conditions within a traffic stream and take into consideration such factors as volume, speed, travel time, and delay. LOS is represented by letter grades A through F. Table 3.12 summarizes the typical traffic conditions for each of the level of service designations. LOS A through C implies traffic flows with minimal delay, while LOS D and E imply conditions that approach capacity, and LOS F implies unstable flow with potential for substantial delays (Transportation Research Board 2000).

Table 3.12. Description of Level of Service Designations.

LOS Level	Description
A	A condition of free flow in which there is little or no restriction on speed or maneuverability caused by the presence of other vehicles.
B	A condition of stable flow in which operating speed is beginning to be restricted by other traffic.
C	A condition of stable flow in which the volume and density levels are beginning to restrict drivers in their freedom to select speed, change lanes, or pass.
D	A condition approaching unstable flow in which tolerable average operating speeds are maintained, but are subject to sudden variations.
E	A condition of unstable flow in which operating speeds are lower with some momentary stoppages. The upper limit of LOS is the capacity of the facility.
F	A condition of forced flow in which speed and rate of flow are low, with frequent stoppages occurring for short or long periods of time; with density continuing to increase, which causes the highway to act as a storage area.

[113] There are HSSs nearby—I-82 from the Yakima County Line to the Oregon State Line; I-182 from I-82 to State Route 12; State Route 240 from Stevens Drive to I-182; State Route 240 from I-182 to State Route 395; State Route 395 from I-82 to I-182; State Route 395 from I-182 to the Adams County Line; State Route 17 from State Route 395 to the Adams County Line; State Route 12 from I-182 to the Columbia County Line; and State Route 125 from the Oregon State Line to State Route 12.

LOS standards represent the minimum performance level desired for transportation facilities and services within the region. They are used as a gauge for evaluating the quality of service on the transportation system and can be described by travel times, freedom to maneuver, traffic interruptions, comfort, convenience and safety. The Washington State Growth Management Act (RCW 36.70A) states that these standards should be regionally coordinated. The standards are used to identify deficient facilities and services in the transportation plan and are also to be used by local governments to judge whether transportation funding is adequate to support proposed land use developments.

Within Washington, highways that are not classified as HSS may be held to the locally adopted LOS standards of the jurisdictions in which they are located. The Benton-Franklin Council of Governments has established a uniform LOS D as the standard in urban areas and LOS C in rural areas. At the discretion of each jurisdiction, a higher or lower LOS may be used on selected portions of the urban transportation network. Benton County has adopted a standard of LOS C for major collectors and minor arterials located outside of the Benton County Urban Growth Area. Lower classified roadways in the unincorporated County do not have designated LOS values (Benton County 2003). Franklin County has adopted a standard of LOS C for rural county roadways (Franklin County 2000). Grant County has adopted the following standards for roadways within the unincorporated County: LOS B for roadways in rural areas; LOS C for rural state highways; and LOS D for roadways in urban areas (Grant County 1999).

Within the Monument, State Routes 24 and 240, as well as those that provide additional direct access to the area (State Routes 225 and 243), are subject to local LOS standards; LOS C has been identified as the standard for all functionally classified roadways that would potentially be affected by the CCP.

3.18.2.5 State Highway Design Standards

State Routes 24 and 240 are classified as limited-access highways under the full jurisdiction of the WSDOT. Limited-access highways are those facilities for which WSDOT has purchased access control. Standards for limited-access highways are set forth in the WSDOT Design Manual (WSDOT 2003). Limited-access highways may be designated as having the following levels of access controls.

- ***Full access control.*** This is the most restrictive level of limited access, allowing access by interchange only.

- ***Partial access control.*** This is the second most restrictive level, allowing at-grade intersections with selected public roads; there may be some crossings and driveway approaches at-grade. No direct commercial access is allowed.

- ***Modified access control.*** This is the least restrictive level, with characteristics similar to partial access control facilities, except that direct commercial access is allowed.

The highways in the vicinity of the Monument fall under the definition of partial access control facilities. No new intersecting access roadways are being proposed under any of the alternatives, but an upgrade of existing access points/intersections is proposed under each of the alternatives. Both State Routes 24 and 240 are designated as minor arterials in the project vicinity (Benton-Franklin Council of Governments 2001). The WSDOT has defined the following standards for access points on minor arterials with partial access control.

- At an at-grade intersection, control will be established and acquired long the crossroad for a minimum distance of 300 feet from the centerline of the highway.

- If another frontage or local road is located within 350 feet of the at-grade intersection, limited access will be along the frontage or local road for the required 300 feet and for an additional minimum distance of 130 feet from the centerline.

- At-grade intersections should be spaced at a minimum of 0.5 mile, if the average daily traffic is less than 2,000 vehicles. If the average daily traffic is expected to be greater than 2,000 vehicles within twenty years, grade separation should be planned for within that time period.

- Bus stops for both common carriers and school buses are not allowed, except at railroad crossings, at intersections with necessary pullouts that have been constructed by the state, at shoulder widenings that have been provided for mail delivery service, and at designated school bus loading zones that have been approved by the WSDOT.

- Pedestrian crossings are allowed when grade-separated.

- Pedestrian and bicycle traffic is allowed, consistent with the "Rules of the Road" (RCW 46.61), except where unusual safety conditions support prohibition.

- Pedestrian and bicycle trails are allowed with WSDOT headquarters approval, consistent with the "Rules of the Road." When a trail is allowed, it must be documented on the right-of-way and limited access plan and include the location of the trail, movement notes, and where it crosses the highway.

A limited-access deviation would need to be requested in cases where one or more of these standards could not be applied.

3.18.2.6 Access Rights

Access rights are legally defined for all roadways that intersect with state highways. In the Monument, access definitions most likely date back to agreements with the DOE and could potentially date back prior to the DOE's jurisdiction. Thus, it is highly unlikely that the uses defined under existing access deeds for Monument roadways include recreational uses that are proposed in this CCP. The WSDOT maintains access deeds and has a procedure in place for applying to revise existing legal access agreements.

3.18.2.7 Washington State/Local Transportation Plans

Transportation is guided by the plans and policies that have been adopted by the state and local jurisdictions that operate the roadways located within the study area. Plan elements have been developed to be consistent with transportation policy and plans that have been adopted at the state and local levels, as described in the following sections.

3.18.2.7.1 Washington Transportation Plan

The Washington Transportation Plan (WTP) lays out policies to identify transportation problems and provide solutions. Although the WTP focuses on regional planning efforts, it also addresses important statewide goals. In the 1998 legislative session, the Washington State Legislature directed the WSDOT to focus the next WTP update on five primary goals for the state transportation system: congestion relief, preservation, safety, freight mobility, and seamless connections.[114]

The WTP addresses the essential and interconnected roles of the Regional Planning Organizations and their local jurisdictions and the important transportation issues of tribal governments in Washington State. It highlights the role of the WSDOT to maintain, preserve and improve the transportation system while meeting other societal needs.

3.18.2.7.2 Benton-Franklin Council of Governments

The mission of the Regional Transportation Plan is to develop and maintain a balanced regional transportation system that provides access and mobility for people, goods and services in a safe,

[114] In addition to the interregional and statewide goals listed above, the WTP addresses other investment needs via seventeen other goals for the state transportation system. See www.benton-franklin.cog.wa.us/RTP_Chapter10.pdf for the complete list.

convenient and energy-efficient manner. The goals, policies and strategies developed through the transportation planning process, and subsequently adopted by the Benton-Franklin Council of Governments Board, were developed to guide the regional transportation planning process for the next twenty years. The goals and policies of the Regional Transportation Plan include a transportation system that is integrated with local land use policies, meets the needs of sustained economic growth, and is consistent with local, regional, state, and federal policies; comprehensive least-cost solutions for transportation deficiencies; lower cost solutions that include transit, vanpool/carpool, demand management, and non-motorized modes in lieu of capacity expansion; and a system that assures improvements support the values of communities and neighborhood structures.

3.18.2.7.3 Benton County

Transportation goals and policies defined in the Benton County Comprehensive Plan are consistent with those defined at the state and regional levels. The following goals particularly apply to roads in the Monument.

- Goal 20: Provide safe, convenient, economic and multi-modal transportation networks, with new construction and other county public works projects designed to be compatible with the rural character and serve the transportation demands of the Land Use Element, at designated levels of service, and consistent with all other relevant provisions of the Comprehensive Plan.

- Goal 21: Provide adequate roads that safely handle anticipated traffic and serve a diversified area of industrial, agricultural and residential uses.

- Goal 22: Provide county road right-of-ways wide enough for off-road walking, jogging and horseback riding, from one area to another safely.

- Goal 23: Improve the cost effectiveness of capital spending by coordinating new road construction with all jurisdictions and service districts/providers.

- Goal 26: Provide an integrated network of trails and paths for non-vehicular recreation and travel throughout the rural areas and connecting to urban trails and paths, as part of an overall county/city trails system.

- Goal 27: Provide safe pedestrian ways and bicycle routes, separate from vehicle roadways where feasible.

3.18.2.7.4 Grant County

Transportation goals and policies defined in the Grant County Comprehensive Plan are consistent with those defined at the state and regional levels. The following goals particularly apply to roads in the Monument.

- Goal T-1: Establish levels of service for transportation facilities and determine what improvements are needed in order to achieve and maintain the standards for existing and future populations and to repair or replace existing transportation facilities.

- Goal T-2: Complement the land use and rural areas element of the Grant County Comprehensive Plan.

- Goal T-3: Coordinate with neighboring cities and other transportation providers.

- Goal T-4: Promote safe and efficient access to land, while maintaining the integrity of the arterial roadway system and minimizing environmental impacts of transportation systems.

3.18.2.8 Transportation Infrastructure

A comprehensive inventory of all transportation facilities provides a sound basis for effective planning. Consistent with the requirements of the Washington Growth Management Act, cities maintain inventories of transportation facilities, which include roadway network, parking, transit, non-motorized transportation, air and rail. These elements of the regional transportation system are described in the following sections.

3.18.2.8.1 Roadway Network

Transportation roadway systems consist of a hierarchy of highways and streets that provide the dual functions of access to land and development and through-movement for travelers. Roadways are classified based on the relative degree to which they provide these functions. Land use policies and street standards typically vary according to the street function. For example, most jurisdictions designate minimum right-of-way requirements, stopping and entering sight distances, roadway width, design speed, design traffic volumes, access control, and sidewalk requirements in accordance with an adopted classification system. These requirements are usually codified in the jurisdiction's municipal code and/or adopted as street standards.

Washington State law requires that cities and counties adopt a street classification system that is consistent with state and federal guidelines (codified in RCW 35.78.010 and RCW 47.26.090). Each local jurisdiction is responsible for defining its transportation system into the following functional classifications: freeway, principal arterial, minor arterial, and collector. All other roadways are assumed to be local access streets.

A **freeway** is a multilane, high-speed, high-capacity roadway intended exclusively for motorized traffic. All access is controlled by interchanges and road crossings are grade-separated.

A **principal arterial** is an inter-community roadway that connects major community centers and facilities and is often constructed with limited direct access to abutting land uses. The primary function of principal arterials is to provide a high degree of vehicular mobility; however, they may play a minor role in providing land access. Principal arterials serve high-volume corridors, carrying the greatest portion of through or long-distance traffic within a community.

A **minor arterial** is an intra-community roadway, bounded by the principal arterial system, which connects centers and facilities within the community and serves some through-traffic, while providing a greater level of access to abutting properties. Minor arterials connect with other arterial and collector roads extending into the urban area.

A **collector** is a roadway designed to fulfill both functions of mobility and land access. Collectors typically serve intra-community trips, connecting neighborhoods with each other or activity centers, while also providing a high degree of property access within a localized area. These roadways collect vehicular trips from local access roads and distribute them to higher classified roadways.

A **local access road** is a roadway designed with a primary function of providing access. Typically, they are only a few blocks long and are relatively narrow. All roadways that have not been designated as arterials or collectors are considered to be local access roads.

3.18.2.8.1.1 State Highways

Two state routes run through the Monument—State Route 24 and State Route 240. Their routes in the Monument are described below.

State Route 24 traverses the northwest corner of Benton County (12.8 miles). This minor arterial extends from the city of Yakima to State Route 26 at Othello. One function of this route is access to the west gate of the Hanford Site at the junction of State Route 24 and State Route 240.

State Route 240 extends forty miles between State Route 24 at the Hanford West Gate and the cities of Richland and Kennewick. This route traverses the western portion of the Hanford Site and is highly utilized by Hanford commuters. In conjunction with State Routes 24 and 243,

State Route 240 carries regional freight and passenger traffic. From State Route 24 to Stevens Drive in Richland, the roadway is a two lane minor arterial. The Richland Bypass segment, and the segment from I-182 to U.S. 395 in Kennewick, are four-lane principal arterials. These segments flow at or near capacity during the daily Hanford Site work commute. Regional transportation studies have addressed both major capacity improvements and traffic management strategies for these congested commute segments. The Richland Bypass segment is currently being expanded to six lanes, as is the segment from I-182 southeast to the Columbia Center Interchange.

An additional state route provides direct access to the southwest area of the Monument. State Route 225 is an eleven-mile major collector extending from I-82 at Kiona, through Benton City, to State Route 240 at Horn Rapids. DOE Route 10 extends on into Central Hanford. Hanford Site commuters dominate peak volumes on this two-lane roadway.

3.18.2.8.1.2 Federal/Interstate Highways

Four federal interstates and U.S. highways constitute the east-west and north-south backbones of the regional highway system. These routes carry the vast majority of freight and goods movement and automobile traffic throughout the region.

I-82 is an interstate freeway extending from I-90 near Ellensburg, Washington, to I-84 near Hermiston, Oregon. This four-lane freeway traverses down the lower Yakima Valley, entering Benton County northwest of Prosser. The route follows the Yakima River past the Kiona/ Benton City area, traverses southeasterly along the fringe of the Tri-Cities urban area, intersects U.S. 395 south of Kennewick, then traverses southerly over the Horse Heaven Hills to enter Oregon at Umatilla.

I-182 is a 15-mile interstate spur route from I-82 west of the Tri-Cities to U.S. 395, State Route 397, and U.S. 12 at Pasco. The highway descends across the Yakima River to Richland, where it expands from four to six lanes, crosses the Columbia River into the west Pasco/Riverview area, then reverts back to four lanes at the interchange with the south leg of U.S. 395 at Pasco. The freeway extends through an interchange with State Route 397 and northerly extending U.S. 395, then becomes U.S. 12 extending on into Walla Walla County.

U.S. 12 is a cross-state route extending from the Washington Coast at Aberdeen, over the Cascades via White Pass, down the Yakima River Valley via I-82 and I-182 to Pasco, then on through southeastern Washington to Lewiston, Idaho, and over Lolo Pass to Missoula, Montana. At East Pasco, U.S. 12 extends from I-182 as a four-lane expressway across the Snake River into Walla Walla County near Burbank. There the highway intersects State Route 124, reduces to two lanes, then extends southerly along the Columbia River to a junction with U.S. 730 near Wallula. The highway then turns easterly to Walla Walla, expands to four lanes through the urban area, then reverts to two-lane extending through Waitsburg and on toward Idaho.

U.S. 395 is a highway of national significance that runs between Mexico and Canada. From Umatilla, Oregon, to south Kennewick, the highway is shared as I-82. From I-82, the highway extends north as a four-lane facility through Kennewick and Pasco. A 1.5-mile segment in Kennewick has numerous intersections, many with signals; consequently, that segment functions more as a city arterial than an urban expressway. At Pasco the highway utilizes two miles of east-west I-182, then resumes its northeasterly course up through Franklin County toward I-90 at Ritzville. The thirty-eight-mile segment from Pasco to the Adams County line has four lanes with some scattered rural intersections and interchanges. Efforts are on going to replace some of the intersections with interchanges. In the Tri-Cities region, the daily traffic volume includes 30-35% trucks.

3.18.2.8.1.3 Other State Highways

The other state routes as described below, serve primarily as local roadways and carry lower traffic volumes.

State Route 14 is an east-west route along the Columbia River from Vancouver (I-5) to Plymouth (I-82), south of the Tri-Cities. This route provides a two-lane alternative to I-84 on the Oregon side of the Columbia River. The segment from Plymouth westerly to Paterson, in conjunction with State Route 221 northerly to Prosser, provides an alternative route to the longer I-82 loop from Prosser to Umatilla, Oregon, via the Tri-Cities.

State Route 224 provides a ten-mile connection, from I-82 (Kiona/Benton City) through West Richland to Richland (State Route 240). The route is a two-lane major collector from I-82 to downtown West Richland, then a four-lane minor arterial extending to State Route 240. Traffic on this route is oriented to Richland and Central Hanford work sites and local freight movement.

State Route 397 is a two-lane collector from the Finley area to East 10th Avenue in Kennewick. From 10th Avenue, across the river, and through East Pasco to the I-182/State Route 395 interchange, the route is a principal arterial (5.6 miles). Much of this urban section has four lanes. This route serves industrial sites along the river; therefore trucks are common.

State Route 124 is a two-lane minor arterial extending east from U.S. 12 at Burbank through Prescott to U.S. 12 at Waitsburg, a distance of approximately forty-five miles. This route is seventeen miles shorter than the U.S. 12 routing down through Walla Walla. Both cars and trucks (16-20%) use this shortcut.

3.18.2.8.2 National Highway System

The following roadways in Benton, Franklin and Walla Walla Counties are included in the NHS:

- I-82 and I-182.
- State Route 240/Stevens Drive from I-182 to the Hanford Site boundary.
- State Route 395 from I-82 at Kennewick to the Adams County line.
- State Route 17 from Mesa to the Adams County line.
- State Route 12 from Pasco to the Columbia County line.
- State Route 125 from Oregon to State Route 12 at Walla Walla.
- North 20th Avenue from I-182 to the Tri-Cities Airport.
- Airport Way from State Route 12 to the Walla Walla Airport.

3.18.2.8.3 Scenic and Recreational Highways

Established by the state legislature in the 1960s, scenic and recreational highways are recognized for the subject values. These routes, or route segments, are part of the National Scenic Byways System and are administered by the Heritage Corridors Program of the WSDOT. Management emphasis is on preservation, maintenance and enhancement of heritage resources; on access to those resources; and on related tourism. Local partnerships, long-term stewardship, and public involvement are key elements of successful heritage corridors. The Monument has no state-designated scenic byway segments, but the three-county region has the following scenic byways.

- State Route 14 from the Klickitat County line to I-82.
- I-82 from the Oregon State line to the junction with State Route 395.
- State Route 17 from State Route 395 to the Adams County line.
- State Route 12 from the Snake River (East Pasco) to the Columbia County line.
- State Route 261 from State Route 260 to the Columbia County line.

3.18.2.8.4 Pullouts in Project Area

Two pullouts are located on the segment of State Route 24 north of the Columbia River. The more western pullout includes an informational kiosk that describes the B-Reactor. The more eastern pullout includes an informational kiosk that describes the Monument.

3.18.2.8.5 Parking

Existing public parking lots within the Monument boundaries are primarily located along the Columbia River within the Wahluke Unit. The existing parking lots, and their approximate capacities, are summarized in Table 3.13.

Table 3.13. Existing Monument Parking Areas.

Parking Lot	Approximate Capacity (Parking Spaces)
1	15
2	20
3	4
4	4
5	4
6	4
7	15
8	4
WB-10 Pond	8
White Bluffs Boat Ramp	20

3.18.2.9 Refuge Roads

The refuge is crossed by a large number of non-public roads. Some are, of course, roads constructed by the DOE for Hanford Site operations. Some are remaining from military use of the land in protection of the Hanford Site. Others are roads within transmission line and irrigation ditch easements, granted to the BPA and to local irrigation districts, respectively. Many of these roads are open to public use.[115] Most use occurs on these roads in the spring and fall and is associated with salmon fishing, hunting and wildflower observation.

A refuge road inventory of the Monument was conducted in 2001 pursuant to the Transportation Equity Act for the 21st Century (TEA-21; Public Law 105-178). Under this legislation, refuge roads were defined as those roads that provide access to or within a unit of the NWRS and for which title and maintenance responsibility is vested in the U.S. government. The inventory

[115] The roads associated with utilities are closed to public use.

resulted in twenty-nine miles of public use roads identified in the Monument, with seventeen paved and twelve unpaved.

All public use roads occur on the north side of the Monument and are former DOE and military roads associated with access to Nike missile sites and anti-aircraft gun emplacements. All of these roads were once paved and well maintained, although they are currently in various stages of disrepair. Public access on many of these roads began in 1971 when the WDFW, under permit from the DOE, took over management of a 57,000-acre land parcel (the Wahluke Slope Wildlife Recreation Area). Public access to the eastside of the Monument, both north and south of State Route 24 and at the state-managed Ringold Fish Hatchery, is via the same roads as under WDFW management.

As noted, many of the public use roads are in poor shape. A TEA-21 project, administered by the U.S. Department of Transportation/Federal Highways Administration reconditioned approximately twenty miles of one public use road in 2005, transforming a deteriorating asphalt and river cobble road into a uniformly graveled road. This road serves as the main south artery from State Route 24 to access the White Bluffs Boat Launch and the WB-10 Ponds and is the main artery from the Ringold Fish Hatchery to parking lots and a primitive boat launch in the Ringold area.

In addition to the public use roads, there are approximately 250 miles of administrative roads in the Monument, with the majority on the ALE and Saddle Mountain Units. Administrative roads are used to carry out day-to-day management of the Monument. However, many of the administrative roads are also used by other entities, such as public utility districts, irrigation districts, BPA, DOE and many contractors to maintain their equipment or fulfill their respective missions. These roads are closed to public use, as are the roads specifically associated with utilities. Most of these roads are maintained as gravel or two-tracks over native materials. Access to most of these roads is through locked gates off State Routes 225, 240, and 24.[116]

Some of these administrative roads receive heavier traffic than others. The 106 Road, for example is quite heavily used by the DOE and its contractors, as well as by the FWS. It is one of the few paved administrative roads in the Monument and is jointly administered by DOE and the FWS. Access to the 106 Road is through a locked gate off of State Route 225, which provides a connection to a Monument maintenance facility. Most traffic on this road is associated with DOE-permitted activities to monitor and maintain communications equipment and towers on the summit of Rattlesnake Mountain.

[116] Since establishment of the Monument, many two-tracks over native material have been closed to protect resources, and the BPA and irrigation districts have closed access along their respective easements.

Table 3.14. Miles of Roads by Management Unit.

Unit	Administrative Road	Public Road	Other Road	Total Miles
Ringold	1.1	10.0	0.0	11.1
Wahluke	49.0	40.0	0.0	89.0
Saddle Mountain	14.0	9.0	0.5	23.5
River Corridor	3.8	9.2	0.0	13.0
Rattlesnake	83.0	24.0	0.0	107.0
Total	150.9	92.2	0.5	243.6

3.18.2.10 Transit

Transit service in the region is provided by Ben Franklin Transit in the Tri-Cities urban area. However, there is no transit service to or in the Monument.

3.18.2.11 Non-Motorized Transportation

The two state routes that directly serve the Monument area are not well suited for bicycle travel. There is an absence of consistent paved shoulder along the highways, requiring bicyclists to potentially travel in the highway lanes.

Since the surrounding land is mainly undeveloped and government-owned with restricted access, no pedestrian generators are identified under existing conditions. The existing pullouts along the highways are typically accessed by car, but their widths are sufficient for people to walk around the pullout area while maintaining separation from the highway traffic.

3.18.2.12 Rail

Regional rail service is provided by the Burlington Northern-Santa Fe Railway, AMTRAK, the Union Pacific Railroad, the Tri-City and Olympia Railroad, and the Blue Mountain Railroad. However, there is no rail service currently operating to or in the Monument. There are tracks and former rights of way that have been used in the past for construction activities, and one suggested use raised is to use those tracks to access the B Reactor in the event it becomes open to the public.

3.18.2.13 Airports

3.18.2.13.1 Regional Airport

The Tri-Cities Airport at Pasco, owned and operated by the Port of Pasco, is a non-hub air carrier facility serving southeastern Washington and northeastern Oregon. Scheduled air service includes Delta, Horizon Air, Skywest and United Express. The regional airport also provides private and charter services, large and small freight service, and serves private and business aircraft. The Federal Aviation Administration (FAA) air traffic control tower and tracking facility provides radar service to several area airports and supports the three runways, including one that is a full instrument landing system. In 2000, the airport boarded 209,434 passengers, transferred more than 2,000,000 pounds of freight, and had 92,487 total aircraft operations.

3.18.2.13.2 Other Local Airports

The following additional small airports are located in the region.

- The Richland Airport (Port of Benton) is a general aviation facility with two paved runways and a localizer instrument system. About eighty-five single and twin-engine aircraft are based here.

- Vista Field, owned and operated by the Port of Kennewick, is a basic utility airport with one paved runway and no instrumentation. This facility is home base for about thirty small aircraft.

- Walla Walla Regional Airport (Port of Walla Walla) is a commercial service facility with three paved runways and instrumentation. This site is home to about 100 small aircraft. Horizon Air provides passenger service. The runways are capable of handling large aircraft, including freight carriers.

- Prosser Airport is a general aviation facility owned by the Port of Benton. There is one paved runway and no instrumentation. Approximately fifteen to twenty small aircraft are based there.

- A privately owned single paved runway, non-instrumented facility, serves the city of Connell. A few single engine aircraft are based at this facility; however, it does not meet FAA criteria for general utility aircraft use.

- Martin Field at College Place is privately owned, but available for public use. The one runway is paved and non-instrumented. Approximately twenty to twenty-five small craft operate from this facility.

- Lower Monumental is a state-owned, gravel-surfaced, emergency airstrip near Kahlotus. The site is not used on a regular basis.

3.18.2.14 Existing Conditions

3.18.2.14.1 Traffic Volumes

Traffic counts on state highways are collected on a regular basis by the WSDOT. Average daily traffic counts are calculated by averaging the daily traffic counts of several days during a typical week. Locations and volumes for the average daily traffic are listed in Table 3.15.

3.18.2.14.2 Level of Service

The LOS was calculated for the state routes located within the Monument. Table 3.16 shows that existing average daily traffic on these facilities is far below the maximum volume that would allow the standard of LOS C to be maintained. The existing volumes indicate that State Routes 24 and 240 are generally operating at LOS A under existing conditions.

3.18.2.14.3 Accidents

Table 3.17 summarizes the most recent accident data that was available from the WSDOT for State Routes 240 and 24 in the area (WSDOT 1997). Accident rates are calculated according to million vehicle miles traveled on the segment. The statewide average calculated for the same time period shown in the table was 1.75 accidents per million miles traveled. The table shows that two locations in the project vicinity have rates slightly higher than the statewide average, and all other rates are below the average.

Field observation of the study area indicated that vehicles tend to travel through the area at fairly high speeds. The relatively low volumes and low number of access points are conducive to higher travel speeds.

Table 3.15. Existing Characteristics of Area Highways.

Highway	Location	Functional Classification	Number of Lanes	Average Daily Traffic
State Route 240	North of State Route 224	Minor Arterial	2	18,000
	North of Bypass Highway	Minor Arterial	2	9,600
	North of State Route 225	Minor Arterial	2	3,200
	South of State Route 24	Minor Arterial	2	1,500
State Route 24	West of State Route 240	Minor Arterial	2	2,900
	North of State Route 240	Minor Arterial	2	3,500
	South of State Route 243	Minor Arterial	2	3,400
	North of State Route 243	Collector	2	830
	West of Saddle Mountain Road	Collector	2	1,200
	East of Saddle Mountain Road	Collector	2	1,900
	South of State Route 26	Collector	2	3,600
State Route 225	North of I-82	Collector	2	4,600
	South of State Route 240	Collector	2	1,500
State Route 241	South of State Route 24	Collector	2	1,200
State Route 243	West of State Route 24	Minor Arterial	2	3,900
State Route 124	East of US 12	Minor Arterial	2	5,400
I-82	West of State Route 225	Freeway	4	13,000
	East of State Route 224	Freeway	4	16,000
	East of I-182	Freeway	4	6,300
	West of US 395	Freeway	4	8,400
I-182	West of US 395	Freeway	4	32,000
Source: WSDOT 2002				

Table 3.16. Highway Level of Service Assessment.

Highway	Location	Existing Average Daily Traffic[1]	Maximum ADT Maintain LOS C[2]	Estimated LOS[2]
State Route 24	West of State Route 240	2,900	12,000	A
State Route 24	North of State Route 240	3,500	10,000	A
State Route 24	At Vernita Bridge	3,400	12,000	A
State Route 24	East of State Route 243	830	11,000	A
State Route 240	North of State Route 225	3,200	12,000	A
State Route 240	North of I-82	18,000	62,000	A

Notes: [1] Source: Washington State Department of Transportation 2003.
[2] Based on Highway Capacity Manual (TRB 2000) highway LOS procedures.

Table 3.17. Historical Accident Data, 1993 to 1996.

Route	Segment	Length (mi)	Four-year Accident Rate (Accidents Per Million VMT)	County
State Route 240	State Route 24 to Beloit Road	7.95	1.4	Benton
	Beloit Road to State Route 225	12.53	0.8	
	State Route 225 to the Richland City Limits	1.88	2.0	
State Route 24	State Route 241 to State Route 240	7.95	1.0	Benton
	State Route 240 to Priest Rapids Dam Road	3.55	1.4	
	Priest Rapids Dam Road to the Grant County Line	1.53	1.8	
	Grant County Line to State Route 243	0.34	1.1	Grant
	State Route 243 to 24 SW Road	8.81	1.4	
	24 SW Road to the Adams County Line	12.26	0.8	
Source: WSDOT 1997				

3.18.2.15 Future Planned Projects

3.18.2.15.1 Regional Planning Projects

The WSDOT Regional Transportation Planning Organization Planning Project list includes two improvements in the project area.

- State Route 24: Construct climbing lanes for trucks in the Vernita vicinity and improve the State Route 24/240 intersection.

- State Route 240: Widen the road to four lanes from the State Route 225 intersection to Snively Road.

These are identified as future planned projects, but are not included in financially constrained project lists, so they are not anticipated to happen in the near to mid-future. No additional projects were identified on financially constrained or unconstrained state, county, or regional project lists.

3.18.2.15.2 Vernita Rest Area

The WSDOT is planning to renovate the Vernita Rest Area, with design beginning in the spring of 2005. The project will consist of demolition of the existing building, construction of a larger facility, and site improvement and landscaping. The project does not include any expansion of the parking area, nor increase in the overall site footprint. Completion of preliminary engineering was expected in the fall of 2005, with the project going out to bid in summer 2006 and completed in the spring of 2007 (WSDOT 2004). However, to date the project has not been completed, nor has construction begun; the project's status is unknown.

3.18.3 Utilities

Several federal and local government agencies and commercial businesses operate utilities in the Monument under DOE permits, easements, and rights-of-way agreements. These include the BPA, Energy Northwest, SCBID, Benton County, and various private sector communications businesses.

3.18.3.1 BPA Transmission Lines and Substations

The BPA has existing agreements with the DOE for management of transmission line rights-of-way, access roads, microwave tower lines-of-sight, electric power substations, and other sites. Seventeen high-voltage transmission lines cross the Monument boundaries, with eleven of these crossing the Hanford Reach. Some of the transmission line rights-of-way include fiber-optic lines for rapid response to outages. Two electric substations are located within the Monument boundaries. The BPA also operates several microwave towers within Monument boundaries, with corresponding microwave paths that need to remain clear of structures or vegetation that would obstruct communications signals between the towers.

Periodic patrols and 24-hour access for emergency replacement of failed equipment are required for these facilities. The lines are patrolled by helicopter usually three times each year to assess potential problem areas. In addition, helicopters may be used in lieu of ground vehicles for maintenance or repairs. A complete review of the condition of the rights-of-way and lines is conducted from ground vehicles at least once per year. Regular maintenance to ensure continued power transmission through control of unwanted vegetation, adequate line clearance, and replacement of aging parts is necessary.

The BPA has easements and maintains several roads providing access to its facilities within the Monument. Access road maintenance includes regular grading of the road surface; road repair and reconstruction when needed; maintenance of gates, locks and culverts; and vegetation management.

Vegetation management follows the guidance outlined in the BPA's Transmission System Vegetation Management Program EIS (DOE/EIS-0285). The BPA keeps the rights-of-way clear of brush, timber, dangerous trees, structures and fire hazards, and prevents any use of the area that would interfere in any manner with the BPA's use for transmission line purposes. Options for vegetation management include mechanical removal and herbicide and biological agents. In general, BPA personnel must complete a seven-step process, which includes documentation on a checklist, for each transmission line or facility where vegetation management is being considered to ensure that no sensitive resources or landowner needs are overlooked and unnecessarily impacted. The BPA coordinates with the Monument on proposed activities.

The BPA will likely need to expand its existing transmission system in the vicinity of the Monument to meet future needs for moving electricity from generation sources in Montana, northern Idaho, and northeastern Washington to load centers in the Pacific Northwest. Any activities related to transmission system expansion would first require study and analysis under the NEPA and coordination with the DOE and FWS to ensure protection of the Monument's natural and cultural resources.

3.18.3.2 Energy Northwest

Energy Northwest operates and maintains the Columbia Generating Station, a boiling water nuclear fission reactor located along the south shore of the Columbia River and near the Monument's southeast boundary. Associated facilities within the Monument boundary include underground utilities, an access road, buried pipes for water intake and discharge, and two pump houses. These facilities require regular unimpeded monitoring and maintenance activities. The partially completed WNP-1 and -4 Nuclear Plants are located adjacent to the Monument boundary. These sites have been slated for possible future development as industrial/commercial areas.

Monument lands and waters fall within the ten-mile emergency planning zone for the Columbia Generating Station. Energy Northwest has an exclusion authority in a 1.2-mile radius around the station. There are sirens scattered throughout the Hanford Site and, in particular, placed along the Hanford Reach of the Columbia River approximately ¼ mile from the south and west bank for evacuation of river recreationists. There is an existing plan for the automatic river closure and evacuation of nearby residential areas in the event of an emergency.

3.18.3.3 Communication Towers and Other Transmission Lines

Rattlesnake Mountain supports seven communications towers operated under DOE easements and leases. These towers provide services for local and regional communication networks and

emergency services and for commercial interests. The towers and associated buildings require regular patrol and maintenance.

The Benton County PUD operates and maintains transmission lines on Rattlesnake Mountain under a DOE right-of-way agreement. The power lines and associated access roads require regular inspection and maintenance.

3.18.3.4 South Columbia Basin Irrigation District

The SCBID operates facilities within the Monument that are associated with a major irrigation project which delivers water from the Grand Coulee Dam southward on the Columbia Plateau 125 miles to the confluence of the Snake and Columbia Rivers. Facilities within the Monument include main canals, lateral canals, drains and wasteways, including the WB-10 Ponds and the Saddle Mountain Lake. These facilities and their access roads require regular monitoring and maintenance activities.

3.18.4 Valid Existing Rights

Chapter 1 provides a discussion of the major valid existing rights. The only issue here is the infrastructure needed to allow for the implementation of those rights. Of the rights identified in Chapter 1, the only real need for infrastructure is for access. All of the rights holders have their own service roads and will maintain them, sometimes in conjunction with the FWS. However, many of these service roads are accessed from FWS-managed Monument roads; these roads are briefly described in Section 3.18.2. All of the roads needed for access for valid rights holders are planned for continued operation by the FWS.

Of course, the valid existing rights holders are maintaining infrastructure of their own, including irrigation canals, power lines, electric substations, etc. Some of those facilities are described under utilities (see Section 3.18.3).

The only other existing use specifically mentioned in the White House Background Paper accompanying the Proclamation is for the movement of a specific livestock herd. "The DOE has issued a license (#R006-94LI12799.000) to the S. Martinez Livestock, Inc., for a road right-of-way to herd livestock across the Monument along what is commonly known as the Wanapum Road. This license is a valid existing right that is protected by the preservation of valid existing rights in the proclamation." This activity does not require any specific infrastructure beyond that of the continued existence of the Wanapum Road, which is planned.

There are a variety of other land use authorizations that were in effect at the time of the Proclamation, and that, although they involve no rights, or their standing as a right remains to

be determined, continue into the present. For example, there are a variety of communications facilities in the Monument. There are also state or county gravel storage sites in the Monument. The FWS will need to determine if these are consistent with protection of Monument resources, and the infrastructure needs will be determined/assessed at that time, although it is unlikely there would be any needs beyond the existing roads system.

3.19 Social-Economic Setting

Demographic information obtained from the U.S. Bureau of Census was used to identify the total population near the Monument, as well as its composition. The four counties immediately surrounding the Monument—Adams, Benton, Franklin and Grant—and other counties within a sixty-mile radius—Kittitas, Walla Walla and Yakima—are considered the populations most impacted by the Monument and were chosen as the basis for all socioeconomic analysis. Native American tribes that have treaty rights in the Monument are also considered as they exercise those treaty rights.

3.19.1 Population Demographics

This section provides a general overview of the existing population in the region surrounding the Monument. Additional demographic composition can be found below in section 3.19.3.2, where minority and low-income populations are described in order to analyze environmental justice in Chapter 4.

The Monument is located in the counties of Adams, Benton, Franklin and Grant. A perimeter that projects sixty miles in all directions of the Monument includes the counties of Kittitas, Walla Walla and Yakima. These seven counties are considered to comprise the affected demographic and economic region.

3.19.1.1 General Population

Table 3.18 presents population in the state and in the counties that comprise the study area. The table shows that the greatest share of the regional population resides in Benton and Yakima County, and that Benton County has by far the highest population density in the region. A total population of approximately 589,300 people resides in the study area.

While the largest percentage of residents within the study area considers itself white (497,900 people), the minority population within the area of impact consists of approximately 91,400

people and represents approximately 16% of the population in the assessment area. The ethnic composition of the minority population is primarily of Hispanic origin (approximately 22%), which can be of any race. The Hispanic population varies greatly across the study area, both in total population (from a high of 23,500 in Benton County to a low of 900 in Kittitas County) and in percentage of the population (48% in Adams County to 3% in Kittitas County).

Table 3.18. Population in Economic Study Area.

Jurisdiction	Population	State Population (%), County Ranking[1]	Population Density (Persons/Square Mile)
Adams County	16,000	31	8.6
Benton County	140,700	10	83.7
Franklin County	45,900	21	39.7
Grant County	75,900	13	28.4
Kittitas County	34,000	25	14.8
Walla Walla County	54,200	19	42.0
Yakima County	222,600	7	49.0

[1] There are thirty-nine counties in the state of Washington. Source: Washington State Employment Security Department, 2000-2002.

3.19.1.2 Native American Populations Near the Monument

Substantial Native American populations are located within the sixty-mile assessment area (approximately 13,000 people). Census block groups within the assessment area and composed primarily of Native American populations are primarily located on the Yakama Indian Reservation in Yakima County, Washington. However, other Native American populations located outside of the assessment area also have an interest in the Monument based on treaty rights.

3.19.2 Government-to-Government Consultations with Native American Tribes—Partial History

The FWS, mainly through the Monument, has consulted with the four federally recognized Native American Tribes in the area—Yakama Nation, Nez Perce Tribe, CTUIR and CCT—and the Wanapum. The consultation has been through numerous methods, including mail and email correspondence, telephone conversations, and in-person meetings and presentations. Consultation over management of FWS managed lands commenced in April 1999 with the CTUIR, in June 1999 with the Nez Perce Tribe, and in July 1999 with the Yakama Nation.

The Presidential Proclamation formally designated the Monument in June of 2000. In 2001, the FWS began consultation specifically on the CCP with the Yakama Nation, CTUIR, and Nez Perce Tribe, primarily through written communication and in-person meetings (Nez Perce Tribe and CTUIR). In 2002, FWS staff met with Yakama Nation, CCT, and CTUIR tribal representatives and provided written communication with all of the tribes to describe the CCP process and invite consultation on the cultural and natural resources of the Monument. A Planning Workshop was held November 4-7, 2002, with subsequent two workshops held February 10-13 and June 17-19, 2003.

In April 2003, the FWS met with the Nez Perce Tribe's Natural Resources Subcommittee, and in May 2003, FWS staff met with the CTUIR's Cultural Resources Committee. In July 2003, the FWS invited all tribes to attend a land and river tour of the Monument. Tribal representatives from the Yakama Nation, Nez Perce Tribe, CTUIR, and Wanapum attended. In October, the Monument's Project Leader and Cultural Resources Manager met with the Colville Reservation's Natural Resources Committee and Business Council.

Since January 2004, Monument and other FWS staff have met with the CTUIR, Yakama Nation, and Nez Perce Tribe numerous times, primarily to discuss draft CCP goals, objectives and alternatives and to provide updates on the CCP's development.

3.19.3 Environmental Justice Setting

On February 11, 1994, President Clinton signed Executive Order 12898, requiring federal agencies that administer and implement programs, policies and activities that affect human health or the environment to identify and avoid "disproportionately high and adverse" effects on minority and low-income populations. (See "Demographics" below.)

The FWS's environmental justice guidelines state that environmental justice is one of the factors considered when developing an environmental analysis. These guidelines stipulate that environmental justice should be addressed similar to other environmental concerns and should include identification, avoidance, minimization and finally, mitigation. To correctly identify potential inequities, the environmental justice analysis requires preliminary census research and may require more detailed studies of communities/populations in combination with effective community outreach. This process is intended to ensure that projects are developed in a manner that avoids disproportionately high and adverse effects on minority and low-income populations.

The FWS is required to undertake activities in support of the Environmental Justice Program and ensure compliance with Executive Order 12898 in all FWS programs and activities. Incorporation of environmental justice principles is an implementation of the NEPA, Title VI of the Civil Rights Act, Uniform Relocation Act, and other regulations and guidance that affect social, economic and environmental factors; public health; and public involvement.

3.19.3.1 Area of Consideration

Data for five communities—Richland, Pasco, Mattawa, Othello and Prosser—and three counties—Benton, Franklin and Grant—in the state of Washington were evaluated as part of this environmental justice analysis. The communities were chosen due to their proximity to the Monument and for their differing social and economic backgrounds. The counties are those in which the Monument is primarily located. Following is a discussion of minority—including Native American populations—and low-income data for these communities and counties.

3.19.3.2 Minority and Low-Income Populations

A minority is defined as a person who has any of the following traits.

- Black (having origins in any of the black racial groups of Africa).
- Asian (having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands).
- Native American and Alaskan Native (having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition).
- Hispanic (of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race).[117]

Detailed minority data for the five communities, three counties, and the state of Washington are included in Tables 3.19 and 3.20. The distribution of races in the five communities is compared

[117] Origin can be viewed as the heritage, nationality group, lineage, or country of birth of the person or the person's parents or ancestors before their arrival in the United States. As such, people who identify their origin as Spanish, Hispanic, or Latino may be of any race. According to the U.S. Census Bureau (Census Bureau): The data on the Hispanic or Latino population were derived from answers to a question that was asked of all people. The terms "Spanish," "Hispanic Origin," and "Latino" are used interchangeably. Some respondents identify with all three terms, while others may identify with only one of these three specific terms. People who identify with the terms "Spanish," "Hispanic," or "Latino" are those who classify themselves in one of the specific Spanish, Hispanic, or Latino categories listed on the [census] questionnaire—Mexican, Mexican American, Chicano, Puerto Rican, or Cuban—as well as those who indicate that they are "Other Spanish/Hispanic/Latino." Hispanics or Latinos who do not identify with one of the specific origins listed on the questionnaire but indicated that they are "Other Spanish/Hispanic/Latino" are those whose origins are from Spain, the Spanish-speaking countries of Central or South America, the Dominican Republic, or people identifying themselves generally as Spanish, Spanish-American, Hispanic, Hispano, Latino, and so on.

to the state of Washington in Table 3.19 below.[118] The distribution of races in the counties is compared to the state of Washington in Table 3.20. In 2000, Washington State's minority population was 18.2%, higher than the community of Richland (10%), but lower than in the communities of Mattawa (97%), Pasco (47%), Othello (46%) and Prosser (20%). In 2000, Franklin and Grant Counties had higher minority populations (38.1% and 23.5%) than the state of Washington (18.2%); Benton County's minority population (13.8%) was lower than the state's minority population.

Table 3.19. Race Distribution in Five Sample Communities Near the Monument and the State of Washington, 2000.

Race	Representative Communities					
	Richland	Pasco	Mattawa	Othello	Prosser	State
White	34,662 (89.5%)	16,919 (52.8%)	772 (29.6%)	3,168 (54.2%)	3,865 (79.9%)	4,821,823 (81.8%)
Black or African American	530 (1.4%)	1,033 (3.2%)	5 (0.2%)	31 (0.5%)	26 (0.5%)	190,267 (3.2%)
Native American and Alaska Native	293 (0.8%)	248 (0.8%)	14 (0.5%)	59 (1.0%)	44 (0.9%)	93,301 (1.6%)
Asian	1,571 (4.1%)	567 (1.8%)	24 (0.9%)	59 (1.0%)	37 (0.8%)	322,335 (5.5%)
Native Hawaiian/ Other Pacific Islander	41 (0.1%)	46 (0.1%)	0 (0.0%)	5 (0.1%)	14 (0.3%)	23,953 (0.4%)
Other Single Race	718 (1.9%)	12,004 (37.4%)	1,718 (65.8%)	2,312 (39.5%)	731 (15.1%)	228,923 (3.9%)
Two or More Races	893 (2.3%)	1,249 (3.9%)	76 (2.9%)	213 (3.6%)	121 (2.5%)	213,519 (3.6%)
Total Population	38,708	32,066	2,609	5,847	4,838	5,894,121

Notes: Percentages may not exactly equal 100 due to rounding. Source: U.S. Census Bureau 2000.

3.19.3.2.1 Hispanic and Latino Populations

As explained in footnote 117, Hispanics may identify with any race and are counted according to their answers on the 2000 census. However, the Census Bureau asked respondents to provide an Hispanic origin response, as well as responding to the question of racial origin. As such, the Census Bureau was able to identify the Hispanic/Latino population. The Hispanic or Latino populations in the sample communities, surrounding counties, and state of Washington are:

[118] The category of "two or more races" in the 2000 census data addresses the issue of avoiding double-counting individuals who might be of two different races (e.g., Hispanic and Native American).

- Adams County—7,732 (47.1%).
- Benton County—17,806 (12.5%).
- Franklin County—23,032 (46.7%).
- Grant County—22,476 (30.1%).
- Mattawa—2,343 (89.8%).
- Othello—3,728 (63.8%).
- Pasco—18,041 (56.3%).
- Prosser—1,421 (29.4%).
- Richland—1,826 (4.7%).
- Washington—441,509 (7.5%).

Except for Richland, all the sample communities and surrounding counties have Hispanic populations well above the Washington State average, as a percentage of the population. This is a prevalent minority population in the area around the Monument and must be considered in development and implementation of the CCP. To date, there has been no special outreach to Hispanic populations, although the FWS has tried to facilitate their involvement in the CCP process by having Spanish translation available for scoping meetings. The FWS has been producing Spanish language versions of some signs and informational publications. Additional outreach, more Spanish language signs, and other measures to facilitate the involvement of Hispanic populations in the Monument will occur with implementation of the CCP, regardless of the alternative chosen.

Table 3.20. Race Distribution in Counties Around the Monument and Washington State, 2000.

Race	Surrounding Counties				
	Adams	Benton	Franklin	Grant	Washington
White	10,672 (65.0%)	122,879 (86.2%)	30,553 (61.9%)	57,174 (76.5%)	4,821,823 (81.8%)
Black or African American	46 (0.3%)	1,319 (0.9%)	1,230 (2.5%)	742 (1.0%)	190,267 (3.2%)
Native American and Alaska Native	112 (0.7%)	1,165 (0.8%)	362 (0.7%)	863 (1.2%)	93,301 (1.6%)
Asian	99 (0.6%)	3,134 (2.2%)	800 (1.6%)	652 (0.9%)	322,335 (5.5%)
Native Hawaiian/Other Pacific Islander	6 (0.0%)	163 (0.1%)	57 (0.1%)	53 (0.1%)	23,953 (0.4%)
Other Single Race	5,042 (30.7%)	9,983 (7.0%)	14,300 (29.0%)	12,967 (17.4%)	228,923 (3.9%)
Two or More Races	451 (2.7%)	3,829 (2.7%)	2,045 (4.1%)	2,247 (3.0%)	213,519 (3.6%)
Total Population	16,428	142,475	49,347	74,698	5,894,121

Notes: Percentages may not exactly equal 100 due to rounding. Source: U.S. Census Bureau 2000.

3.19.3.2.2 Native American Populations

The Yakama Indian Reservation, located in Klickitat and Yakima Counties, Washington, is approximately fifty miles to the west of the Monument. As noted elsewhere, the Monument and

the entire Hanford Site has cultural significance to the members of the CCT, CTUIR, Nez Perce Tribe, Wanapum and Yakama Nation. The FWS is keenly aware and highly supportive of tribal interest in the Monument and has made every effort—within the CCP development time frame—to involve, listen to, and accommodate area tribes and Native American peoples.

Future opportunities of tribal members to exercise treaty rights are dependent upon the health of the ecosystems. The tribes assert that a treaty right to hunt, fish, or gather plants is diminished (if not voided) if the fish, wildlife, or plants have vanished or are contaminated to the extent that they threaten human health. These resources, particularly the resources with cultural and religious connotations, do not have equivalent value for the general population. Treaty reserved tribal fishing rights have been recognized as being effective within the Hanford Reach. The tribes also have an interest in continuing/renewing traditional uses, such as gathering of foods and medicines, hunting, and pasturing horses and cattle on Monument lands.

3.19.3.2.3 Low Income Populations

The Census Bureau follows the Office of Management and Budget's Statistical Policy Directive 14 to determine poverty status based on income level. To determine poverty, the Census Bureau uses a set of monetary income thresholds that vary by family size and composition. If the total income for a family or unrelated individual falls below the relevant poverty threshold, then the family or unrelated individual is classified as being below the poverty level. Poverty status can be used as a measure of low income for environmental justice analyses. Poverty thresholds do not vary geographically, but do vary according to size of family unit.

In 1999, 7.3% of the population of Washington consisted of families with incomes below the poverty level; Table 3.22 analyzes poverty around the Monument. With the exception of Richland, all of the jurisdictions looked at have a higher percentage of their families at or below the poverty level than the state average. Also, all communities except Richland have median family income lower than that of Washington.[119] All of the counties except Benton have poverty rates equal to or higher than the state of Washington; Adams, Franklin and Grant Counties had median incomes lower than that of Washington.[120] There may be a correlation between lower incomes and higher minority populations, factors for which are beyond the scope of this CCP.

Open areas (e.g., parks, national forests) are often of great importance to low-income families as a source of recreation and entertainment. It is important to keep public fees associated with access and use of these resources low in order to accommodate use by low-income families, a

[119] The state of Washington's median income for families was $53,760.

[120] Richland, in Benton County, helps to raise the county's average income and lower its percentage of families below the poverty line.

factor that was considered by the FWS in selection of a preferred management alternative and its implementation.

Table 3.21. Low Income Statistics for Area Surrounding the Monument.

Community	Median Household Income	Median Family Income	Population Below Poverty Level	Families Below Poverty Level
Adams County	$33,888	$37,057	18.2%	13.6%
Benton County	$47,044	$54,146	10.3%	7.8%
Franklin County	$38,991	$41,967	19.2%	15.5%
Grant County	$35,276	$38,938	17.4%	13.1%
Mattawa	$31,964	$25,921	34.4%	30.6%
Othello	$30,291	$31,282	24.0%	18.4%
Pasco	$34,540	$37,342	23.3%	19.5%
Prosser	$39,185	$45,162	13.5%	11.5%
Richland	$53,092	$61,482	8.2%	5.7%
Washington	$45,776	$53,760	10.6%	7.3%
Source: U.S. Census Bureau				

3.19.4 Fiscal Environment

The fiscal environment is described by the industrial makeup, employment levels, and average wages in the area.

3.19.4.1 Industrial Makeup

One way to measure the industrial makeup of an area, and thereby its relative economic strength, is to compare it to other areas. In the state of Washington, location quotients are calculated for the major industrial sectors using employment data. The idea of the location quotient is to compare a given industry's share of total local employment versus its share statewide. Dividing the statewide industry employment share into the local industry share derives the quotient. Therefore, a quotient of 1.0 denotes an industry in which the local area is typical to the state as a whole. A value greater than 1.0 indicates an industry with higher concentration of employment than in the state as a whole, and a value less than 1.0 indicates the industry has a lower employment concentration than the state as a whole. Table 3.22 presents location quotients for major industrial sectors in the counties that comprise the economic study area.

The table shows that agriculture is the strongest sector in the region and that government employment is also stronger in the region than the statewide average. Manufacturing and trade

quotients vary from county to county, with some counties in the region stronger than the statewide figures and some not. The other major industrial sectors are generally shown to be weaker in the region.

Table 3.22. Location Quotients in Economic Study Area.

Industrial Sector	Adams	Benton	Franklin	Grant	Kittitas	Walla Walla	Yakima
Agriculture	9.0	2.8	7.2	6.8	2.0	3.4	6.3
Government	1.3	0.9	1.1	1.2	1.9	1.2	0.9
Manufacturing	1.2	0.6	0.5	2.8	0.5	1.3	1.0
Trade	1.3	0.3	1.2	0.8	1.2	0.8	1.3
Construction/Mining	0.4	0.8	0.9	1.5	0.7	0.5	0.5
Transportation & Utilities	0.7	2.6	0.8	0.6	0.7	N/A	0.5
Services	0.4	1.0	0.8	0.5	0.7	0.9	0.8
Fire, Insurance, Real Estate	0.2	0.6	0.3	0.3	N/A	0.7	0.5

N/A = information not available.
Source: Washington State Employment Security Department, 2000-2002

3.19.4.2 Unemployment

The unemployment rate is the percentage of the total labor force that has been unable to secure jobs but is actively looking. Table 3.23 summarizes the average unemployment in the counties in the economic study area. The table shows that most of the counties have average unemployment that exceeds the state average, and for many of the counties the difference is substantial.

Table 3.23. Average Unemployment in Economic Study Area.

Jurisdiction	Average Unemployment Rate (%)
Adams County	9.4
Benton County	6.2
Franklin County	9.0
Grant County	9.5
Kittitas County	5.3
Walla Walla County	5.8
Yakima County	9.1
State of Washington	4.7

Source: Washington State Employment Security Department, December 2005

3.19.4.3 Average Wages

Annual average covered wages are derived by dividing the total wages paid in an area by the annual average employment in that area. The number reflects actual wages and does not include benefits such as insurance or retirement plans. Jobs not covered by the unemployment insurance program are not covered. However, the program does cover approximately 85% of all employment in the state. Table 3.24 summarizes the average annual wages for the counties within the economic study area.

Table 3.24. Average Wages in Economic Study Area.

Jurisdiction	Average Wage In 2000
Adams County	$23,900
Benton County	$32,700
Franklin County	$21,700
Grant County	$24,000
Kittitas County	$22,400
Walla Walla County	$25,300
Yakima County	$23,300
State of Washington	$35,400
Source: Washington State Employment Security Department 2002	

The table shows that all counties within the study area have average wages lower than the statewide average. However, it is important to note that only two counties within the state (King County and San Juan County) have average wages higher than the statewide average. The table also shows that the average wage in Benton County is considerably higher than the wages of other counties in the region. This is primarily caused by the substantial concentration of high-paying jobs related to Hanford Site operations in Benton County and the high concentration of lower-paying agricultural jobs in the other counties.

3.19.4.4 Economic Development Organizations

This section lists the economic development organizations that have been identified in each county in the study area.

3.19.4.4.1 Adams County

Adams County Economic Development Council: This is a private, non-profit organization with both private and public sector employees. A primary emphasis of the council is to find ways to add dollar value to local products prior to shipment, promoting sustainable growth that melds with the established culture of the region.

Chambers of Commerce: Othello, Lind and Ritzville each have a Chamber of Commerce, composed of local business owners and other interested individuals who work together to further the business interests of their respective communities.

3.19.4.4.2 Benton and Franklin Counties

Tri-City Industrial Development Council (TRIDEC): TRIDEC was created in 1962 to achieve stability and balanced growth through job creation and retention, as well as enhance of the quality of life. A thirty-nine-member board of directors governs TRIDEC. Its mission is pursued through proactive business recruitment, retention and expansion.

3.19.4.4.3 Grant County

Grant County Economic Development Council (GCEDC): The GCEDC is a private, non-profit corporation funded by both private and public sectors. The primary mission of the GCEDC is to work closely with existing industries to assist with business retention and expansion.

Economic Development Task Forces: Moses Lake, Ephrata and Grand Coulee have active economic development task forces working to further the business interests of their respective communities.

3.19.4.4.4 Kittitas County

Phoenix Economic Development Group: Appointed by the Kittitas County Commissioners, this group is a cooperative public/private nonprofit association established to provide leadership that stimulates business development and promotes economic opportunities in the county.

Chambers of Commerce: Ellensburg, Cle Elum/Roslyn, and Northern Kittitas County/Roslyn each has a Chamber of Commerce, composed of local business owners and other interested individuals who work together to further the business interests of their respective communities.

3.19.4.4.5 Walla Walla County

Port of Walla Walla: This is a municipal corporation established by voters in 1952 to expand the economic base in the county. It is the principal local contact for state agencies involved in economic development efforts.

Walla Walla Valley Chamber of Commerce: A private, non-profit organization made up primarily of business and community leaders, the organization is committed to furthering the business interests of the greater Walla Walla area.

Walla Walla Downtown Foundation: Comprised primarily of downtown businesses and local government representatives, this organization is committed revitalizing the downtown Walla Walla area.

3.19.4.4.6 Yakima County

Yakima County Development Association: This is an organization whose mission is to enhance the quality of life and economic stability of the Yakima region by retaining, expanding and recruiting new business and industry.

Chambers of Commerce: Yakima, Toppenish, Grandview, Sunnyside, Granger, Selah and Zilah each have a Chamber of Commerce, composed of local business owners and other interested individuals who work together to further the business interests of their respective communities.

3.19.4.5 Recreational Use at the Monument

The primary impact of the Monument on the local economy will be through tourism and recreational use of the Monument. Table 3.25 summarizes the estimated annual recreational use in the Monument under existing conditions.

Table 3.25. Existing Annual Recreational Users Estimates.

Activity	Estimated Annual Visitor Days (2004)
Hunting: Big Game	200
Hunting: Upland Game	400
Hunting: Waterfowl	1,000
Fishing	20,000
Wildlife Observation	500
Wildlife Photography	70
Education & Interpretation	250
Hiking	330
Non-Motorized Boating	670
Motorized Boating	2,000
Commercial River Trips	1,880
Equestrian Use	330
Driving For Pleasure	330
Other	1,870
Total	29,830

3.19.5 Educational Services

The area around the Monument offers a fairly diverse array of opportunities for pursuing an education, including public and private schools, colleges and community education.

3.19.5.1 Public Schools

Primary and secondary education are served by the Tri-Cities, Kiona-Benton, Othello, North Franklin, and Wahluke School Districts. The combined 2004 enrollment for all districts was 43,702 students.

Table 3.26. Public Schools Near the Monument.

School District	Elementary	Middle	Jr.	High	Alternative[1]
Columbia	1	1		1	1
Finley	1	1		1	
Kennewick	14	4		3	6
Kiona-Benton City	1	4		1	1
North Franklin	3		1	2	2
Othello	3		1	1	
Pasco	10	3		2	2
Richland	8	3		3	2
Wahluke	1	3		1	1
Total	40	17	2	13	14
Note: [1] Includes all non-traditional schools—vocational centers, special education, etc.					

3.19.5.2 Private Schools

Several private elementary and secondary schools offer an alternative to the local public school system. These institutions include Country Haven Academy, Kingspoint Christian, St. Patrick's, Tri-Cities Prep, and Tri-City Junior Academy in Pasco; Bethlehem Lutheran, Calvary Christian, Shepherd's Academy, and St. Joseph's in Kennewick; and Children's Garden Montessori, Christ the King, Liberty Christian, and Oasis in Richland; and Liberty Bell Academy and Mid-Columbia Christian in Othello.

Table 3.27. Enrollment in Area Public School Districts.

School District	Enrollment	Asian	Native American	Black	Hispanic	White
Columbia	968	.72% (7)	1.45% (14)	.72% (7)	19.32% (187)	77.69% (752)
Finley	1,030	.58% (6)	1.17% (12)	.29% (3)	17.57% (181)	80.39% (828)
Kennewick	14,987	2.02% (303)	0.55% (82)	2.32% (348)	22.24% (3,333)	72.88% (10,922)
Kiona-Benton City	1,656	1.27% (21)	0.60% (10)	0.91% (15)	20.65% (342)	76.57% (1,268)
North Franklin	1,942	1.49% (29)	0.31% (6)	0.51% (10)	58.75% (1,141)	38.93% (756)
Othello	3,096	0.48% (15)	0.19% (6)	0.48% (15)	74.48% (2,306)	24.35% (754)
Pasco	10,477	1.47% (154)	0.46% (48)	2.80% (293)	67.68% (7,091)	27.59% (2,891)
Richland	9,790	4.50% (441)	0.83% (81)	2.69% (263)	6.05% (592)	85.93% (8,413)
Wahluke	1,754	0.40% (7)	0.74% (13)	0.00% (0)	86.32% (1,514)	12.54% (220)
Total	43,702	2.22% (970)	0.56% (246)	2.16% (944)	37.34% (16,319)	57.72% (25,224)

Note: Actual student numbers are approximations based on the percentages provided by the Washington State Office of Superintendent of Public Education.
Source: Washington State Office of Superintendent of Public Education 2004 Report Card

3.19.5.3 Post-Secondary Education

Post-secondary education in the area is provided by a junior college, Columbia Basin College, and the Tri-Cities branch campus of Washington State University.

3.19.5.3.1 Columbia Basin College

Columbia Basin College is a comprehensive two-year college that provides quality education and effective job preparation. It offers approximately 7,000 students a full array of Associate Degree and Vocational/Technical career programs. The college works closely with regional employers to develop specific programs needed to train prospective workers for area businesses. The Workforce Training Center houses 120 computer work stations and provides state-of-the-art training customized to an employer's needs. Columbia Basin College exists to ensure that the

people of Benton and Franklin Counties have access to educational programs providing sufficient knowledge for higher educational achievement, meaningful employment, basic skills development, cultural enrichment, and physical and emotional well being.

3.19.5.3.2 Washington State University

Washington State University's Tri-Cities branch campus provides its 1,300 students the opportunity to acquire undergraduate and graduate degrees in a variety of programs. The Tri-Cities campus is the gateway to Washington State University (WSU), a premier research university, centered in Pullman, Washington. The branch campus, established in 1989, provides upper-division undergraduate and graduate study opportunities, research and public service to the community. The Consolidated Information Center (CIC) houses the merged Washington State University Tri-Cities Library, operated by the university, and the Hanford Technical Library, operated by the PNNL under contract with the DOE. It also houses the DOE Public Reading Room, Business LINKS, classrooms and exhibit space. The CIC assists in Hanford Site remediation by providing easy access to WSU and Hanford Technical Library resources. Its training facility has state-of-the-art telecommunications capabilities. In addition, Business LINKS provides the region with a comprehensive business and entrepreneurial marketing, training and referral service. The Food and Environmental Quality Laboratory and the Washington State Pest Management Resource Service provide facilities for scientists to conduct research on herbicides, pesticides and agricultural pests.

3.19.6 Agriculture

While Benton County, and to a lesser extent Franklin County, relies heavily on government and the Hanford Site cleanup as an economic base (total expenditures), the other counties in the sixty-mile radius study area are much more dependent on agriculture for total revenues.[121] The following data is taken from the Washington State Employment Security Department reports for 2002 and reflects 2000 data.

3.19.6.1 Adams County

In Adams County, agriculture is the number one industrial employer; 28% of workers in Adams County are employed by the agricultural sector. Wheat is the premiere crop in the county, with the fourth highest county production in the state. However, dryland wheat farming required little

[121] Agriculture accounts for 22% of all jobs in the entire state.

human labor, employing less than thirty workers. Apples, potatoes and cherries are the most important crops for employment, employing 2,237, 644, and 281 workers, respectively.

3.19.6.2 Benton County

While a large amount of revenues in Benton County come from the Hanford Site, agriculture is an important employer—9% of jobs are related to agriculture. Fruit trees are the most important crop, accounting for 36% of agricultural jobs (1,962 jobs), but the county also produces other fruits (grapes, melons, nectarines and plums), field crops, and vegetables. In fact, grape production is the fastest growing sector (147% increase in jobs to 859).

3.19.6.3 Franklin County

Agriculture in Franklin County accounts for 23% of agricultural jobs in the county. Like Benton County, fruit trees represent the highest employment crop in Franklin County—40% of jobs (1,967 jobs). Franklin County was ranked first in the state for potato, asparagus and sweet corn production; third for acres of grapes and peaches; and seventh for acres of orchards. The production of vegetables is the second largest employer at 641 workers.

3.19.6.4 Grant County

Grant County, like Adams County, relies on agriculture as its number one employment industry; 23% of workers in Grant County are employed by the farm sector. Grant County also has a substantial wheat harvest (fifth highest, statewide), but fruit trees (apples, cherries, apricots, pears, peaches, nectarines and plums) and potatoes are the most important crops. Fruit trees employed 3,217 workers, while potatoes, where Grant County leads the state in production, employed an estimated 2,000 workers. Ornamental nurseries also employed 500 workers.

3.19.6.5 Kittitas County

In Kittitas County, 6.9% of jobs are related to agriculture. While the county has a large number of beef and dairy cattle farms, which typically pay higher wages, the largest employer is in the production of fruit trees. Oats, hay and potatoes are also important; Kittitas County is the largest producer of oats and hay in the state. These four crops employed 635 people.

3.19.6.6 Walla Walla County

In Walla Walla County, agricultural jobs account for 12% of total employment. The county's primary crop is wheat, although as noted earlier, this crop does not employ many workers, instead being capital intensive. Fruit production is the largest employer, employing 1,468 workers for a total payroll of $20.4 million (out of a total agricultural payroll of $39.2 million). Apples and grapes are the main fruits grown, apples being the more important. Walla Walla County ranks first in the state in production of onions and alfalfa seed and fourth in the state in the production of wheat. Other major crops include corn for grain, sweet corn, potatoes, fruits, and hay.

3.19.6.7 Yakima County

Agriculture in Yakima County accounts for 21% of all jobs. While a breakdown of jobs per crop is not available, 79% of all agricultural jobs (15,720 jobs) were in the production of crops, such as fruit trees (apples, cherries and grapes being the primary crops), hay, carrots, asparagus, mint and grass seed. Of special note is Yakima County's contribution to the nation's alcohol market. Yakima County is home to numerous award-winning wineries, and the Yakima Valley and Rattlesnake Hills Wine Tours are becoming quite well known among wine connoisseurs. Yakima County also produces a large percentage of the hops used in beer production, both nationally and internationally. These hops are known for their excellent quality and wide variety.

3.19.7 Emergency Services

The Monument and its surrounding area has a high per capita share of law enforcement and firefighting personnel and equipment, as well as a host of emergency notification systems. These resources are briefly described in the sections that follow. See Section 3.20.10, "Hanford Site Protective Safety Buffer Zones," for additional information.

3.19.7.1 Police

Police protection for the Hanford Site is provided by the Hanford Patrol, which is operated by DOE contractors and supported by county sheriff departments, local municipal police departments, and the Washington State Patrol headquartered in Kennewick.

Police protection in Benton and Franklin Counties is provided by county sheriff departments, local municipal police departments, and the Washington State Patrol headquartered in

Kennewick. Table 3.28 shows the number of commissioned officers and patrol cars in each department. The Kennewick, Richland and Pasco departments maintain the largest staffs of commissioned officers with seventy-three, fifty and forty-four, respectively.

Table 3.28. Police Personnel in the Tri-Cities.

Area	Commissioned Officers	Reserve Officers	Patrol Cars
Kennewick Municipal	73	15	45
Pasco Municipal	44	33	15
Richland Municipal	50	13	13
West Richland Municipal	12	10	11
Benton County Sheriff	47	15	55
Franklin County Sheriff	19	17	22
WDFW	5	0	?

3.19.7.2 Monument Law Enforcement

The FWS law enforcement officers perform police protection and enforcement services in the Monument. Currently, the McRiver NWRC has two law enforcement officers; one is on military duty, and the other position is vacant. One FWS special agent is located on the Monument; however, the special agent's duties are region wide and are different than those of a national wildlife refuge law enforcement officer, although he can be called on if needed. At present, most wildlife violations are addressed by WDFW agents.

Unlike the fire department (see below), Monument law enforcement currently have no mutual-aid agreements with local police departments, but does receive assistance from county sheriffs and the Hanford Patrol. Likewise, Monument personnel provide assistance to Hanford Patrol, Washington State Patrol, WDFW officers, county sheriffs, and city law enforcement.

3.19.7.3 Area Fire Fighting

Fire protection for the Hanford Site is provided by the Hanford Fire Department, which, like the Hanford Patrol, is operated by Hanford Site contractors. The Hanford Fire Department has ninety-three firefighters who are trained to dispose of hazardous waste and to fight chemical fires, in addition to their regular firefighting duties. During a twenty-four-hour duty period, the 1100 and 300 Areas have seven firefighters; the 200 East and 200 West Areas have eight firefighters; the 100 Areas have five firefighters; and the 400 Area, which includes Energy Northwest, has six firefighters. To perform their responsibilities, each station has access to a hazardous material response vehicle equipped with chemical fire-extinguishing equipment, an

attack truck that carries foam and Purple-K dry chemical, a mobile air truck that provides air for respirators, and a transport tanker that supplies water to six brushfire trucks. The Hanford Fire Department owns five ambulances and maintains contact with local hospitals.

In addition to the Hanford Fire Department, the FWS has its own firefighting staff and equipment (described below), and the FWS can be assisted by numerous area fire districts. Table 3.29 indicates the number of firefighting personnel, both paid and unpaid, on the staffs of fire districts in the area.

Table 3.29. Fire Protection in the Tri-Cities.

Station	Personnel	Volunteers	Total	Service Area
Kennewick	63	0	63	City of Kennewick
Pasco	30	0	30	City of Pasco
Richland	48	0	48	City of Richland
Benton County Rural Fire Department 1	9	94	103	Kennewick Area
Benton County Rural Fire Department 2	3	37	40	Benton City
Benton County Rural Fire Department 4	5	30	35	West Richland

3.19.7.4 Monument/FWS Firefighting Capacity

Fully staffed, the FWS would have fifteen full-time and approximately ten temporary (seasonal) firefighting staff within the area. Additionally, ten to fifteen refuge staff have completed basic firefighting training and serve as collateral firefighters.

FWS fire staff primarily perform fuels management, fuels hazard reduction, wildland fire suppression, and prescribed fire activities on lands administered by the FWS. The FWS fire team relies on mutual-aid and cooperative working agreements with ten county rural fire protection districts and the Hanford Fire Department for initial and extended attack of fires. Likewise, through these agreements, fire protection services are provided for off-refuge lands as resources and fire protection staffing levels will allow. The mutual aid agreements provide for the first twelve hours of services at no charge to the requesting department.

3.19.7.5 Other Emergency Systems

The Hanford Site Emergency Alerting System was established to provide notification to all site workers (including the Monument) of public health and safety issues that require immediate response. Generally, this system is centered around radiological concerns, but it could also be used to notify site workers of imminent law enforcement and fire concerns. This system uses crash alarm telephones, sirens and an AM radio station; however, the system is outdated and out

of compliance. A new system is being developed that will integrate the old system with new technologies not in the current system. Pagers, cell phones, all local area networks, and two-way radios are some of the new technologies that will be directly connected to the new system.

Energy Northwest, as a working nuclear power-production reactor, is required to have a siren warning system to alert personnel and other nearby people in the event of an emergency. Its warning sirens must reach each area where there are people at a minimum decibel level. Under some of the alternatives currently being considered (i.e., allowing for use in the Hanford Dune Field), new or additional sirens would have to be installed.

3.20 Special Area Designations

As noted throughout this CCP, the Monument is a unique and special place. This has led to the creation of several additional actual or potential designations or management overlays, including those resulting from the existence of the Hanford Nuclear Reservation. These overlays include an IBA, an RNA, National Register Historic Districts, Washington Heritage Sites, eligible TCPs, a potential National Historic Site (B Reactor), and a river corridor eligible and suitable for designation into the NWSRS (see Map 23). Also addressed as per FWS policy are potential wilderness areas.

3.20.1 Important Bird Area

The IBA program is a global effort to identify areas that are crucial for maintaining bird populations. An IBA is a site that provides essential habitat for one or more species of birds. IBAs represent discrete sites, both aquatic and terrestrial, that are critically important to birds during their annual life cycle (i.e., breeding, wintering, feeding, and migration). When the sites are identified, conservation efforts can focus on protecting those sites.

The IBA selection process examines sites based on two characteristics: 1) the presence and abundance of birds; and 2) the condition and quality of habitat. IBAs are chosen using standard biological criteria and the expert review of ornithologists. All sites nominated as potential IBAs are rigorously evaluated to determine whether they meet the necessary qualifications.

Within the United States, the program has been promoted and maintained by the American Bird Conservancy (ABC) and National Audubon Society (NAS). The ABC coordinates the identification of nationally significant IBAs, while the NAS works to identify sites in individual states. The NAS, as the Partner Designate for Bird Life International, is working within each state to identify a network of sites across the country that provide critical habitat for birds. By

working through partnerships, principally the North American Bird Conservation Initiative, to identify those places that are critical to birds during some part of their life cycle, the hope is to minimize the effects that habitat loss and degradation have on bird populations. In the United States, the IBA program has become a key component of many bird conservation efforts. Additional information can be found at www.audubon.org/bird/iba/.

In Washington State, the goals of the IBA program are twofold: 1) identify the sites in the state most essential for long-term conservation of birds; and 2) take action to ensure the conservation of those sites.

The ALE is a designated IBA. It was chosen because of its unique habitat features and because, prior to the 2007 fires, it was one of the few large, contiguous blocks of shrub-steppe habitat in the Northwest still retaining a dominant pre-European settlement ecology and physical character. The ALE also supports an extraordinary assemblage of breeding birds associated with grassland and shrub-steppe ecosystems, including ferruginous hawks, long-billed curlews, burrowing owls, loggerhead shrikes, sage thrashers, sage sparrows, Brewer's sparrows, and grasshopper sparrows. Two year-round desert springs support extensive riparian areas that provide breeding habitat for flycatchers, warblers, orioles and other neotropical migrants.

The Hanford Reach corridor is also a designated IBA. It comprises the Columbia River and the near-shore environment and extends approximately 0.25 mile inland from the river between the Vernita Bridge and the Ringold Fish Hatchery. The majority of this stretch of river contains specialized habitats, including islands, gravel bars, and rapids, not found elsewhere along the Columbia. This last free-flowing section of one of the largest rivers in the United States is important for birds that use riverine habitats in the arid West. It supports a high concentration of wintering bald eagles and waterfowl. Cliffs provide nesting sites for swallows, owls, hawks and falcons. The forty-plus species of fish inhabiting the Hanford Reach support American white pelicans, gulls, terns and cormorants. Waterbirds, such as herons and egrets, have well-established rookeries in several locations along the river. The riparian habitat within this IBA is important for neotropical migrant species, as well as for the characteristic breeding species of riparian habitats in the interior Columbia River Basin.

3.20.2 Research Natural Area

In addition to being an ecological reserve, the 120-square-mile ALE is an RNA, known as the Rattlesnake Hills RNA. An RNA is a physical or biological unit (or both) in which natural conditions are maintained insofar as possible by letting natural physical and biological processes prevail without human intervention (Federal Committee on Ecological Reserves 1977). Following are the objectives for establishing RNAs.

- Preserve examples of all significant natural ecosystems for comparison with those influenced by humans.[122]

- Provide educational and research areas for ecological and environmental studies.

- Preserve gene pools for typical and rare and endangered plants and animals.

In 1928, the USFS established the first RNA, the Santa Catalina Natural Area, on the Coronado National Forest in northern Arizona. Since then, the program has grown nationwide and includes designations by other federal agencies, as well as cooperation with state natural area programs and TNC. The RNA program in the Northwest began in 1931 when the Metolius RNA was established on the Deschutes National Forest in Oregon. RNAs in Oregon and Washington on federal lands are managed by the U.S. Department of Agriculture (USDA); the DOI (BLM, NPS and FWS); the DOD (Navy); and the DOE. Management differs somewhat between agencies, but the agencies all concur on the objectives for RNAs.

Scientific use of RNAs has always been encouraged in Oregon and Washington. RNAs provide useful and essential information to land managers; they also contribute to basic science. Research activities must be essentially non-destructive, and the scientific and educational values of the areas must not be impaired. Each agency has a set of guidelines for use, but none is particularly restrictive as long as the essential characteristics and processes of the RNA are maintained.

The Rattlesnake Hills RNA was established as a result of a federal interagency cooperative agreement. The ALE constitutes the single largest tract in the federal RNA system for Oregon and Washington (Franklin et al. 1972), due in part to its being one of the few remaining large tracts of shrub-steppe vegetation in Washington that retains a predominant pre-European settlement character. The ALE is closed to general access by the public and is maintained for scientific purposes consistent with its value as an RNA.

3.20.3 National Register Listed and Eligible Properties (Historic Districts)

The National Register is the nation's official list of cultural resources worthy of preservation. Authorized under the NHPA, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate and protect our historic and archeological resources. It is a list of buildings, sites, structures, objects and districts

[122] In some circumstances, human intervention may be justified to maintain the feature for which the RNA was set aside. The introduction of prescribed fire in seral stands historically maintained by fire is an example.

significant—at the local, state, or national level—in American history, architecture, archeology, engineering and culture. The NPS administers the National Register.

A National Register Historic District is a concentration of historic buildings, structures, sites, or objects united historically or aesthetically by plan or physical development. Any one of the properties in a historic district may not have particular historical, architectural, engineering, or archaeological distinction, but collectively they are significant in one of these areas.

The Secretary of the Interior established criteria to determine the eligibility of historic properties for inclusion in the National Register. All projects must be reviewed for any listed or eligible National Register sites in accordance with these regulations through the (Washington) SHPO. The following criteria are used to determine which sites qualify for listing.

- An association with events that have made significant contributions to broad patterns of our history.
- An association with significant persons in our past.
- Having distinctive characteristics of a type, period, or method of construction; having high artistic values; or being representative of a master or other significant entity.
- Having yielded, or being likely to yield, important historic or prehistoric information.

The Monument has a total of 127 sites evaluated for inclusion in the National Register, with forty-nine actually listed. Most of the National Register sites are part of six National Register Historic Districts (Hanford North Archaeological District, Locke Island Archaeological District, Rattlesnake Springs Historic District, Savage Island Archaeological District, Snively Canyon Archaeological District, Wooded Island Archaeological District), all of which are archaeological in nature and most of which comprise several sites. It is of note that the Hanford Site has a substantially higher percentage of archeological districts than historic districts; this characteristic is somewhat unusual nationwide.

3.20.4 Washington Heritage Register Sites

The Washington Heritage Register (WHR), maintained by the Washington Office of Archaeology and Historic Preservation, is similar in nature to the National Register of Historic Places. In fact, all National Register sites are automatically on the Washington Heritage Register. However, several resources on the Hanford Site are on the WHR but not the National Register. Sites eligible for the WHR must meet state-established criteria rather than national criteria. To be considered for inclusion in the WHR, sites, including buildings, structures and objects, must meet the following criteria.

- The resource must be at least fifty years old or have exceptional, documented significance.

- The resource must retain a high to medium level of integrity (i.e., defining characteristics from its historic period of construction).

- The resource must have documented historical significance at the local, state, or federal level.

In the Monument, there are three state archaeological districts—Coyote Rapids Archaeological District, Hanford South Archaeological District, and Wahluke Archaeological District. The Hanford Site also contains the Gable Mountain Archaeological Site.

Any sites listed in the WHR must be given consideration when evaluating projects requiring compliance with the State Environmental Policy Act. The SHPO reviews such documentation and makes recommendations on the effects of the project.

3.20.5 Traditional Cultural Properties Eligible Sites

A TCP is a recognized component of the National Register. Under the National Register, the word *culture* is understood to mean the traditions, beliefs, practices, lifeways, arts, crafts and social institutions of any community, be it an Indian tribe, a local ethnic group, or the people of the nation as a whole. One kind of cultural significance a property may possess, and that may make it eligible for inclusion in the National Register, is traditional cultural significance. *Traditional* in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property, then, is significance derived from the role the property plays in a community's historically rooted beliefs, customs and practices. Examples of properties possessing such significance are:

- A location associated with the traditional beliefs of a Native American group about its origins, its cultural history, or the nature of the world.

- A rural community whose organization, buildings and structures, or patterns of land use, reflect the cultural traditions valued by its long-term residents.

- An urban neighborhood that is the traditional home of a particular cultural group and that reflects its beliefs and practices.

- A location where a community has traditionally carried out economic, artistic, or other cultural practices important in maintaining its historic identity.

- A location where Native American religious practitioners have historically gone, and are known or thought to go today, to perform ceremonial activities in accordance with traditional cultural rules of practice.

A TCP, then, can be defined generally as one that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that: 1) are rooted in that community's history; and 2) are important in maintaining the continuing cultural identity of the community. There are multiple sites in the Monument associated with ongoing Native American use, beliefs and ceremonial activities that likely qualify as TCPs; several potential TCPs and sacred areas are known to exist. Although no areas have been officially designated as TCPs, an area such as Rattlesnake Mountain (known to the native people as *Laliik*) is revered as a sacred area by all Native Americans in the area.[123] However, for reasons described below, the exact locations, boundaries and even numbers of potentially eligible TCPs in the Monument is unknown.

In the Monument, the significance of the environmental setting is integral to the Native American heritage connectivity or cultural traditions. Native people tie traditional, continuous use and occupation patterns to this land. Spiritual beliefs link plants, animals and sacred areas within the cultural landscape. Utilization of traditional hunting, gathering and collecting territory has been uninterrupted for generations.

The descendants of aboriginal people in the Columbia Basin practice cultural traditions and follow belief systems that may be recognized as being indigenous or traditional. Many of these cultural elements are expressed even today in collection and use of traditional resources such as foods, medicinal plants, and fibers. This cultural continuum expressed in the region within and surrounding the Monument is an important element of the ethnographic pattern of Native American expression within the cultural landscape. It represents an unusual and significant connection for Native American presence and land use patterns in the Columbia Plateau.

Traditional cultural values are often central to the way a community or group defines itself, and maintaining such values is often vital to maintaining the group's sense of identity and self-respect. Properties to which traditional cultural value is ascribed often take on this kind of vital significance, so that damage to or infringement upon such properties is perceived to be deeply offensive, and even destructive, to the group that values them. As a result, it is extremely important that traditional cultural properties be considered carefully in planning and that actions proposed under the CCP be respectful of Native American values.

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[123] The DOE is currently working with local tribes in delineating and assessing the eligibility of Rattlesnake Mountain and associated areas as a TCP. The DOE has completed the National Register Determination of Eligibility, determining that it is eligible. The Washington SHPO has concurred with this determination.

TCPs are often hard to recognize. A traditional ceremonial location may look like merely a mountaintop, a lake, or a stretch of river; a culturally important neighborhood may look like any other aggregation of houses; and an area where culturally important economic or artistic activities have been carried out may look like any other building, field of grass, or piece of forest in the area. As a result, such places may not necessarily come to light through the conduct of archeological, historical, or architectural surveys. The existence and significance of such locations can often be ascertained only through interviews with knowledgeable users of the area, or through other forms of ethnographic research. The subtlety with which the significance of such locations may be expressed makes it easy to ignore them; on the other hand, this subtlety makes it difficult to distinguish between properties having real significance and those whose putative significance is spurious.

Identifying TCPs can present special challenges. First, those who ascribe significance to the property may be reluctant to allow its description to be committed to paper or to be filed with a public agency that might release information about it to inappropriate people.[124] Second, documentation necessarily involves addressing not only the physical characteristics of the property as perceived by an outside observer, but culturally significant aspects of the property that may be visible or knowable only to those in whose traditions it is significant. Third, boundaries are often difficult to define. Fourth, in part because of the difficulty involved in defining boundaries, it is important to address the setting of the property.

Particularly where a property has supernatural connotations in the minds of those who ascribe significance to it, or where it is used in ongoing cultural activities that are not readily shared with outsiders, it may be strongly desired that both the nature and the precise location of the property be kept secret. Such a desire on the part of those who value a property should of course be respected, but it presents considerable problems for the use of National Register data in planning. In simplest terms, one cannot protect a property if one does not know that it is there, which is one of the problems the FWS will face in implementing this CCP.[125]

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[124] Under Section 304(a)(3) of the NHPA, "The head of federal agency shall withhold from disclosure to the public, information about the location, character, or ownership of a historic resource if the Secretary and the agency determine that disclosure may . . . impede the use of a traditional religious site by practitioners."

[125] The need to reveal information about something that one's cultural system demands be kept secret can present agonizing problems for traditional groups and individuals. It is one reason that information on traditional cultural properties is not readily shared with federal agencies and others during the planning and environmental review of construction and land use projects. However concerned one may be about the impacts of such a project on a traditional cultural property, it may be extremely difficult to express these concerns to an outsider if one's cultural system provides no acceptable mechanism for doing so. TCPs may be kept confidential under the authority of Section 304 of the NHPA.

3.20.6 B Reactor, Potential Historic Site

One of the unique components of the Monument is its association with the nuclear age and the Cold War. While other national wildlife refuges exist as the result of nuclear and other Cold War-era weapons (e.g., Rocky Flats, Rocky Mountain Arsenal), none are so closely linked with American history as the Monument. Over a three-decade span, nine reactors were eventually built on the Hanford Nuclear Reservation. Most famous among these reactors is B Reactor.

B Reactor was the first reactor built—there was no A Reactor at Hanford—and was the world's first industrial-scale nuclear reactor, producing weapons-grade plutonium. Completed in September 1944, B Reactor was a focal point of the top-secret Manhattan Project to develop the atomic bomb. Integral to World War II weapons development, B Reactor was part of the response to concerns over German development of nuclear capability (later learned to be unfounded). Completed in just thirteen months, it was one of three plutonium production reactors built in total secrecy at Hanford during WWII.

Apart from being the world's first major nuclear reactor, B Reactor holds many other distinctions. Plutonium from the B Reactor was used in the world's first nuclear explosion on July 16, 1945, at the Alamogordo Bombing and Gunnery Range in New Mexico. B Reactor plutonium was used in the Fat Man bomb dropped on Nagasaki, Japan, on August 9, 1945.[126] As a result of its history and the fact that it was the "first" in many categories, B Reactor has received many designations. B Reactor has the following current designations.

- National Historic Mechanical Engineering Landmark (American Society of Mechanical Engineers, 1976).
- National Register of Historic Places (National Park Service, 1992).
- Nuclear Historic Landmark (American Nuclear Society, 1993).
- National Civil Engineering Landmark (American Society of Civil Engineers, 1994).
- National Historic Landmark (National Park Service, pending).

Due to its role in history, there is a large amount of local and national support to preserve the B Reactor. This led to passage of Public Law 108-340 on October 18, 2004, which directed "the Secretary of the Interior to conduct a study on the preservation and interpretation of the historic sites of the Manhattan Project for potential inclusion in the National Park System." The NPS is assessing the B Reactor—as well as the Cold War nuclear sites of the Los Alamos National

[126] Fat Man, exploding in a twenty-kiloton blast, devastated more than two square miles of the city and caused approximately 45,000 immediate deaths and as many as 150,000 total deaths. Japan sued for peace five days later.

Laboratory and town sites in New Mexico, Oak Ridge Nuclear Reservation in Tennessee, and a nuclear trigger production facility in Dayton, Ohio—for national significance and possible designation as a unit of the National Park System (e.g., national park, national historical park, national historical site). The NPS held public scoping meetings for B Reactor on March 22, 2006, with the scoping period concluding on June 30, 2006. Since that time, the NPS has been evaluating the site; the final report and determination is expected in the spring of 2008.

While not actually part of the Monument, the B Reactor lies just outside its boundaries, and interpretation of the B Reactor would be partially within the Monument. The most likely access route would begin in the Monument. If the B Reactor is preserved for public use and education, it will have significant impact on the Monument, and for that reason is being considered within this CCP as a reasonably foreseeable action.

3.20.7 Wilderness Eligible Areas

The Wilderness Act of 1964 directed the Secretary of the Interior, within ten years, to review every roadless area of 5,000 acres or more within NWRS and to recommend to the President the suitability of each qualifying area for inclusion in the National Wilderness Preservation System. This assessment is still in progress. In August 2003, the FWS began the wilderness assessment for the Monument.

Using criteria derived from the Wilderness Act, FWS standards, and the BLM's Colorado and Utah State Offices, Monument staff and contractors developed a standardized checklist to be used in the wilderness assessment. This checklist was completed in the field using methodologies developed by the BLM for the Utah wilderness assessment.

With the completion of the field assessment, it was determined that three areas on the Rattlesnake Unit met the criteria as being potentially eligible as wilderness.[127] These areas included Bobcat and Snively Canyons and the southwestern-most corner of the Monument. However, at this time it has been determined that carrying these areas forward to the wilderness study phase is not compatible with the DOE's current mission for site cleanup and the protection of public property and safety. These areas will be re-examined when this CCP is revised and the mission of the DOE changes and cleanup of the Hanford Site is completed or progresses enough to allow for wilderness designation.

[127] A copy of the wilderness assessment is available from the Monument.

3.20.8 Wild and Scenic River Study Area

As the mission of the DOE at Hanford changed from production of plutonium to environmental restoration, the need for buffer lands diminished. Alternatives for disposition of these lands were proposed by different interests, one alternative of which was preservation of the area to protect the large block of shrub-steppe habitat and the unique assemblage of plant and animal species present. Equally as important a consideration as the shrub-steppe habitat was the last free-flowing segment of the non-tidal Columbia River remaining in the United States.[128]

In November 1988, Congress enacted Public Law 100-605, known as the Hanford Reach Comprehensive River Conservation Study Act, to address the future of the Hanford Reach and surrounding lands. The Act required the Secretary of the Interior, in consultation with the Secretary of Energy, to prepare a study that would evaluate the outstanding features of the Hanford Reach (including fish and wildlife, geologic, scenic, recreational, natural, historical, and cultural values) and its immediate environment (i.e., surrounding lands) and examine alternatives for preserving those values. The alternatives considered were to include, but not be limited to, inclusion of the Hanford Reach in the NWSRS. The study was to be conducted in cooperation with state, local and tribal governments and with participation from the public and would conclude with a recommendation to Congress of a preferred alternative for preservation.

The Secretary of the Interior designated the NPS as the lead agency for the study. A study team was organized with representatives from the NPS, DOE and FWS. Their job was to conduct the study, prepare the necessary documentation, including the environmental analysis, and develop the agencies' recommendations for protection of the Hanford Reach.

In June of 1992, the NPS released the *Draft Hanford Reach of the Columbia River Conservation Study and Environmental Impact Statement*, followed by the final report and EIS in June of 1994. In that report, the NPS found that approximately fifty-one miles of the Hanford Reach—from one mile below Priest Rapids Dam (river mile 396.5) to the backwaters of the McNary Pool (river mile 345)—were eligible for designation into the NWSRS. The NPS study recommended that, should the Hanford Reach be designated, it be classified as recreational.[129]

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[128] While the Hanford Reach is bounded upstream and down by hydroelectric dams, it retains some semblance to conditions supported by a natural flow regime and is free-flowing as defined by Section 16 of the Wild and Scenic Rivers Act (Public Law 90-542, as amended; 16 USC 1271-1287).

[129] Section 2(b) of the Wild and Scenic Rivers Act mandates that every designated river be classified as wild, scenic, or recreational. These classifications are based solely on the degree of development existing along the river at the time of designation, with wild being almost free of the evidence of man, and recreational rivers being "readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past."

Under the Wild and Scenic Rivers Act, eligible rivers must be free-flowing and support one or more "outstandingly remarkable resources" (ORVs)—"scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values" to be preserved in free-flowing condition so that "they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations." ORVs are generally considered to be unique, an exemplary example of the type of feature, or of importance to the region or nation; this provides the basis for measurement of a resource as an ORV. While a designated or eligible river needs only one ORV to be eligible for designation, the NPS found that Hanford Reach supported the following seven ORVs.

- Fall-run Chinook salmon along with their spawning and rearing habitat.
- The intact ecosystem of the river and the adjacent Wahluke Slope.
- American Indian cultural resources.
- Archaeologic artifacts and sites.
- Hydrology and geology.
- Federally recognized rare animal species.
- Federally recognized rare plant species.

The NPS study also addressed the "suitability" of the Hanford Reach for designation, concluding that it is suitable for designation.[130] The eligibility, classification and suitability findings were transmitted by Secretary of the Interior, Bruce Babbitt, to Congress along with the recommendation that the Hanford Reach be designated a national wild and scenic river under FWS management and that the Wahluke Slope be administered as a national wildlife refuge.

Following completion of the study and its subsequent transmittal to Congress, debate continued over the final disposition of the Hanford Reach and the surrounding lands. According to public opinion polls, the majority of Washington residents wanted the area protected according to the preferred alternative of the NPS study—designation of the Hanford Reach as a national wild and scenic river and protection of the Wahluke Slope as a national wildlife refuge. However, many

[130] Eligibility is based on the physical characteristics of the river—free flow and river resources. Suitability refers to the social and economic feasibility and impacts of designation. There may be other, more suitable, ways to protect a river and its resources, or there may be more suitable uses for a river area than designation. Factors considered include the status of land ownership, including the amount of private lands involved; uses of the land that would be enhanced, foreclosed, or curtailed if the river were designated and the values lost if it were not; public and state/local government interest in designation; the costs of acquiring necessary lands and of administration of the river following designation; and other issues and concerns identified during the study process.

interests in the immediate area were either opposed to further designations or wanted the area opened to other uses, agriculture being the primary use. This debate continued for several years, finally leading to creation of the Monument.

Creation of the Monument did not convey with it full protection of the river's eligibility as a wild and scenic river. In 1996, Section 404 of Public Law 104-333, the Omnibus Parks and Public Lands Management Act of 1996, amended the original study legislation (Public Law 100-605) to mandate that no federal agency may construct any dam, channel or navigation project. All other new federal and non-federal projects and activities shall, to the greatest extent practicable:

- Be planned, designed, located and constructed to minimize direct and adverse effects on the values for which the river is under study; and

- Utilize existing structures and facilities including, but not limited to, pipes, pipelines, transmission towers, water conduits, powerhouses and reservoirs to accomplish the purposes of the project or activity.

- Federal and non-federal entities planning new projects or activities in the study area shall consult and coordinate with the Secretary to minimize and provide mitigation for any direct and adverse effects on the values for which the river is under study.

Under the Wild and Scenic Rivers Act and DOI practices, the FWS will manage the river as if it were a wild and scenic river and will take no actions that would change its status. This protection only partially extends to other federal agencies. Those agencies are obligated to take all reasonable care to protect the river's free flow and ORVs, but they are not obligated to forego projects if no reasonable alternative exists.

3.20.9 National Environmental Research Park

As early as 1952, ecological research on radionuclide cycling was underway at the Hanford Site and on land surrounding other nuclear weapons facilities. Scientists sought to understand the natural ecosystem and the transport, cycling and fate of radionuclides and other contaminants in soils, water and air. Out of the radionuclide research grew pioneering technologies for quantifying the movement of both natural materials, such as nutrients and fluids, and introduced pollutants through the ecosystem. In 1967, the Atomic Energy Commission formally designated a portion of the Hanford Site—the ALE—as a study area for scientists and educators. This environmental research designation was assigned two years before NEPA directed each federal agency and department to make environmental protection a part of its mission.

In an effort to comply with the spirit of Section 1 of NEPA, in 1977, the U.S. Energy Research and Development Agency (a predecessor to the DOE) developed the idea of National Environmental Research Parks (NERPs) and designated the entire Hanford Site as one of seven NERP sites in the United States. A NERP is an outdoor laboratory where research may be carried out to achieve national environmental goals, as articulated by NEPA, the Energy Reorganization Act, the Department of Energy Organization Act, and the Non-nuclear Energy Research and Development Act. The NEPA translated the public concern for a quality environment into environmental goals, and the NERPs network provided lands to help the nation and DOE comply with the spirit of NEPA. The Energy Reorganization Act of 1974 directed the DOE to engage in environmental research related to the development of energy sources so as to advance the goals of restoring, protecting and enhancing environmental quality. The NERPs are actually field laboratories set aside for ecological research, for study of the environmental impacts of energy developments, and for informing the public of the environmental and land use options open to them.

Because public access to DOE land is limited, environmental research projects can be carried out with a minimum of interference. Any land outside restricted areas may be made available by the DOE field manager for study under DOE's site-use procedures. The DOE has protected some areas of the ALE from all anthropogenic manipulations for more than sixty years in order that the area might serve as an environmental studies control area. While execution of the program missions of DOE sites must be ensured, ongoing environmental research projects and protected natural areas are given careful consideration in any DOE site-use decisions. Where appropriate, research parks may be established with other governmental agencies (through interagency agreements) such as the Rattlesnake Hills RNA.

3.20.10 Hanford Site Protective Safety Buffer Zones

Existing and planned waste disposal sites, waste processing facilities, and hazardous or radiological materials storage facilities are found throughout the Hanford Site. To protect the public from routine or accidental releases of radiological contaminants and/or hazardous materials, protective measures for waste remediation, processing and disposal facilities are required by numerous laws, regulations, rules and DOE internal orders.

One method of public protection, engineering control, uses the current Hanford Site boundary as the point-of-compliance to identify and design safety class systems, structures and components for operating facilities in both accidental and routine operation scenarios.

Another method of public protection, institutional control, uses distance as the protective measure expressed as safety buffer zones. These buffer zones limit public exposure to

radiological and hazardous chemicals from routine operations and accidents. Some of these safety buffers extend into the Monument.[131]

The DOE divides the buffer zones necessary to protect human health and safety from potential accidents into two components—an inner exclusive-use zone (EUZ) and an emergency planning zone (EPZ). Within portions of the EUZ, certain types of access would be restricted, while other types of public access within that same area might be acceptable.[132] The protective buffer zones for the Hanford Site are established using boundaries calculated for individual limiting facilities (i.e., facilities, such as the water treatment plant, with accidents [e.g., a chlorine leak] of maximum potential public health impact). Information about the limiting facilities, controlling contaminants, and credible accidents for 1999, were presented in the CLUP.

In addition to known risks (e.g., Hanford's radioactive waste Tank Farms), the DOE reserves land for operational safety and/or remediation/stewardship buffer zones for unknown risks.[133]

In addition to DOE's protective buffer zone requirements, the security and emergency preparedness needs of Energy Northwest (formerly Washington Public Power Supply System) must be considered. Under U.S. Nuclear Regulatory Commission procedures, the Energy Northwest WNP-2 Reactor requires a 10-mile EPZ and a 1.2-mile EUZ, both of which cover Monument lands. Energy Northwest has placed public warning sirens in appropriate areas within the Monument consistent with NRC requirements; however, any new activities proposed under the CCP may require additional warning sirens.

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[131] At a minimum of every five years, the DOE revisits the buffer zones through various methodologies to determine the location, size, shape and characteristics of the buffer zones needed for the Hanford Site, using information from existing safety analysis reports, hazard assessments, and emergency planning zone studies. This process allows the restriction of potential land uses in areas where hazardous or radioactive material handling could pose an unacceptable risk to human health.

[132] The only current buffer zone in the Monument is that surrounding the K Basins. It is anticipated that this zone will be reduced such that it does not encroach on the Monument within a decade or less. However, the plutonium finishing plant may require an increase in buffer area based on future emissions.

[133] It is extremely difficult for the DOE to adequately characterize heterogeneous burial grounds created more than forty years ago (e.g., the 618-4 burial ground near Richland had approximately 1,500 barrels of uranium fines packed in mineral oil that was previously unknown). The EUZ and EPZ boundaries provide a conservative buffer zone based on risk and consequence management that is expected to be sufficient to address protective zone needs for the multiple facilities present in each area on the Hanford Site. As the cleanup mission progresses, the extent of these EUZs is expected to shrink in size and eventually migrate inward to the Central Plateau within Central Hanford (e.g., the K Basins).

3.21 Additional Management Considerations

While the Monument presents numerous management challenges, there are four—fire, elk, river flows, and sites of (potential contamination) concern—that are highly controversial and that are exceptionally challenging for a number of reasons. All are influenced by outside actions, and in the case of river flows, almost entirely outside the control of the FWS. All represent significant social problems/concerns, perceptions and attitudes that likely exceed the biological or cultural resource challenges. All involve significant costs to resolve or control, either to the agencies involved or to society. Finally, all are at least in part beyond the scope of this CCP. Fire management and control have already been addressed through a separate plan, which will need revision and will become a step-down plan to this CCP. Additional elk management methods may need to be addressed through a step-down plan, although the basis is addressed within this CCP. River flows are beyond the scope of this CCP—other than to note their known and potential impacts—and are being addressed through the FERC licensing process and other venues. Finally, the Hanford Site is one of the largest CERCLA sites in the United States. While most of the lands within the Monument are not contaminated, there are "sites of concern" that require additional investigation and management consideration.

3.21.1 Fire

In the desert, shrub-steppe environment that comprises the Monument, fire is one of the biggest threats to natural and cultural resources, as well as to human life. The Monument devotes considerable time, money, personnel and other resources to the management, suppression and strategic use of fire to protect and enhance natural, cultural and recreational resources, as well as to safeguard life and property.

One of the step-down plans associated with this CCP is a Fire Management Plan. The Fire Management Plan is unique among the Monument's step-down plans in that it has already been written, approved and implemented.[134] An environmental assessment for the Fire Management Plan was issued on April 3, 2001, and a finding of "No Significant Impact" was issued in June 2001. The plan is an operational guide for managing both the Monument's wildland and prescribed fire programs.[135] The plan defines levels of protection needed to promote firefighter and public safety, protect facilities and resources, and restore and perpetuate natural processes within the context of current understanding of the complex relationships in natural ecosystems.

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[134] The Fire Management Plan is available on request or can be downloaded from the Monument's web site at hanfordreach.fws.gov/fire.html.

[135] The Monument will suppress all wildland fires using appropriate management strategies. Prescribed fire will reduce hazardous fuels and/or improve wildlife habitat through the preparation of prescribed fire plans.

While the Fire Management Plan is already in place, there are plans to rewrite it—possibly this year—based in part on the management alternative chosen for this CCP.

3.21.1.1 Fire Season

Records show that fire season is typically from May to mid-September. Depending on the specific weather of any particular year, the fire season may start earlier or last longer. Most fires in the area occur during the summer months, with the majority of ignitions in June, July, August and September. Although precipitation-free months are rare, summer months are generally hot and dry, averaging sixty-five days of 90º or more during the summer with only 0.3 inches of precipitation per month. Usually, July and August have some dry lightning storms that pose ignition hazards across the Columbia Basin.

3.21.1.2 Fire Ecology

Fire has played an integral role in the shrub-steppe environment. The bunchgrass component of the native shrub-steppe is a discontinuous fuel bed that prevents many large fires (Paige and Ritter 1999). Prior to manmade disturbances,[136] the historic fire regime was a thirty-two- to seventy-year fire return interval (Quigley and Arbelbide 1997) of small, high-intensity fires that removed small patches of the fire-intolerant shrub overstory. Small, infrequent fires maintained bunchgrass openings within the shrub-steppe, providing for both shrub and grassland communities.

However, the historic fire regime has been significantly altered by sociopolitical and economic factors. After the 1900s, human activities interrupted the natural fire interval and patterns of burning. Agricultural development and livestock grazing reduced the light fuels that would normally carry a fire. Livestock grazing also had the effect of suppressing native bunchgrasses and allowing non-native invasive species (e.g., cheatgrass) and native sagebrush densities to increase.

Fire suppression organizations developed in the early twentieth century nationwide. Beginning about 1906 through the present, fire suppression efforts have resulted in increased sagebrush stand density. This allows for hotter, more destructive fires, due to the closer proximity of each individual plant, which allows fires to spread within the shrub canopy.

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[136] It is highly possible that Native American's used fire to shape the landscape, drive wildlife, etc., as they did in other parts of the country. However, until additional factors, such as extensive livestock grazing, introduction of exotic species, and farming, significantly altered the ecology of the area, fire would likely not have had as significant an impact as it does today. Fires set by Native Americans could arguably be considered part of the historic, natural fire regime, if indeed fires were purposely set in the Columbia Basin.

Of even greater impact, though, is the introduction of cheatgrass and other invasive species and noxious weeds. Rangeland "improvements" brought in a variety of non-native grasses, either as purposeful introductions to provide forage enhancement, or as accidental introductions in seed/pasture mixes. Plants such as cheatgrass, tumbleweed and other annual species altered the native plant community structure. The discontinuous fuel that native bunchgrasses provided were invaded by thick, continuous fuels that would carry fires over large areas. Cheatgrass also cures into dry fuel earlier in the fire season than native grasses, providing a longer fire season. A high mortality of perennial grasses may occur if fire burns in a cured litter of annual grasses while perennials are still actively growing. Fires that start in cheatgrass stands often spread to surrounding habitats, resulting in the loss of shrubs from adjacent communities.

Finally, the arrival of settlers brought additional sources of wildfire. Even today, many fires on the Monument are ignited by such sources as cigarettes, sparks from machinery, and motor vehicles. The 24 Command Fire, one of the most destructive in recent history, was caused by a highway accident, and the Wahtoma Fire of 2007 was almost certainly human-related.

Particularly hard-hit by modern, high-intensity fires are sagebrush and other shrubs; sagebrush does not tolerate fire, while native grasses are more fire-tolerant. The natural recovery of sagebrush stands following a fire is further hampered by the presence of invasive species, which often out-compete sagebrush following a disturbance such as fire. Additionally, sagebrush totals only 15-25% of the vegetative cover in sagebrush shrub-steppe communities, and although wind can disperse sagebrush seeds up to ninety feet, most seeds fall within three feet of the canopy (Meyer 1994), so the natural reintroduction of sagebrush into an area can take decades.

In summary, the contemporary fire regime is a short fire-return interval of large, high-intensity fires that remove large patches of the fire-intolerant shrub overstory. The invasion of cheatgrass has changed the community appearance and altered the fire regime because of an abundance of available and continuous fuel. Natural succession has been altered by cheatgrass such that burned areas do not recover to their former community structure following fire. This has led to a decrease in the fire intolerant sagebrush and a commensurate increase in exotic species, primarily cheatgrass and tumbleweed, thereby creating a cycle that is hard to break.

Table 3.30. Wildfire History Since 1991.

Calendar Year	Wildfires	Acres Burned
1991	2	181.6
1992	5	4,032.1
1993	5	12,951.2
1994	3	1,042.4
1995	3	2.7
1996	1	5.0
1997	2	10.1
1998	7	8,265.0
1999	10	1,286.8
2000	5	78,900.1
2001		
2002		
2003		
2004		

3.21.1.3 Fuels

The fuel types in shrub-steppe are typically grass and shrub. The fuel is generally herbaceous plants that are dormant, or are nearly dormant. Occasionally, litter and dead/down stemwood from the open shrub overstory contributes to the fire intensity. Fires in this fuel type are surface fires that move rapidly through the cured grass and associated material. In rare instances, brush can become the primary carrier of fire spread; however, brush requires moderate winds (more than eight miles per hour at the mid-flame height) for fire to spread from crown to crown.

Four different fuel types are currently recognized on the Monument.

- ***Native grasslands*** are characterized by dry, open, grassy areas, with individual grass clumps providing a discontinuous natural fuel. Native perennial grasses and forbs are found throughout this community. Perennial grasses and forbs tend to have long, fibrous root structures that can access moisture throughout the soil profile. Thus, native vegetation in this area remains green during the first half of the fire season, curing out during the late summer, typically July and August. Fires during late summer can burn within these areas. Perennial grasses may suffer high mortality if fires fueled by cured annual grasses burn perennial species during their active growing season, or if they burn at such a high intensity that the crown (the actively growing part of the plant) is damaged or killed. Fires during late summer can burn within perennial grassland areas. Occasionally, depending upon wind conditions, surface fires can move rapidly through the cured grass and associated materials.

- ***Shrub-steppe*** areas are grasslands that retain a component of shrub as an overstory. Wyoming big sagebrush is the most common, dominant shrub, but there are also communities of three-tip sagebrush, bitterbrush, black greasewood, spiny hopsage, and gray and green rabbitbrush. Generally, the shrubs burn with greater intensity than the grasses and produce longer flame lengths. Sagebrush has volatile, flammable chemicals associated with its foliage. In some areas, the shrubs can burn with such intensity that they permanently destroy the understory plants and create hydrophobic conditions on the soil surface.

- ***Riparian and riverine bottoms*** are occupied by willow-dominated communities. Because of their proximity to water, riparian and riverine habitats tend to have a high density of shrubs and trees and a greater amount of vertical structure. Native and non-native grasses are found in the understory throughout the community. Vegetation in this area remains green during the majority of the fire season, but as the grasses cure, the understory becomes more flammable. Dried grasses and shrubs can provide ladder fuels that burn into the riparian tree canopy and can kill overstory trees. Occasionally, aquatic vegetation can build up such that open water habitat becomes limited. These situations may require fire to reduce such buildups.

- ***Non-native plant communities*** are dominated by invasive species such as cheatgrass, tumbleweed and other exotic plants. Cheatgrass germinates in late fall, winter and early spring and cures earlier than native grasses, usually by early June. As the cheatgrass cures, it becomes an available and abundant fuel. Often, fires start within the cheatgrass and spread to other adjacent communities. Subsequently, other plants are exposed to burning earlier in the fire season than they historically would have been. This weakens native plants because they are burned during the peak of their growing cycle, which allows cheatgrass to spread further into native plant communities. This reduces biodiversity and accelerates the fire cycle.

3.21.2 Elk

The Monument is within the home range of an impressive elk herd, the Rattlesnake Hills Elk Herd. The Rattlesnake Hills Elk Herd is identified as a sub-population of the Yakima Elk Herd, which also includes the Cascade Slope Elk Herd (WDFW 2002). The Rattlesnake Hills Elk Herd resides east of the Yakima River and west of the Columbia River in the Rattlesnake Hills region. Archaeological evidence suggests that elk inhabited these areas over the past 10,000 years; however, they have not been found here since at least the mid-1800s based on discussions and writings of Native Americans, early explorers, and settlers. Following their extirpation from Washington, the area was devoid of elk for several decades until the 1930s, when Rocky Mountain elk were brought from Yellowstone National Park in Wyoming and reintroduced to Washington in the Cascade Mountains near Mt. Rainier. Elk were first seen on the Monument (ALE) in 1972 (Fitzner and Gray 1991). This original group of animals was believed to originate from the Cascade Mountains to the west and arrived naturally. Since approximately 1975 (Rickard et al. 1977), the Rattlesnake Hills Elk Herd core range has been the ALE and private land to the south and west (Tiller et al. 2000). Peripheral rangelands include the Hanford Site, the Rattlesnake Hills west of State Route 241, the Yakima Training Center, and southern Grant and western Franklin Counties.

Historically, the Rattlesnake Hills Elk Herd has had a high reproductive rate, averaging an approximate 25% initial annual increase.[137] This reproductive output, coupled with low annual harvest, led to substantial population growth throughout the 1980s and 1990s; by 1998, the population was estimated at more than 800 animals. The increasing herd size prompted multiple concerns, including damage to private agricultural lands, potential damage to fragile resources on the Monument, vehicle collisions and public safety on State Route 240, and increased elk presence within Hanford Site surface contamination areas. Efforts to reduce the herd have had some success. Since 1986, hunting seasons on private lands around the ALE have actively

[137] While the birth rate is still quite high, averaging approximately ninety calves per year, the herd size has not seen any substantial growth in recent years. In fact, in some years herd size has trended downward. See the next page for a discussion of herd size.

harvested elk. The WDFW has continued to liberalize hunting seasons on adjacent lands in order to reduce the herd and alleviate some of the above concerns. Further, the FWS, along with the WDFW and DOE, have conducted two capture and relocation efforts to reduce the herd. In 2000, 191 animals (primarily cows) were removed and taken to the Blue Mountains in Asotin County and the Selkirk Mountains in Pend Oreille County. In 2002, a smaller capture/relocation removed thirty-two animals to the Spokane Indian Reservation. Both increased hunting success and the capture/relocation efforts, combined with reduced calving rates in recent years, have contributed to the reduction in the elk population from its historic high.

The FWS and WDFW have been cooperatively monitoring the Rattlesnake Hills Elk Herd population on the ALE since 2001. Standardized winter inventories conducted over the last three years have estimated the herd to be 674 (2005), 537 (2006), 681 (2007), and 639 (2008) animals—a four-year average of 633 elk. The 2008 survey showed a 56:67 sex ratio of bulls to cows. Calf recruitment typically adds about ninety animals/year, and annual harvest on lands adjacent to the ALE is between fifty-seventy animals, although this past hunting season likely resulted in over 100 animals being harvested.[138] Additional animals are likely removed by natural or other causes (e.g., killed by vehicles). As the WDFW's current population level goal (post-harvest) for the Rattlesnake Hills Elk Herd is 350 animals (WDFW 2002), the herd is still above the targeted level for management.

Movements of the Rattlesnake Hills Elk Herd have been monitored through tracking radio-marked elk. The PNNL began annual monitoring of the herd from the late 1970s (shortly after the herd established itself in the Rattlesnake Hills) through the spring of 2001 (Rickard et al. 1977; Eberhardt et al. 1996; Tiller et al. 2000; Tiller unpublished data). The summer of 2001 was the last season of intensive monitoring by the PNNL. At that time, while the distribution of radio-collared elk had remained relatively stable between the 1980s and 2000, increased use of lands south of Rattlesnake Ridge and north of State Route 240 was observed in 1999, 2000 and 2001. Both population growth and the effects of wildfire in 2000 may have played a role in the shift of radio-marked elk movements. It is possible that elk use areas may change again in the future.

The Rattlesnake Hills Elk Herd is a wide-ranging natural herd. Elk have habituated to the use of agricultural lands as agricultural development has encroached on native habitats within their home range in the Columbia Basin. Much of their current range may be attributed to behavioral shifts based on resource availability on the landscape, and it is unknown if herd reduction alone will resolve the current management concerns.

[138] Exact harvest levels are unknown at this writing and are based on hunter success reports and landowner permits issued.

3.21.3 River Flows

The Hanford Reach lies just downstream of the Priest Rapids Dam, which is part of a two-dam hydroelectric project—the Priest Rapids Hydroelectric Project—owned and operated by the PUD #2 of Grant County. The project consists of Priest Rapids and Wanapum Dams and is licensed by the FERC as Project #2114. These dams significantly impact flows through the Hanford Reach, although their overall ability to modify flows in the Columbia River is greatly influenced by the operation of larger water storage facilities upstream, such as Chief Joseph and Grand Coulee Dams. These dams, as well as several other federal and privately owned dams on the Columbia and Snake Rivers, have completely altered the flow regime and natural environments of the Columbia River System. For additional discussion of the water flows in the Hanford Reach, see Section 3.3.1.1.[139]

Although development of the Columbia River hydrosystem has not eliminated the relatively free-flowing Hanford Reach and its unconstrained alluvial floodplain, it has altered the timing and magnitude of the hydrograph, both seasonally and hourly. The spring freshet has been reduced by storage of higher flood and channel maintenance flows in reservoirs for flood control and for power generation during summer and fall. Hourly regulation of the hydrosystem, which is conducted to meet electrical demand in the region (load following), results in water level fluctuations of six to ten vertical feet in a matter of hours. Flow levels and fluctuations affect the interaction between surface water, groundwater and the associated convergence zones.

These seasonal and daily flow alterations from the natural condition affect the Hanford Reach, although the exact extent of impact is under debate. The rapid and continuous water level fluctuations that occur in the Hanford Reach may have the most significant impact on aquatic species, including benthic macroinvertebrates, anadromous fish, and resident fish (see Section 3.10.1.5.1 for a discussion of the impacts of river fluctuations on juvenile salmonids). Alternate drying and rewetting of wetlands, riparian zones, and shallow-water habitats limit the production of aquatic plants and invertebrates that are important as forage species for both wildlife and juvenile fish. The stability and productivity of the riparian zone, islands, wetlands, sloughs,

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[139] See all of Section 3.3, Hydrology, for the hydrologic benefits of dams to the region—flood control, water storage, etc. In addition to these beneficial impacts, dams on the Columbia River also provide for hydroelectric generation, reservoir recreation, barge transportation, and irrigation.

These projects have recently gone through the process of being issued a new license by the FERC. The EIS associated with that licensing provides a full description of the environmental and social impacts, both beneficial and non-beneficial, of these dams on the river, the region, and the nation. This CCP/EIS is only concerned with noting the impacts of the dams on the Monument. However, these dams have impacts reaching far beyond the borders of the Monument, and it is the responsibility of the FERC to address those impacts in the licensing EIS. Please refer to that document for a full discussion of the impacts of the Priest Rapids Dam Complex, including things like the need for electrical power, the benefits to irrigation, the environmental trade-offs associated with replacement power, etc.

backwaters and other shallow-water habitats is a function of streamflow levels and fluctuations; the artificial hydrograph and, to a greater extent, the short-term hourly fluctuations currently compromise the productivity of these habitats, although the degree of impact is unknown. Fluctuations may also be affecting populations of persistent-sepal yellowcress, a rare plant species found in the wetted zone at water's edge (see Section 3.9.5.16). Fluctuations in water levels can also flood bird nests along the island shorelines and well into nesting trees.

Flow fluctuations may also be affecting erosion rates within the Hanford Reach. The daily inundation and dewatering of the inherently unstable soils within the Hanford Reach may exacerbate natural erosion, although this is unproven and additional study is necessary. However, if natural erosion rates are accelerated, there could be several far-reaching implications. Cultural resources would be eroded out of the strata, thereby either losing the resource itself or losing its archeological context. Aesthetics would be negatively affected. Siltation of salmon redds might occur. Water quality would be affected. Finally, the loss of the White Bluffs could be furthered beyond that taking place through landslides (see Section 3.7.4). While none of these impacts are proven to be occurring and are not shown to be directly tied to flow fluctuations, further study is warranted.

River fluctuations also affect recreational use of the Hanford Reach. Flow fluctuations have resulted in vehicles parked at boat launches becoming submerged as well as beached boats being swept away. Flow fluctuations either slow or speed human-powered boat trips. High flows may create turbulent conditions, thereby creating a potential swamping situation. Low flows may lengthen trip times to such an extent that some boaters are unable to complete their trip during daylight hours. Daily low flows also create navigational concerns for motor boaters. Daily fluctuations impact aesthetics by occasionally creating a flooded landscape or by creating a "bathtub ring" along the shoreline (i.e., an area where no vegetation grows due to the daily fluctuations). These dewatered areas are also of safety concern from the exposure of algal- and silt-encrusted rocks, which are extremely slippery.

3.21.4 Sites of Concern

As previously noted, most of the land within the Monument boundary is held by the DOE. However, the eventual planned disposition of the majority of this land area will be to transfer it to the FWS.[140] Prior to the transfer of title, the FWS must be assured, either by outside agencies (e.g., EPA or WDOE) or by internal assessment, that the lands meet FWS standards regarding possible residual contamination and/or physical hazards. While most of the lands within the Monument are considered clean and can be transferred quickly, there are some areas

[140] The transfer of lands is a separate process from the development of this CCP. All NEPA analysis related to land transfer will be carried out through that process, as well as the complete description of the land area and any associated concerns about contamination and physical hazards.

that will remain with the DOE for the long term (e.g., lands around reactors) or that require additional assessment prior to transfer.

At present, there are approximately fifty of these sites of concern—areas that require additional assessment (see Map 24). Potential contaminant concerns at these sites range from oil spills to prior applications of insecticides such as DDT. In addition, there are concerns over potential physical hazards, ranging from uncapped wells to minor excavations. In some instances, it is likely that limited remediation could return the property to a condition that would be acceptable for transfer to the FWS. For contaminants, all that might be required is excavation of contaminated soils in specific areas and their proper disposal elsewhere. For physical hazards, backfilling holes or providing an appropriate permanent cover might be adequate. Although these sites have been identified as requiring further investigation, an assessment at any particular site could reveal that there are no problems and no further action would be required. Furthermore, many of the concerns are related to resident wildlife with life-long exposure to the site; transitory contact by wildlife or human visitors may not be a health concern.

3.21.5 Islands

There are nineteen islands located in the Columbia River upstream of Richland, Washington, that are managed by the FWS and included within the scope of this plan. Six islands are currently part of the McNary National Wildlife Refuge (McNary Islands); the three islands furthest upstream are actually within the Monument's boundaries. The remaining thirteen are part of the Monument (Hanford Islands).[141] The McNary Islands are located from river mile 341, just north of the Snyder Street Boat Launch in Richland, upstream to the first powering crossing at river mile 351. Upstream of river mile 351 are the thirteen Hanford Islands, which are held in fee title by a mixture of the ACOE, BLM, DOE, FWS and WDNR. One island (Homestead) is a mixture of federal and private ownership; this CCP applies only to that portion owned by the federal government.

Although all nineteen islands are natural features within the Columbia River, and not man-made through dredging or development, some vegetation on these islands is different than what would be historically present in a natural river setting. Tree species were not historically prevalent; natural flood flows annually scoured these islands, thereby reducing the potential for tree establishment or survival. Likewise, naturally occurring native species are not as abundant on shorelines due to daily fluctuations of river levels as discussed above. Nonetheless, these islands today hold a wealth of sensitive biologic and irreplaceable cultural resources unique to the entire Columbia River system.

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[141] As noted elsewhere, the Monument and the McNary National Wildlife Refuge have been consolidated—along with six other national wildlife refuges—under the McRiver NWRC. The result being that all the islands under FWS management are now part of the McRiver NWRC and are managed by one office.

3.21.5.1 Island History

The islands of the Hanford Reach have been used for thousands of years as important dwelling, gathering and food processing places for Native American peoples. In the late 1800s to early 1900s, the islands were also used by homesteaders and river operators. In 1943, all public access to the islands and approximately forty-eight miles of the Columbia River upstream of Richland was closed due to site security and public safety needs associated with construction of the nuclear reactors. In the early 1970s, the Hanford Reach was reopened to public access along its entire length. Although the islands remained closed to the public above the ordinary high water mark, the shoreline areas below this level have been used by hunters and fishermen for more than forty years.

The McNary Islands were withdrawn from the public domain by the Department of the Army for flood control purposes through Public Land Order 606, dated September 13, 1949. The McNary National Wildlife Refuge was established on April 30, 1956. A cooperative agreement between the ACOE and FWS, established in September 1963 and amended in September 1969, provided for the protection and management of islands and shorelines of the Columbia River, including the McNary Islands. Under the cooperative agreement, the FWS would provide "maintenance and management of wetlands resources of and habitats thereon, particularly non-migrating birds, fish, waterfowl, and upland birds." The McNary Islands would also be managed to provide for waterfowl nesting, resting and feeding habitats.

Seasonal public use (July 1 - September 30) occurred on the McNary Islands for several years following the reopening of the river. However, following a lawsuit settlement in 1993, the McNary Islands were again closed to summertime public use in 1994 for the protection of shorebird and migratory waterfowl breeding, nesting and rearing habitat.[142] The five upstream islands remained open to waterfowl hunting. (The downstream island is within the city limits of Richland and hence closed to firearm use.)

While the islands' closure was implemented in 1994, the islands' shorelines have continued to receive public use due to fluctuating Columbia River water levels, which regularly expose the shorelines below the ordinary high water mark.[143] Typical recreational uses of these areas include hunting, fishing, picnicking, camping, waterskiing, sunbathing, swimming and social gatherings. However, these activities are frequently extended beyond the high water mark and into the closed portion of the islands, in particular on Island 19 due to its proximity to a public boat launch and its long, sandy beach. Unfortunately, because the islands are so small, it is easy

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[142] The lawsuit, filed by the NAS and other conservation interests, challenged the FWS compatibility determinations for allowed uses of the islands.

[143] The riverbed and shorelines up to the ordinary high water mark are controlled by the WDNR and are open to public recreational uses.

to significantly affect resources through public use. Impacts on wildlife resources from shoreline activities—especially those that extend above the mean high-water mark—include disturbance of colonial nesters (especially during pre-nesting when birds can be disturbed from nesting, as well as later when there are young flightless birds); destruction of bank swallow nesting sites; disturbance to breeding waterfowl; and interruption of foraging and resting activities by a wide range of raptors, passerines, wading birds, waterfowl and mammals. Other impacts include unsanitary waste, littering, fire, noxious weed spread, and unauthorized collecting. Renewed patrols and signing efforts to enforce the court-ordered closure of the McNary Islands were undertaken in 2004, with varying degrees of public acceptance.

3.21.5.2 Island Wildlife Values

Islands provide important nesting and foraging habitat and escape cover for many species of birds and mammals, including waterfowl, migratory water and shore birds, colonial water birds, neotropical birds, and deer. Nesting on the islands has increased through the years, especially by ring-billed and California gulls. Great blue heron and great egret rookeries have increased on Island 17. Other bird species using the islands include black-crowned night-heron, Forster's tern, Caspian tern, killdeer, pelican, Canada goose, mallard, teal and bank swallow. Foraging species frequenting the islands include white pelican, long-billed curlew, spotted sandpiper, black-necked stilt, and American avocet. Wildlife, such as deer, likely seek out the islands for breeding habitat for safety and security and in order to avoid some mammalian predators. Other wildlife, such as river otter and mink, use the islands extensively.

Shoreline riparian communities are seasonally important for a variety of species. Willows trap food for waterfowl (e.g., Canada geese) and birds that use shoreline habitat (e.g., Forster's terns), as well as provide nesting habitat for passerines (e.g., horned larks). Terrestrial and aquatic insects are abundant in emergent grasses and provide food for fish, waterfowl and shorebirds.

3.21.5.3 Island Vegetation

Plant communities on the islands consist of very complex terrestrial and aquatic systems, including riffles, gravel bars, oxbow ponds, backwater sloughs, and cobble shorelines that are otherwise rare in the Columbia River today. In order to provide a concise analysis of current conditions on the islands, riparian vegetation classifications have been simplified.[144] Island plant communities have been classified into the following five primary groupings.

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[144] An extensive survey of riparian plant communities was conducted in 1995 (Salstrom and Easterly, TNC) and has been recently updated by the DOE and PNNL. Current information is synthesized in the 2005 Hanford Site National Environmental Policy Act Characterization.

3.21.5.3.1 Wooded

These are islands with plant communities comprising tree and shrub overstories and forb and grass understories. Shorelines are ringed by shrub species including willow, poplar and mulberry. Tree species are prevalent on shorelines and the interior portions of the island and serve as nesting and roosting habitat for many species, including egrets, herons, hawks, owls and eagles. Understory species along shorelines include smartweed, sedges, rushes, horsetail, reed canary grass, and barnyard grass. The uplands are primarily cobble or sand dunes and contain a higher percentage of cover than other islands. Upland vegetation includes bulbous bluegrass, sand dock, buckwheat, balsamroot and non-native species including cheatgrass and kochia.

3.21.5.3.2 Sparsely Wooded/Shrub

These islands characteristically have shorelines occupied by small groves of shrubs, including willow, poplar and mulberry. Siberian elm, cottonwood and sycamore are present but scattered across the uplands and shoreline. Shrubs and tree species provide hiding, roosting and nesting habitat for a variety of wildlife species. Mature trees, generally mulberry, are used by herons and egrets for rookeries. The uplands consist of sand dunes and cobble. Upland plant communities contain bulbous bluegrass, sand dock, buckwheat, balsamroot, and non-native species, including cheatgrass, Russian thistle, and kochia. Stabilized sand dune soils provide habitat for bank swallow colonies but also provide small stretches of sandy beach that invite public use.

3.21.5.3.3 Grass/Cobble

These islands consist primary of cobble and sandy soils that support grass and forb species, with significantly less vegetative cover than the wooded islands. Shoreline areas consist of reed canary grass, smartweed, sedges, rushes, horsetail and barnyard grass. Scattered shrubs may be present along the shorelines but do not contribute to the overall vegetative makeup of the island. The uplands are primarily cobble or sandy soils and include a variety of native and non-native species, such as sand dropseed, Indian ricegrass, sagewort, sand dock, balsamroot, buckwheat, lupine, lomatiums, curlycup gumweed, cheatgrass, willow-herb, Russian thistle, and mullein.

3.21.5.3.4 Grass/Cobble/Scattered Trees

These islands are similar in soils and vegetative characteristics to the grass/cobble islands, but they have scattered trees, generally mulberry, which are used by wildlife for nesting and roosting activities.

3.21.5.3.5 Cobble/Dune

These islands are composed of mostly bare cobble or silt soils. Shorelines and large portions of the island can be inundated almost daily during the growing season due to water flow manipulation upriver at Priest Rapids Dam (Salstrom and Gehring 1994). Plant species on these islands are similar to the grass/cobble classification, but the vegetation cover is generally less than 5%.

3.21.5.4 Specific Island Descriptions

Below are brief descriptions of ownership, island morphology, and unique wildlife habitat features of islands within the Hanford Reach. Slackwater areas around Islands 1 through 10 serve as important resting and spawning habitat for Chinook salmon and support a myriad of wildlife species that come to forage during the spring and fall anadromous fish runs. Coyotes, bald eagles, golden eagles, pelicans, cormorants, egrets, and herons are but a few of the wildlife species that utilize these islands throughout the year. These descriptions detail unique features for each island; Table 3.31 summarizes island attributes. See Map 15 for island locations.

3.21.4.5.1 Island #1 (WDNR)

Located just south of the Wahluke town sites, the island is sparse/grass and cobble. The island is used by many wildlife species, including deer, geese, ducks, American white pelicans, and double-crested cormorants. The western portion of the island has pronounced cobble shores that are shallow and provide resting and foraging opportunities for many avian species.

3.21.4.5.2 Island #2 (BLM)

Island 2 is sparse grass and cobble and used by deer, geese, ducks and pelicans. A unique feature is a lone mulberry tree on the eastern shore that has been used as a great blue heron rookery for the past two years.

3.21.5.4.3 Island #3 (BLM)

The island is cobble/dune and used by many species including deer, geese, ducks, pelicans and coyotes. The sand dune features of the island have supported an active coyote den.

3.21.5.4.4 Island #4 (WDNR)

Island 4 is cobble with sparse vegetation cover. Shorelines serve as resting and foraging areas for many avian species.

3.21.5.4.5 Island #5 (WDNR)

Island 5 is cobble with sparse vegetation cover. Shorelines serve as resting and foraging areas for many avian species.

3.21.5.4.6 Island #6—Locke Island (DOE)

Locke Island has a grass/shrub cover type, provides hiding, nesting and foraging habitat for deer, geese, eagles and coyotes. In 2004, WDFW biologists described how coyotes pull salmon carcasses from the shoreline into grass or shrub cover on the upper bench of the island before consuming the fish. The lee and slack-water sides of the island provide foraging habitat for bald eagles, which feed on the "zombies" (i.e., fish that have spawned and are near death in shallow pools near the island shores).[145]

Locke Island is situated at the north end of the White Bluffs Formation on the Hanford Reach of the Columbia River. Renewed landslide activity began in the White Bluffs about 1977, with several small landslides along a two-mile section of the bluff. By 1984, the landslides were a nearly continuous landslide mass. Landslide activity seemed to peak by the mid 1980s, but minor activity is still occurring. As the landslides amassed, the sloughed material was forced into the river toward Locke Island. The landslide mass has partially blocked the river channel on the bluff side and forced the river's path toward Locke Island.

During 1996-97, the river experienced record high runoff which, combined with the partial channel blockage, resulted in major erosion of Locke Island's east bank. The accelerated erosion has affected about 1,500 feet of Locke Island's east bank, with an average width of ninety feet lost. Studies of erosional process on the island resulting from the sloughing have been conducted since 2000.

Slough-related erosion has negatively affected vegetation, wildlife habitat, rare plant species, and cultural resources.

Noxious weeds on the island pose a threat to the biological integrity and stability of the island.

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[145] Bald eagles prefer to feed on the live fish rather than those that are dead on the shoreline, although they will also scavenge carcasses.

3.21.5.4.7 Island #7 (WDNR)

Island 7 is sparse grass and cobble and used by many wildlife species including deer, geese, ducks, white pelicans, and double-crested cormorants.

3.21.5.4.8 Island #8 (DOE)

The island is sparse grass and cobble and is similar to Island #7. A survey conducted by the WNHP has identified this island as a potential reintroduction site for northern wormwood, which is a Washington State endangered plant species and an FWS candidate for ESA listing.

3.21.5.4.9 Island #9 (BLM)

This island is sparse grass and cobble and is similar to Island #8. This island is also considered a potential reintroduction site for northern wormwood.

3.21.5.4.10 Island #10 (WDNR)

Island 10 is sparse grass and cobble and is used by many avian species, including white pelicans, geese, cormorants and bald eagles.

3.21.5.4.11 Island #11 (BLM)

This island is sparse grass/shrub vegetation with scattered trees along the shoreline and used by a variety of wildlife. Noxious weeds on the island poses a threat to biological integrity and stability, as well as to rare plant species. Columbia yellowcress—considered endangered by the state of Washington and a species of concern by the FWS—has been mapped on this island in the past; however, recent monitoring suggests that the population of plants has been significantly reduced in this area.

3.21.5.4.12 Island #12 (BLM)

This island is similar to Island #11, is sparsely vegetated by grass and shrub species, and is used by herons as a foraging area. Noxious weeds on the island pose a threat to biological integrity and stability, as well as to rare plant species. Columbia yellowcress has been mapped on this island in the past; however, recent monitoring indicates that the population of yellowcress in this particular area has declined significantly.

3.21.5.4.13 Island #13—Homestead Island (BLM, WDNR, Private)

This island has mixed ownership and has been affected by past development attempts. Past attempts to convert private lands to orchards altered vegetation on the island; however, following court-ordered restoration work, the island is primarily wooded with cobble uplands and shore on the north end of the island. Homestead Island provides habitat for avian species, as well as deer, coyotes, porcupines and other mammals. In March of 2006, up to 500 sandhill cranes were recorded as using the island as a roosting area. Noxious weeds on the island pose a threat to the biological integrity and stability, as well as to rare plant species. Columbia yellowcress has been mapped on this island in the past; however, recent monitoring indicates that the population of yellowcress in this particular area has declined significantly.

3.21.5.4.14 Island #14—Wooded Island (FWS)

Wooded Island is grass/cobble and supports a variety of wildlife, including ducks, geese, pelicans, egrets and great blue herons. This island has been used by local waterfowl hunters. Noxious weeds on the island pose a threat to its biological integrity and stability and have the potential to spread to other lands as a result of public use of these lands.

3.21.5.4.15 Island #15 (FWS)

This island is grass/cobble and supports a variety of wildlife, including ducks, geese, pelicans, egrets and great blue herons. A small cobble "satellite" island is used by American white pelicans, great blue herons, and great egrets for foraging. The island has been used by local waterfowl hunters. Noxious weeds on the island pose a threat to its biological integrity and stability and have the potential to spread to other lands as a result of public use of these lands.

3.21.5.4.16 Island #16 (FWS)

This island is often referred to in historic management plans as Underwater Island. Daily river fluctuations inundate the lowlands and leave very little of the island visible and usable for wildlife. The island contains shrubs and immature trees on the upland portions and is classified as wooded here. The island is less than one acre in size with less than 25% of the island visible during high flows.

3.21.5.4.17 Island #17—Johnson Island (FWS)

The island is grass/scattered trees. Backwater areas of the island have been used by local waterfowl hunters. Noxious weeds, such as purple loosestrife, on the island pose a threat to its biological integrity and stability and have the potential to spread to other lands as a result of public use of these lands. A survey conducted by the WNHP has identified this island as a potential reintroduction site for northern wormwood.

3.21.5.4.18 Island #18 (FWS)

This island is sparsely wooded with shrubs on the shorelines. The island is extensively used by California and ring-billed gulls for nesting. Great blue herons, great egrets, and black-crowned night-herons have an established rookery in trees on the east side of the island. This rookery was severely damaged by a windstorm in March 2005, and few trees remain that will provide long-term nesting sites for these birds. The island also supports other avian species, including geese and ducks. A survey conducted by the WNHP has identified this island as a potential reintroduction site for northern wormwood. Noxious weeds on the island pose a threat to its biological integrity and stability and have the potential to spread to other lands as a result of public use of these lands.

3.21.5.4.19 Island #19 (FWS)

Often referred to as Third Island by the general public, this island is sparsely wooded with groves of shrubs on the shoreline. Uplands are comprised of cobble and sand dunes and support a variety of wildlife, including bank swallows, geese, ducks, deer, coyotes and porcupines. Shallow cobble shorelines on the northern point of the island are used extensively by pelicans, herons, egrets, and cormorants for foraging. The sand dune structure of this island creates attractive sandy beaches that draw boaters and water skiers; however, the island is closed to all public access year-round. A survey conducted by the WNHP has identified this island as a potential reintroduction site for northern wormwood. Noxious weeds on the island pose a threat to its biological integrity and stability.

3.21.5.4.20 Island #20 (ACOE)

Island 20 is wooded with cobble uplands. Directly adjacent to the Snyder Boat Launch in Richland, the island is home to an active heron rookery that supports great blue herons and black-crowned night-herons. Geese, ducks, pelicans and gulls now use the island for foraging and nesting. This island, although outside the management purview of the FWS, directly contributes to the wildlife diversity of the Hanford Reach.

Table 3.31. Hanford Reach Islands.

Number/ Name	Ownership	Vegetation Cover	Biological Resources, Wildlife Species of Concern; Threats
1	WDNR	Sparse Grass/Cobble	
2	BLM	Sparse Grass/Cobble	Heron Rookery - Mulberry Tree
3	BLM	Cobble/Dune	Coyote Den
4	WDNR	Cobble	
5	WDNR	Cobble	
6 Locke	DOE	Grass/Shrub	Bank Swallow Colony; Noxious Weed Concerns*
7	WDNR	Sparse Grass/Cobble	
8	DOE	Sparse Grass/Cobble	Potential Northern Wormwood Reintroduction Site
9	BLM	Sparse Grass/ Cobble	Potential Northern Wormwood Reintroduction Site
10	WDNR	Sparse Grass/Cobble	
11	BLM	Shrub/Sparse Grass/Scattered Trees	Rorippa; Noxious Weed Concerns
12	BLM	Sparse Grass/Shrub	Heron Foraging Site; Rorripa; Noxious Weed Concerns
13 Homestead	Private/BLM/ WDNR	Wooded (Cobble North Side)	Rorripa; Noxious Weed Concerns
14 Wooded	FWS	Grass/Cobble	Noxious Weed Concerns
15	FWS	Grass/Cobble (Small Satellite Island)	Noxious Weed Concerns
16 Underwater	FWS	Wooded	
17 Johnson	FWS	Grass/Scattered Trees	Potential Northern Wormwood Reintroduction Site; Noxious Weed Concerns
18	FWS	Shrubs/Sparsely Wooded	Multi-species (Gull, Forster's Tern, Great Egret) Nesting/Rookery; Potential Wormwood Reintroduction Site; Noxious Weed Concerns
19	FWS	Shrubs/ Sparsely Wooded/ Dune/Cobble	Bank Swallow Colony; Potential Wormwood Reintroduction Site; Noxious Weed Concerns
20	ACOE	Wooded/ Cobble	Black-crowned Night Heron Rookery; Gull Nesting Colony
21 Nelson	City of Richland	Wooded	

* Noxious Weed Concerns: These islands possess noxious weed populations that would be affected through increased public use activities. The threat of weed movement to other locations through public use is high.

3.21.5.4.21 Island #21—Nelson Island

This island is owned by the city of Richland and is the last of the islands identified in the Hanford Reach of the Columbia River. Nelson Island is wooded and supports foraging and nesting habitat similar to that of Island #20. No active rookery has been established on this island due, potentially, to its location adjacent to a high-use city park. This island, although outside the management purview of the FWS, directly contributes to the wildlife diversity of the Hanford Reach.

3.21.5.5 Island Cultural Resources

The islands were historically used by Native American tribes and contain regionally and nationally significant cultural resources. Recorded archaeological sites tend to demonstrate extensive use by Native American tribes over at least the past 10,000-12,000 years. The majority of site inventories represent a wide range of Native American site types, including pit house villages, campsites, fishing stations, root gathering and resource processing camps, caches, hunting blinds, rock cairns, hearth features, sacred locations, cemeteries, quarries and lithic tool production sites. Resource procurement and processing sites make up the bulk of sites on the islands, with nineteen of the twenty-three recorded pit houses on the Monument in the vicinity of the processing stations. One of these sites contains an extensive array of pit house depressions, one of the largest such villages remaining in the region.

Unfortunately, a cultural resource inventory of all lands within the Monument, including the islands, has not been completed to date. The DOE reports that 1,171 cultural resource sites and isolated finds have been documented on the Hanford Site (DOE 2003). Of these, 575 sites fall within the Monument, with just over half (367) in the Columbia River Unit; it is likely that many of these documented resources are located on the islands. However, because site records reflect various levels and styles of reporting, the database can be difficult with which to work.

3.21.5.6 Island Salmon Habitat

The islands also serve as an important habitat for salmon—a culturally significant resource for area tribes—for spawning and rearing of juvenile fish. A three-year study conducted by the FWS, USGS, WDFW, Yakama Nation, Columbia River Intertribal Fish Commission (CRITFC), and Alaska Department of Fish and Game shows that fall-run Chinook salmon spawning is concentrated in a number of specific areas scattered throughout the Hanford Reach (Anglin et al. 2005). The majority of known spawning in the Hanford Reach occurs in areas in the upper segment, primarily Vernita Bar (35%); the middle segment from White Bluffs to 100F slough (60%); and the lower segment near Ringold, Homestead Island, and Wooded Island (5%). Spawning habitat in the middle and lower segments of the Hanford Reach has been associated

with water depths of six-twelve, water velocities of 4.6-6.6 feet/second, and areas with lateral slopes of less than 4% (Geist et al. 2000). In addition to the observations of shallow-water spawning, spawning beds have also been documented in deep waters (up to thirty feet), but the extent of deep-water spawning has not been quantified (Chapman et al. 1986; Swan 1989).

Impacts on salmon in the Hanford Reach include entrapment of juveniles and dewatering of redds due to river fluctuations, impacts associated with predation by native and non-native species, siltation and disturbance by human activities. Fall-run Chinook typically build their redds in clusters, making large-scale impacts more likely. Impacts on spawning fish, redds and juveniles can be reduced through cooperative management actions.

Chapter 4

Environmental Impact Analysis

4.0 Introduction

Chapter 4 identifies the potential environmental effects of proposed management actions on natural, cultural and recreational resources within the Monument. For the analysis of environmental effects, Monument staff selected important resource issue areas on the basis of best available science and professional judgment. This selection process was aided by an exhaustive public scoping process; three public workshops; policy and requirements set forth in the NEPA and the Monument Proclamation; and advice from the FAC, cooperating agencies, and consulting tribal governments. More than ninety potential resource issue areas were identified through this process; however, it became apparent that analyzing potential environmental effects on so many individual issue areas was not possible, desirable, or necessary. Accordingly, the planning team consolidated public concerns, along with the Monument Proclamation and federally mandated concerns, into the general issues listed below.

- Sensitive indicator species and resources.
- Resources specifically mentioned in the Monument Proclamation as focus areas of management.
- "Big Six" activities.[146]
- NEPA-mandated analyses.

The planning team then identified specific issue areas for analysis. It should be noted that development of this list necessitated the refinement of the much larger list of potential issues mentioned above. The planning team distilled these issues into the following impact topics.

- Geological and Paleontological Resources
- Shrub-Steppe and Other Upland Resources
    - Wildlife and Habitat
    - Microbiotic Crusts
    - Sensitive Plant Communities
    - Threatened, Endangered, and Sensitive Species

[146] Under the Improvement Act, when such activities are compatible, there are six priority public uses of national wildlife refuges—hunting, fishing, wildlife observation, wildlife photography, environmental education, and environmental interpretation. These are considered "wildlife-dependent" activities. Other public uses of national wildlife refuges are allowed, if appropriate and compatible with resource protection.

- Riverine and Other Aquatic/Wetland Resources
    - Wildlife and Habitat
    - Sensitive Plant Communities
    - Threatened, Endangered and Sensitive Species

- Invasive Species

- Habitat Connectivity

- Cultural Resources
    - Pre-Contact
    - Post-Contact
    - Cultural Traditions

- Interpretation and Education

- Recreation and Public Use
    - Hunting
    - Fishing
    - Wildlife Observation and Photography
    - Other Recreational Activities

- Aesthetics and Solitude

- Special Area Designations

- Islands

- Population Management of Elk

- Social
    - Infrastructure
    - Transportation
    - Economics

- Cumulative, Long-term, and Irreversible Effects
    - Indirect and Cumulative Effects
    - Potential Irretrievable and Irreversible Commitments
    - Relationship between Short-Term Uses of the Human Environment and Enhancement of Long-Term Productivity

While the description of the environmental setting in Chapter 3 was developed to present the most comprehensive picture of existing conditions in the Monument, this impact analysis chapter has been organized to address the above list of issue areas.

As described in Chapter 2, this document addresses landscape-level management actions. Consequently, comprehensive analyses of specific effects on individual land areas, resources, or wildlife species are not presented here. Site-specific resource effects will be addressed in subsequent step-down plans as additional resource inventories are completed, facilities and public use improvements are designed and sited, and additional management actions are considered. Project-level NEPA analysis and documentation will be tiered to this EIS.

4.0.1 Assumptions and Best Management Practices

The alternatives described in this EIS have been developed using many assumptions and best management practices (BMPs) that are common to all alternatives and resource areas.[147] These assumptions and BMPs mold the following analyses. Assumptions address both policy-level management decisions and the mechanisms of effects that are considered in the impact analyses. Assumptions that pertain only to specific resource areas are addressed in the appropriate section of this chapter. BMPs are specific management and policy decisions that the FWS has committed to incorporate into management actions, as appropriate, regardless of the alternative selected.

4.0.1.1 Assumptions

Development of the CCP, its alternatives, and the environmental impacts of those alternatives was based on several assumptions, as described below.

4.0.1.1.1 Landscape-level Planning

The CCP/EIS has been developed using a landscape-level planning approach to develop broad short- and long-term management guidelines. Projects and developments proposed under the various alternatives have not been sited, but have been developed at a conceptual level. Future restoration efforts and infrastructure development and placement will be conducted in accordance with NEPA provisions. Step-down management plans will be developed for site-

[147] It should be noted that even though Alternative A—the "No-Action" Alternative—includes few new management actions, the assumptions and BMPs described below would still apply for management activities taking place in the future under Alternative A.

specific management actions; these plans may address such issues as wildlife habitat management, elk management, cultural resource protection, visitor use, infrastructure development, and transportation systems (see Section 1.4 for a detailed discussion). Step-down plans would require further analysis of the environmental effects of proposed site-specific projects.

4.0.1.1.2 Resource Protection

All alternatives would be protective of the Monument's natural and cultural resources, although to differing levels. Each would provide for varying levels of public use and access. However, in view of finite budget and staffing capabilities, tradeoffs would occur between management programs depending on the alternative selected. For example, Alternative B provides for fewer developed visitor facilities than Alternative D. Consequently, with fewer resources needed for operations and maintenance of visitor facilities and visitor use management, more resources would be devoted to habitat restoration and improvement projects under alternative B. Alternative D would devote more resources to visitor facility maintenance and visitor use management.

4.0.1.1.3 Research Projects

Research projects will be allowed in the Monument in accordance with FWS policy guidelines and SUP provisions.

4.0.1.1.4 Increased Visitor Use

Visitor use in the Monument will increase at about the same rate as use on other public lands with similar outdoor recreational opportunities. Developing new facilities, such as parking lots, trails, interpretive signs, camping areas, and auto tour routes, would result in an increase in visitor use. Increased public access to, and use of, the Monument would increase the risk of wildland fire, the potential spread of non-native invasive species, and the costs of maintenance and law enforcement services. Furthermore, recreational use would entail some level of adverse effects on natural and cultural resources (Cole 2004a; Cline et al. 2005; Purdy et al. 1987). On the basis of typical public use patterns and management emphasis, it is assumed that the primary effects of public use would be concentrated within 1/4-mile of facilities such as parking lots, trails, interpretive signs, camping areas, and auto tour routes.

4.0.1.1.5 Interpretation and Education

Interpretation and education programs, activities, facilities and materials will have beneficial effects on Monument resources by increasing public awareness of, and appreciation for, these resources; informing visitors about proper resource use; and instilling a sense of stewardship in both visitors and the regional public. An Interpretation and Education Plan (step-down plan) would develop specific themes to address the full spectrum of resource issue areas (e.g., wildlife, vegetation communities, habitat characteristics, microbiotic crust, wildland fire and its effects, habitat connectivity, non-native invasive species, cultural resources, and leave-no-trace ethics). Additionally, interpretation and education materials would be developed targeting groups engaging in specific recreational activities (e.g., hunting, fishing, wildlife observation and photography) to provide these users with useful and pertinent information, such as low-impact techniques, success rates, typical visitor use patterns, existing rules and regulations, annual and seasonal changes, access conditions, and other relevant communications.

4.0.1.1.6 Effects on Wildlife

Human activities affect animals through four primary mechanisms—exploitation or harvest through hunting, disturbance, habitat modification, and pollution (Knight and Cole 1995a; Knight and Cole 1995b). In general, most hunting management programs assume that hunting mortality to wildlife is compensatory mortality, rather than additive mortality. Compensatory mortality is defined as mortality within a population that would have taken place via some other source of mortality, therefore total mortality remains equal at the population level. Additive mortality is defined as mortality that is additional to other sources of mortality at a population level, therefore mortality caused by additive sources would add to total mortality at the population level. Hunting programs assume that at a population level there is a "harvestable surplus" of individual animals that can be harvested as compensatory mortality rather than additive mortality.

In many cases, human harvest via a hunting program substitutes for historical sources of natural predation that have been modified or reduced by humans. The removal/elimination of large predators in many areas has allowed populations of some prey species to increase. Hunting programs can mimic the ecological role that large predators once served, in both removing a segment of the population and also causing disturbance and animal movement. Hunting is not a direct ecological substitute for predators, however, as predators would naturally remove the sick, weak, or injured animals, whereas hunters often target the healthiest, largest animals for removal. Yet, in the absence of many large predators, hunting may provide some population-level regulation, as well as a source of disturbance that modifies animal use patterns and behavior within certain sites or areas.

It is assumed that effects specific to the Monument will occur primarily through disturbance and habitat modification, with additional effects anticipated from non-point source pollution such as litter, car exhaust, and marine engine emission.

A variety of animal behavior responses could result from human activity, depending on a range of variables associated with the activity. Examples of such variables include type, distance, direction of movement, speed, predictability, frequency, magnitude and location of the activity (Knight and Cole 1995b). Wildlife disturbance can precipitate behavioral changes, such as avoidance, habituation, or attraction (Knight and Temple 1995). Disturbance of wildlife species that habituate to human use tends to be greater when recreational activities occur away from established use areas such as parking areas and trails (Cole 2004a; Gutzwiller et al. 1994; Gutzwiller et al. 1997; MacArthur et al. 1982; Riffell et al. 1996). Conversely, disturbance effects may be somewhat minimized by establishing designated sites and routes for visitor activities in relation to such species (except for habituation, which is a disturbance response, and which would be exacerbated in established use areas). Physiological responses can include the "fight or flight" response, with elevated heart and respiratory rates, or the "freeze" response, with inhibition of activity and reduced heart and respiratory rates. The implications of disturbance are often heightened during sensitive life stages, such as breeding, overwintering and rearing of dependent young. Depending on the disturbance variables listed above, the long-term effects on individual animals can be altered behavior, reduced vigor, lower reproductive success, and/or death (Knight and Cole 1995a).

Human activities can also alter the suitability of an area as wildlife habitat. For example, effects on soils can alter the presence and characteristics of vegetation, in turn influencing the suitability of the site to serve as habitat for wildlife species that are dependent on a particular assemblage of species or particular vegetative structure (Youmans 1999). Moreover, habitat suitability for prey animals affects the habitat's suitability to support predators.

4.0.1.1.7 Effects on Vegetation

Effects on vegetation from visitor use occur primarily through trampling. Trampling of vegetation bends, weakens and breaks leaves and branches and damages photosynthetic surfaces, seed production, and carbohydrate reserves, eventually killing some species (Douglass et al. 1999). Trampling and resultant soil compaction and erosion can expose roots and kill plants (Cole 2004b), providing an opportunity for weed invasion. Depending on soil type, vegetation cover, topography and use intensity, effects on soils resulting from visitor use include compaction, reduced water infiltration, increased runoff and erosion potential, and inhibited seed germination and plant growth (Alessa and Earnhart 2000; Cole 2004b). The greatest effects of trampling typically occur at the initial impact, even if it is of low intensity; these effects increase incrementally with levels of use (Leonard et al. 1985).

4.0.1.1.8 Spread of Non-native Invasive Species

The presence of non-native invasive plant species can alter ecosystem structure and function; disrupt food chains and other ecosystem characteristics vital to wildlife; and dramatically modify key ecosystem processes, such as hydrology, productivity, nutrient cycling, and fire regime (Brooks and Pyke 2001; Mack et al. 2000; Randall 2001). Such species can displace native species; reduce forage and cover for wildlife; and increase the rate, intensity and severity of wildfire.

Some weed species, such as yellow star-thistle, render large blocks of land unusable for many wildlife species. Due to the sharp needle-like spines that radiate from the plant, some animals avoid these areas or suffer physical injury when passing through infested sites (Callihan et al. 1989). Other habitats are lost through the spread of weed species, such as Russian knapweed, which expands through underground root systems, thereby altering native plant community structure and reducing forage availability. Some weed species (e.g., knapweed) contain allelopathic agents that sterilize the soils around them and do not let native species grow within their zone of influence (Beck 2003).

Recreational uses can spread invasive species by varied mechanisms—such as transport on recreational equipment, clothing and footwear—and through equestrian uses, either in fecal material or in feed. Vehicle undercarriages can rapidly collect and distribute weed seeds (Montana State University Extension Service 2002).

Successful management of noxious weeds requires the development of a long-term strategic plan, incorporating prevention programs; educational materials and activities; and sustainable, long-term, integrated approaches that improve degraded plant communities, enhance the integrity of the ecosystem, and prevent re-invasion or encroachment by other noxious weed species (DiTomaso 2000).

4.0.1.1.9 Wildland Fire and Fire Suppression Activities

Fire is a major disturbance component of the Monument's ecosystems. Although natural fires (e.g., lightning strikes) do occur in the area, the vast majority of fires are of human origin. Fire can affect native ecosystems by changing fuel properties, which in turn influences fire behavior and fire regime characteristics such as frequency, intensity, extent, type and seasonality (Brooks et al. 2004).

Fire in high-quality shrub-steppe habitats generally burns in a mosaic fashion. Historically, fires on the Monument were smaller in size because there were large spaces between bunchgrass plants. These interspaces would naturally have been occupied by microbiotic crust or bare soil. Fires normally did not burn for long periods due to a lack of continuity in fine fuels. Following

lightning fires, vegetation in these areas would quickly regrow, reestablishing habitat connectivity.

Present-day fire regimes, however, have changed, and the destruction or degradation of habitat connectivity often results from catastrophic wildfire events where non-native invasive species are prevalent in shrub-steppe plant communities. Species such as cheatgrass occupy the interspaces between native shrub and bunchgrass species; the presence of such invasive species contributes to the overall fuel loads in these communities, causing rapid fire spread, increased fire intensity, and prolonged duration (D'Antonio and Vitousek 1992). Such fire has a major adverse effect on habitat connectivity. These unnatural fire events threaten to degrade plant community structure and function (D'Antonio and Vitousek 1992), decrease ecotones and edge effect, diminish plant community connectivity, and increase the spread of non-native invasive species.

Fire suppression activities can have moderate to substantial direct effects on upland habitats through the creation of firelines and erosion. These effects can be mitigated through Burned Area Emergency Stabilization and Fire Rehabilitation (BAER) actions, but the effects take time to remedy, especially in arid climates such as the Monument's. Emergency use of equipment (e.g., disking) for fire suppression has the potential to affect upland habitats by clearing vegetation and microbiotic crust, in turn increasing the risk of erosion and the invasion of non-native species. Effects caused by fire suppression activities can be mitigated through pre-suppression planning, adherence to initial attack stipulations, use of existing firebreaks and roads to confine and contain wildland fire, and proper implementation of rehabilitation treatments.

4.0.1.1.10 Cooperative Agreements

Where possible and beneficial towards achieving Monument management goals and objectives, the FWS will develop partnerships and cooperative working agreements with other federal, state, county and/or private entities.

4.0.1.2 Best Management Practices

In order to avoid or mitigate environmental impacts from proposed actions, the FWS will use—is incorporating—numerous well-accepted BMPs into this CCP/EIS.

4.0.1.2.1 Avoidance of Sensitive Resources

Under all alternatives, visitor activity centers, visitor facilities, and both non-vehicular and vehicular travel routes will be sited to minimize effects by avoiding sensitive natural and cultural

resources. Potential adverse effects from visitor use will be further minimized through closures or special restrictions at sites with seasonal protection needs or sites vulnerable to or experiencing resource damage. Group size limitations may be used for specific sites or activities as needed to protect sensitive resources. Visitor use will be managed using informational signs, educational materials, trails, protective devices, and law enforcement patrols. Because many threatened, endangered and sensitive (TE&S) species migrate through the Monument, construction projects and public use patterns will be scheduled seasonally to avoid adverse effects.

4.0.1.2.2 Proper Use of Chemicals in Controlling Non-native Invasive Species

The use of chemicals to control non-native invasive species will be conducted in accordance with EPA laws and regulations, FWS policy, and label directions. Pesticide Use Proposals (PUPs) will be completed annually and approved at the local, regional, or national level as required by FWS policy.

4.0.1.2.3 Implementation of Integrated Pest Management Plan

An IPM plan for invasive plant species control, entitled *Invasive Plant Species Inventory and Management Plan for the Hanford Reach National Monument* (2003) (available on the Monument's web site at hanfordreach.fws.gov/planning.html), prescribes a methodology for treatment that includes inventories and population mapping, assessments of risk, prioritization of treatments, integrated treatment implementation, and effective monitoring. This approach considers direct effects on soils, vegetation, watershed function, and biodiversity in all treatment recommendations. In sensitive plant communities, the use of multiple tools (e.g., chemical, biological, cultural, mechanical) may be necessary to prevent weed invasion and spread, as well as disturbance of soils and plant community structure and function. Use of biological control agents (e.g., insects, microorganisms, pathogens) for control of non-native invasive plant species will be implemented in accordance with FWS policies only after such organisms have been subjected to testing and evaluation by the USDA and approved for release.

Established populations of non-native invasive plants, such as yellow star-thistle, rush skeletonweed, and knapweed, will require extensive integrated treatments to control. Each weed treatment will be conducted in accordance with the IPM plan and in accordance with stipulations set forth in annual PUPs. Additionally, SUPs for activities, such as research projects and commercial tours, will include stipulations designed to prevent the spread of invasive species. Because many components of resource management incorporate methods of invasive species control, some of which are highly visible and potentially controversial (e.g., controlled burns, aerial spraying), information and education would be used to inform the public about the IPM program.

4.0.1.2.4 Restoration Activities

Native seeds and/or plants derived from the Columbia Basin will be used as a priority for all planting/restoration projects in the Monument.[148] Providers of native seed or native plants to the Monument will provide documentation for the origin of seed or plants and will also, in the case of seed, provide certification that the seed provided to the Monument is free of noxious weed contamination. These requirements will be included in any scope of work prior to contracting the production and supply of plant materials. Plant materials may be refused if they do not meet these requirements. Occasionally, small amounts of seed will be collected from the Monument to be provided to plant nurseries and grown into seedling plants to be replanted onto the Monument. In these cases, Monument staff will supervise the selection of species for collection and the actual collection of seed from plants on the Monument. Seed collection needs for species and amounts will be based on annual restoration and rehabilitation needs. Seeds will be collected during the appropriate season as dictated by plant species phenology, and the parent plant will not be damaged or harmed in any way during seed collection. Seed will be collected from no more than 20% of individuals within a population, and no more than 50% of the total seed production from individual plants will be collected annually.

4.0.1.2.5 Natural Resource Data Collection, Monitoring, Adaptive Management

Inventories will be conducted to obtain data related to habitat conditions; wildlife populations and habitat requirements; restoration treatment locations, timing and effectiveness; resource protection measures; invasive species control; TE&S species; and other areas of management concern. Resource information will be collected using GPS technology, permanent monitoring plots, point counts, and pedestrian transect surveys. The information collected will be used to improve existing data sets, mapping and scientific knowledge concerning species, habitats, restoration needs, treatment effectiveness, land disturbance events, and other areas of concern.

Existing and new fish, wildlife, water and vegetation monitoring programs will be conducted by Monument staff, volunteers, or cooperators to support adaptive management. These programs will entail monitoring and evaluation of habitat management and restoration activities, TE&S species, and public uses. Periodic monitoring (every five-seven years) of priority sensitive plant communities will be conducted in permanent monitoring plots.

Adaptive management is an approach to resource management that emphasizes adjusting management practices in response to what has been learned. Adaptive management decisions are based on the best available science, common sense, experience, experimentation, new scientific discoveries, and monitoring. Where possible, Monument management projects will

[148] Depending upon the amount of seed required and specific project needs, either seed or plants may be used in restoration activities.

be designed to contribute to the body of knowledge, as well as to meet specified resource objectives.

4.0.1.2.6 Cultural Resource Inventories

Prior to implementation of any ground-disturbing projects, the applicable cultural resource compliance investigation will be undertaken. This investigation may entail a literature review, records search, field survey, and tribal consultation. If cultural resources are present, appropriate procedures will be implemented to protect them as per federal laws and FWS policies and guidelines.

4.0.1.2.7 Fire Management

Fire management activities will conform to guidelines set forth in FWS policy and the approved Fire Management Plan for the Monument. Wildland fire will be suppressed when possible; suppression techniques will be designed to minimize surface disturbance in the vicinity of sensitive resources. Fire control policies will be implemented to reduce the risk of human-caused wildland fire.

4.0.1.2.8 Facility Design/Aesthetic Considerations

Landscape design standards will be developed to protect the Monument's natural beauty, scenic vistas, and cultural heritage and to ensure that all site developments and facility improvements contribute to, rather than detract from, aesthetic appeal. Facility design and placement will be carefully planned with landscape integrity in mind. Future interpretive sites and signs will be designed to have an unobtrusive profile, with framing and supports that blend with the environment. Visitors will be encouraged to use natural-colored equipment where appropriate.

4.0.2 Effect Severity Ratings

The lands comprising the Monument served as a buffer zone around Central Hanford for more than sixty years, with extensive research and environmental monitoring conducted on lands directly associated with the DOE's mission. However, comprehensive inventories have in many cases not been completed to a level sufficient for intensive resource management. In-depth resource inventories for cultural resources, wildlife, vegetation and public use activities are either underway or pending. The information used in this NEPA analysis was obtained from relevant scientific literature, existing databases and inventories, consultations with other professionals, and personal knowledge of resources based on field visits and experience.

The thresholds and severity ratings defined below were used to analyze the scope, scale and intensity of effects on natural, cultural and recreational resources.

Negligible: Resources would not be affected, or the effects would be at or near the lowest level of detection. Resource conditions would not change or would be so slight that there would not be any measurable or perceptible consequence to a population, plant community, cultural resource, recreation opportunity, or visitor experience.

Minor: Effects would be detectable but localized, small, and of little consequence to a population, plant community, cultural resource, recreation opportunity, or visitor experience. Mitigation, if needed to offset adverse effects, would be easily implemented and successful.

Moderate: Effects would be readily detectable and localized, with consequences to a population, plant community, cultural resource, recreation opportunity or visitor experience. Mitigation measures would be needed to offset adverse effects, would be extensive in nature, moderately complicated to implement, and would probably be successful.

Major: Effects would be obvious and would result in substantial consequences to cultural resources, populations, plant communities within the local area and region, recreation opportunities, or visitor experiences. Extensive mitigating measures would be needed to offset adverse effects, would be large-scale in nature and very complicated to implement, and would not have a guaranteed probability of success. In some instances, major effects would include the irretrievable loss of the resource.

Time and duration of effects have been defined as shown below.

Short-term: An effect that generally would last less than a single year or season.

Long-term: A change in a resource or its condition that would last longer than a single year or season.

4.0.3 Description of Management Actions

Management actions proposed in this document with the potential to impact natural, cultural and recreational resources are explained within each management program below. To avoid redundancy, the actions described below are referred to by section number throughout the rest of the chapter.

4.0.3.1 Biological Resource Management Actions

4.0.3.1.1 Control of Non-native Invasive Species

Non-native species pose a risk to the loss of biological integrity in shrub-steppe, riverine and riparian habitats. A generalized objective for ecologically based weed management is to develop and maintain a healthy plant community that is largely resistant to invasion (Sheley and Krueger-Mangold 2003). Under all alternatives, non-native invasive species will be treated in accordance with the procedures and guidelines set forth in the IPSIMP. The primary relevant management actions are the inventory, prioritization and treatment of weed populations based on an annual threats assessment and analysis. Due to the shortage of funds to treat known weed populations annually, the prioritization of treatments, accompanied by follow-up monitoring, is essential.

Table 4.1. Acres of Weed Infestation by Unit.*

Weed Species	Rattle-snake	Ringold	River Corridor	Saddle Mountain	Wahluke	Total
Russian knapweed	435	138	117	Trace	88	777
Camelthorn	0	0	0	Trace	0	Trace
Hoary cress	495	2	1	0	0	497
Diffuse knapweed	151	54	1,324	22	2128	3,679
Yellow star-thistle	0	69	0	Trace	244	313
Rush skeletonweed	659	0	26	0	2	687
Canada thistle	2	4	5	Trace	4	15
Field bindweed	47	0	36	0	0	83
Russian olive	0	**	**	**	579	579
Kochia	**	**	26	**	64	90
Common rye	472	4	0	0	0	476
Swainson's pea	3	0	0	0	35	38
Salt cedar	0	**	397	**	882	1,279
Puncturevine	1	**	**	**	**	1
Totals	2,589	272	1,969	22	4,026	8,879

* About 30% of the Monument has been mapped to date.
** Weeds are present but not currently mapped.

Alternative A would entail the annual treatment of 5,000-9,000 acres. Weeds would be treated along major transportation corridors using IPM techniques to prevent the spread of non-native invasive species into adjacent upland plant communities. Spot spraying, hand pulling, and seeding with native species would be conducted annually on high-priority weed populations in off-road situations. With current staffing and funding, only a small portion of known weed infestations (the highest priorities) would be mapped, treated and monitored annually.

Alternatives B, B-1, and F (18,000 acres); C and C-1 (13,000 acres); E (12,000 acres); and D (11,000 acres) would entail the annual mapping and treatment of the Monument using IPM techniques. Under each alternative, weed populations would be prioritized and treated annually on the basis of threats analysis and the subject population's potential for offsite movement and infestation of adjacent lands.

4.0.3.1.2 Restoration Activities

Upland Restoration Activities

Alternative A would entail restoration activities on 0-10,000 acres annually, focusing primarily on lands disturbed by wildfire events, maintenance-related project work, Hanford Site mitigation, and noxious weed control efforts. For example, in 2005 two large wildfires required emergency stabilization and rehabilitation actions in the Saddle Mountain Unit (5,000 acres) and the Wahluke Unit (6,000 acres). The location and acreage to be treated varies from year to year, and the potential effects on specific resources would be assessed in individual NEPA documents for each project.

Alternatives B, B-1 and F (6,000 acres); C (4,000 acres); C-1 and E (3,000 acres); and D (2,000 acres) would entail annual restoration activities over fifteen years. Restoration methods would be used primarily to restore degraded habitats or disturbed areas to a natural spectrum of native plant associations, thus improving the condition of native vegetation. Treatments would consist of wildland fire BAER; additionally, prescribed fires would be followed by seeding, hand planting of nursery stock, drill or broadcast seeding, or broadcast/harrowing activities. Restoration may also include plowing, disking, mowing, or other seed bed preparation activities, followed by drill/broadcast seeding or broadcast/harrowing activities. Some restoration projects would be limited to planting activities.

Riparian and Wetland Restoration Activities

Under all Action Alternatives, riparian restoration activities would be undertaken on disturbed habitats in the river corridor. To date, no long-range restoration plans have been developed for the individual management units. Additional resource data will be necessary to determine restoration needs and priorities for each individual unit, and individual projects will be subject

to additional environmental review and documentation prior to project initiation. Generally, in areas where non-native plants are established, control and management of non-native species, followed by replacement with a diversity of native riparian and aquatic plants, would occur, primarily through active planting of native species.

Under Alternatives C, C-1, D and E, water control structures, dikes and ponds would be installed or repaired in selected areas surrounding irrigation waterways and artificial seeps on approximately 800 acres in the Wahluke Unit and approximately 320 acres of seasonal wetlands in the Ringold Unit. Water management in these areas would allow for greater control of wetland water levels and would allow for development of wetland habitats characteristic of plant communities of the Columbia River. Additional resource data would be necessary to determine restoration needs and priorities for each individual unit, and individual projects would be subject to additional environmental review and documentation prior to project initiation.

Rattlesnake Mountain

Several unnecessary buildings and structures on the crest of Rattlesnake Mountain would be removed through scheduled demolition and disposal actions associated with DOE remediation activities. Removal of structures on the crest of Rattlesnake Mountain would be a DOE action, and additional NEPA coverage would be provided through DOE remediation action plans. Buildings identified for demolition and cleanup would be removed, and upland and lithosol habitats would be restored. Some ground-disturbing activities to remove building materials, asphalt, gravel, roads and concrete foundations would ne necessary. Clean-up work would also involve human and vehicle activity around the project area. Site stabilization through seeding with native species, control of noxious weeds, and rehabilitation treatments would occur following the removal of structures. These activities would attempt to return portions of the crest of Rattlesnake to pre-Manhattan Project conditions. However, structures associated with valid existing rights (communications, utilities, emergency services, climate monitoring, etc.) would remain in place.

The observatory on the crest of Rattlesnake Mountain could remain in place under Alternatives A, D and E.[149] Under these alternatives, the observatory would be primarily operated remotely, thereby reducing the number of physical visits to the summit by the public. However, some maintenance and visitor traffic to the observatory would be expected. Under Alternatives B, B-1, C, C-1 and F, in order to achieve habitat restoration and cultural objectives for the summit of Rattlesnake Mountain, the observatory would be proposed for removal, and the site restored as described above.

[149] This is separate from any actions the DOE might undertake. That is, even though the alternative may allow for the observatory to remain in place, the DOE might choose to remove it. Similarly, the DOE could choose to allow the observatory to remain despite FWS recommendations to remove it (e.g., under the preferred alternative).

4.0.3.1.3 Wildlife Population Control

The objective of wildlife population control on the Monument is to manage, control, or remove populations that threaten or affect Monument resources, public safety, or private property. Under all alternatives, control of wildlife populations would be conducted as needed on the basis of scientific resource management data. Wildlife population control efforts may use both non-lethal and lethal methods. Control methods would be used to reduce populations to a level consistent with species management objectives and in a manner that controls target populations without impairing Monument resources.

4.0.3.2 Visitor Service Management Actions—Interpretation and Education

4.0.3.2.1 Interpretive Site Development

No interpretive site developments are planned under Alternative A. Alternatives B, B-1, and F; C-1; C and E; and D would establish ten, thirteen, fifteen and twenty interpretive sites, respectively.

4.0.3.2.2 Interpretive Trail Development

Alternative A does not include the establishment of interpretive trails in the Monument. Up to two interpretive trails would be developed under Alternatives B, B-1 and F; up to four interpretive trails would be developed under Alternatives C, C-1 and E; and up to six interpretive trails would be developed under Alternative D.

4.0.3.3 Visitor Service Management Actions—Recreation

4.0.3.3.1 Hunting

Under all alternatives, the Monument would remain open to hunting in designated areas; however, the number of acres open to hunting would vary as shown below.

- Alternative A – 62,025 acres.
- Alternative B – 62,919 acres.
- Alternative B-1 – 0 acres.
- Alternative C and C-1 – 71,037 acres.
- Alternatives D and E – 74,079 acres.
- Alternative F – 92,555 acres.

Each alternative, except Alternative B-1, calls for developing a step-down Hunting Plan to address issues such as facility needs, access, public safety, and commercial guide requirements.[150] Hunting in the Monument would be subject to: 1) Washington State season and limit requirements; 2) FWS policy disallowing use of lead ammunition; and 3) DOE-imposed weaponry restrictions allowing only shotguns, muzzleloaders and archery equipment. Under all alternatives, the longstanding waterfowl sanctuary would be continued. The sanctuary area includes the Columbia River and lands within 1/4-mile of the river from the wooden power lines at river mile 362 to the Vernita Bridge. This sanctuary area would continue to be closed to all waterfowl hunting, and the White Bluffs Boat Launch would continue to be closed to motorboats during the winter to reduce waterfowl disturbance. In accordance with the FWS policy prohibiting the release of non-native species for sport hunting purposes, the pheasant release program would be discontinued.

4.0.3.3.2 Fishing

Under all alternatives, fishing would be allowed in the Monument in the Columbia River and WB-10 Ponds, with seasons and catch limits regulated by the WDFW. Under all alternatives, a step-down Fishing Plan would be developed to address issues such as facility needs, access, public safety, commercial guiding, and others.

4.0.3.3.3 Wildlife Observation and Photography

Under Alternative A, no wildlife observation and photography sites would be developed. Visitors seeking to observe wildlife would continue to use existing roads and access points. Alternatives B, B-1, and F would entail development of up to six observation sites, Alternatives C, C-1, and E would entail development of up to eight observation sites and two photography sites, and alternative D would entail development of up to twelve observation sites and three photography sites. Where feasible and desirable, sites would be designed as "blinds" to visually screen observers from wildlife. Some sites may be able to support both observation and photography activities, thus potentially lowering the total number of sites developed under any alternative.

[150] As noted earlier in the CCP, the FWS developed and signed a Sport Hunt Opening Package (i.e., Hunting Plan) while this CCP/EIS was still in draft. That plan is currently in place. However, it will need to be modified based on the final alternative chosen through the ROD. The schedule for modification will depend on the alternative chosen and changes in land status as made by the DOE. For example, if the west end of the Wahluke Unit is released from cleanup safety concerns, the preferred alternative allows for additional acres to be opened to hunting. To open those acres would require amending the Hunting Plan and accompanying NEPA documentation.

4.0.3.3.4 Hiking

Under Alternative A, cross-country hiking would continue to occur on 58,858 acres. Under all Action Alternatives, visitors would be encouraged to stay on designated trails, although cross-country use would be allowed in most areas. Under Alternatives B and B-1, 59,707 acres would be open to hiking, with approximately thirty miles of designated trails in the Ringold, Columbia River, and Wahluke Units. Under Alternatives C and C-1, 101,675 acres would be open to hiking, with approximately 100 miles of designated trails in the Ringold, Columbia River, Wahluke and Rattlesnake Units. Under Alternative D, 101,675 acres would be open to hiking, with about 150 miles of designated trails in the same units specified under Alternatives C and C-1. Under Alternative E, 101,132 acres would be open to hiking, with about 150 miles of designated trails in the same units specified under Alternatives C and C-1. Under Alternative F, 92,177 acres would be open to hiking, with about thirty miles of designated trails in the same units specified under Alternatives B and B-1.

4.0.3.3.5 Equestrian Use

Under Alternative A, equestrian use would continue to occur in public use areas with few restrictions. Under all Action Alternatives, equestrian use would be limited to designated roads and trails. Many of the trails available for hiking (summarized above) would be open to equestrian use. Under Alternatives B–F,[151] a step-down Equestrian Plan would be developed to address travel routes, infrastructure needs, and other related topics.

4.0.3.3.6 Boat Launches

Vernita Bridge

Under all alternatives, designated vehicle routes would be established in the Vernita Bridge boat launching area. Under Alternatives A, B, B-1 and F, the Vernita Bridge area would continue to provide primitive opportunities for motorized and non-motorized boat launching. Under Alternatives C, C-1, D and E, a developed boat launch would be provided.

White Bluffs

Under Alternatives A, B, B-1, C-1 and D, the White Bluffs Boat Launch would remain open; improvements would be made under Alternative D. Under Alternative C, once developed launches are established at the Ringold Fish Hatchery and Vernita Bridge areas, the White Bluffs

[151] 'B–F' is used throughout this CCP/EIS as an abbreviation denoting all alternatives from Alternative B through Alternative F (B, B-1, C, C-1, D, E and F), excluding only Alternative A.

Boat Launch and access road would be closed to vehicle use and the area would provide non-motorized recreation opportunities. Under Alternatives E and F, once a developed launch is established at the Ringold Fish Hatchery, the White Bluffs Boat Launch would be closed to motorized boats, remaining open for non-motorized boats.

Ringold Fish Hatchery

Under Alternative A, the FWS would not pursue partnerships to provide a developed boat launch at the WDFW Ringold Fish Hatchery. Under Alternatives B–F, the FWS would work with partners to develop a boat launch adjacent to the Monument boundary in the Ringold Fish Hatchery area.

South Shore

Under Alternatives A, B, C, C-1, E and F, boat launches would not be established on the south shore of the Columbia River (Benton County side) within the Monument boundaries. Under Alternative D, one to two existing boat launches that are located on the south shore and currently used for administrative purposes would be improved and opened for public use.

4.0.3.3.7 Camping

Vernita Bridge

Under Alternative A, the Vernita Bridge area would continue to provide primitive opportunities for camping. Under Alternatives B, B-1, C, C-1 and F, overnight use would not be allowed. Under Alternatives D and E, a campground would be developed.

Non-Motorized Boat Camping

Under Alternatives A, B, B-1 and F, non-motorized boat-in campsites would not be established. Under Alternatives C, C-1, D and E, three to six campsites would be established in the central river corridor for use by non-motorized boaters.

Saddle Mountain

Under Alternatives A, B, B-1, C, C-1, E and F, camping would not be allowed in the Saddle Mountain Unit. Under Alternative D, a campground would be developed in a previously disturbed area along State Route 24.

4.0.3.3.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Under Alternatives A, B, B-1, C, C-1, D and F, the Riverlands area would be closed to public access except for permitted research or environmental education activities.[152] Under Alternative A, current access and public uses would be continued in the Riverlands area. Under Alternative E, public access and uses would be allowed on designated roads and trails only, with use closures established as needed to protect sensitive resources.

Sand Dunes. Under Alternatives A, B, B-1 and F, the sand dunes would remain closed to public access except for permitted research or environmental education activities. Under Alternatives C, C-1, D and E, public access via non-motorized trails would be provided.

South Shore. Under Alternatives A, B, B-1, and F, the south shore would remain closed to public access. Under Alternatives C, C-1, D and E, public access could be provided.

North Shore. Under Alternatives A, B, B-1, C, C-1 and F, new access points would not be provided to the north shore. Under Alternatives D and E, new access points would be provided.

Ringold Unit

Parking. Under Alternative A, eight existing parking areas in the Ringold Unit would be maintained. Under Alternatives B-E, all parking areas would be evaluated; those with consistent visitor use would be maintained, and those that are rarely used would be closed. Management under Alternative F would be as described for Alternatives B-E, with the addition of closing existing Parking Lot 7.

Auto Tour. Under Alternatives A, B, B-1, C, C-1, E, and F, an auto tour route would not be established in the Ringold Unit. Under Alternative D, an auto tour route would be established in this area.

Saddle Mountain Unit

Under Alternatives A, C-1 and D, current access to and surrounding the Saddle Mountain summit area would be maintained. Under Alternatives B and B-1, the Saddle Mountain Road and 2,643 acres encompassing the Saddle Mountain summit would be closed. Under

[152] In the period between the draft and the final CCP/EIS, the DOE has taken measures to curtail trespass use of the Riverlands (i.e, south shore). When the draft was written, public use was not authorized, but there were no measures in place to halt or discourage it. Since the release of the draft, the area has been gated, so Alternative A now reflects this.

Alternatives C and F, the Saddle Mountain Road would be closed to vehicles a short distance from State Route 24, and access to the summit would be by non-motorized means only. Under Alternative E, the Saddle Mountain road would remain open, with use limitations placed on 2,643 acres encompassing the summit.

Wahluke Unit

West Portion Access. Under Alternative A, there would be no public access provided in the western portion of the Wahluke Unit. Under Alternatives B and B-1, one new public access point would be provided and 5,777 additional acres in the Wahluke Unit would be open to non-motorized use. Under Alternatives C, C-1, D and E, two new public access points would be provided and 28,313 additional acres in the Wahluke Unit would be open to non-motorized use. Under Alternative F, one new public access point would be provided and 28,313 additional acres in the Wahluke Unit would be open to non-motorized use.

Auto Tour. Under Alternatives A, B, B-1, C, C-1, E, and F, an auto tour route would not be established near the Vernita Bridge in the Wahluke Unit. Under Alternative D, an auto tour route would be established in this area along existing administrative roadways.

4.0.3.3.9 Permit System

Under Alternatives A-E, public use areas would not require a permit for general access. Under Alternative F, a permit system for all public use in the Monument would be implemented. Permits would be available from self-issue stations at Monument entrances, gateway areas, and administrative offices and from the Monument internet site. No fees or nominal fees would be charged for permits.

4.1 Effects on Geological/Paleontological Resources

The Monument Proclamation specifies protection and preservation of the Monument's unique geological and paleontological features. Many of the Monument's geological features—such as the Hanford sand dunes, glacial erratics, berg mounds, gravel bars, the White Bluffs, and the Ringold Formation—are well known among those with an interest in the subject. The locations of paleontological resources, including fossils and petrified wood, are less well known.

4.1.1 Assumptions

Ground-disturbing activities—such as integrated pest management, restoration activities, visitor facility development, or general maintenance activities—would avoid sensitive geological and paleontological resources and would not adversely affect these sites or features.

Under all alternatives, highlighting these resources through interpretative and educational activities and materials will make a greater portion of the population aware of their existence. Once these resources become more widely known, they could be at heightened risk of damage from illegal activities. However, through careful implementation of education programs and law enforcement activities, adverse effects on these resources are anticipated to be negligible.

4.1.2 Effects Analysis—Geological Resources

4.1.2.1 Effects Common to All Alternatives

4.1.2.1.1 Control of Non-native Invasive Species

Activities to control non-native invasive species using IPM techniques in and around the White Bluffs area could result in minor to moderate beneficial effects. Currently, a variety of non-native species, such as salt cedar and Russian knapweed, occupy the seeps, springs and wetland areas in the sloughing portion of the bluffs. Removal of these species through chemical and mechanical control measures, combined with follow-up treatments of seeding and planting with native species, could contribute to stabilizing the bluffs. There is a potential that removing non-natives and replacing them with native plant species could reduce overall erosion rates; however, this conclusion remains speculative. Removing mature vegetation and replacing it with seeded or seedling species may temporarily increase erosion rates, as young plants would use less water than existing mature trees. However, it is expected that over time areas would stabilize as vegetation matures. Although additional research is needed, implementation of an aggressive non-native invasive species control program with replanting of native trees and shrubs could result in minor to moderate positive effects on the White Bluffs through the stabilization of soils and by reducing erosion.

Alternatively, aggressive removal of non-native vegetation, such as salt cedar, may cause increased erosion rates, with resultant minor adverse effects on the geology of the White Bluffs. Salt cedar is known to have extensive root systems and to be a highly efficient plant for transpiring large amounts of water. Removing salt cedar may increase erosion as the water that is currently being used by these plants would then be released into the bluffs. This conclusion

also remains speculative and requires further research; however, the large scale removal of these non-native plants without follow-up treatment to replace the mature vegetation has the potential to create minor adverse effects on the White Bluffs by increasing erosion rates.

Implementation of IPM for non-native plants in the area of the White Bluffs will require careful monitoring of treatments to determine impacts to the soils, geology and vegetation within the slumping areas of the bluffs.

4.1.2.1.2 Restoration Activities

Activities associated with restoration of shrub-steppe and lithosol habitats are anticipated to have negligible effects on geological resources.

Riparian area restoration actions are expected to have minor direct effects on geological resources. Non-native invasive species control work that causes soil disturbance through the mechanical removal of vegetation (e.g., Russian olive removal) would have direct effects on geological resources through soil disturbance, exposure, or erosion. These effects would be mitigated through site stabilization, native seeding, and plantings. Overall, riparian/riverine restoration would directly benefit geological resources by improving plant community health, by increasing vegetative cover to stabilize soils, and by reducing erosion through streambank stabilization actions.

4.1.2.1.3 Wildland Fire and Fire Suppression Activities

In areas where annual weed species are prevalent, increased fire intensity and duration could lead to the destruction and degradation of geological resources. In many cases, geological resources are protected from severe fire effects by their position on the landscape. Direct effects of fire, such as the loss of vegetative cover (increasing susceptibility to erosion), weathering, spalling, discoloration from fire retardant and oxidation, and heat damage, would be minor. Because of the human tendency to explore previously vegetated areas on foot, by vehicle, or on horseback when vegetation is removed, indirect effects could result from disturbance associated with increased human activity. Increased visitor use around geological sites would exacerbate soil erosion and could contribute to resource degradation. Overall adverse effects are expected to be minor when considering the limited amount of access that would be allowed in the context of the amount of Monument area that would be closed to human entry.

4.1.2.1.4 Public Use

Surface disturbance would result from development of visitor facilities, such as trails, interpretive sites, boat launches, restrooms and parking areas. Visitor use on and around facilities would result in soil compaction, vegetation disturbance, increased erosion, and exposure and degradation of geological resources. Increased visitor use would likely increase the occurrence of vandalism. Overall adverse effects are expected to be minor when considering the limited amount of access that would be allowed in the context of the amount of Monument area that would be closed to human entry.

4.1.2.2 Effects of Biological Resource Management Actions

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre–Manhattan Project conditions. Restoration activities under all alternatives would affect geological resources through demolition and disposal actions associated with scheduled DOE remediation activities on top of Rattlesnake Mountain. Recontouring of the basalt soil following the removal of physical improvements would have a short-term effect, but would result in long-term beneficial effects on the stabilization of the area. Improved site stabilization and reduced erosion potential would be long-term beneficial effects.

4.1.2.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.1.2.3.1 Interpretive Site Development

Under Alternative A, no interpretive sites would be established or planned that depict, explain, or interpret the Monument's geological resources. Several interpretive programs highlighting these resources would be offered annually in the Monument. These programs would be localized and managed and would cause negligible adverse effects.

Under Alternatives B–F, several interpretive sites would present subject matter pertinent to geological resources. Those sited away from geological resources would have negligible adverse effects. Those at or near geological resources would be sited to minimize adverse effects. Site inventories would be conducted prior to installation to facilitate avoidance of any important and significant resources. Visitor flow patterns, vehicle routes, and parking areas would be designed to minimize effects. It is anticipated that interpretive site development would have minor effects on geological resources.

4.1.2.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trail development would take place; consequently, negligible adverse effects on geological resources are expected.

Under Alternatives B–F, the purpose of interpretive trails would be to highlight Monument resources, including geological resources. Trails would be carefully planned to provide access to, and interpretation of, geological resources. Any sensitive resources would be avoided, or interpretation of the resource's sensitivity (e.g., erosion and slumping of the White Bluffs) would be presented. Trail routes would avoid hazards such as cliffs and rock outcroppings prone to landslides.

Each interpretive trail could have some element of interpretation discussing geological resources. Prior to construction of interpretive trails, site inventories would be conducted and significant resources would be located and identified. Trails would be carefully sited to avoid significant resources, and construction methods would employ measures to mitigate collateral damage from erosion and visitor activities. It is anticipated that each trail would have minor adverse effects on geological resources during development.

Interpretive signs along trails would highlight significant geological resources that are near to or visible from the trail. Information would be presented to educate visitors regarding the significance of the resources and any protective regulations that are in effect. The importance of protecting fragile resources would be emphasized, and the ongoing efforts to study and preserve them would be explained. In areas of potential visitor effects, directional and regulatory signage would be installed. It is anticipated that these actions would have positive long-term effects associated with better control of pedestrian travel routes and reduction of off-trail travel. Adverse effects on geological resources from increased visitation would include the possibilities of vandalism, looting and destruction of fragile geological resources, although given the nature of the resource, the overall impacts are expected to be slight.

4.1.2.4 Effects of Visitor Services Management Actions—Recreation

4.1.2.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Visitors pursuing big and upland game hunting activities in the Monument typically walk cross-country or follow game trails. These activities are dispersed across large areas that are open to hunting, the extent of which varies by alternative. Due to the seasonal and dispersed nature of hunting activities, adverse effects—such as soil erosion, degradation of geologic or

paleontologic resources, and impacts to air quality from dust—are anticipated to be negligible at this time (Cole 2004a). Effects could increase in severity over time if hunting use grows on the Monument.

Visitors hunting waterfowl on the Monument typically walk from a parking area to a desirable location, set up a blind, and remain stationary. In the past, hunters dug waterfowl pass-shooting depressions along bluffs in the Wahluke Unit; however, this activity is no longer allowed. Most waterfowl hunters tend to use common footpaths between parking areas and hunting locations, resulting in localized soil compaction along the Columbia River and associated bluffs and around the WB-10 Ponds. However, in light of the localized nature of the impacts, and the lack of sensitive physical resources in these areas, negligible effects are anticipated.

The WDOE classifies the water quality of the Columbia River from Grand Coulee Dam to the Washington-Oregon border, which includes the Monument, as Class A (Excellent). With relatively low hunter numbers, vehicle use limitations (vehicles are limited surfaced roads), and the sheer volume of the river, impacts to water quality would be negligible.

Hunting – Alternative B-1

As the hunting program is believed to have negligible impacts to the physical environment on the Monument, there would be negligible impacts from discontinuing it.

4.1.2.4.2 Fishing

Wake-based erosion from motorboat-based fishing activities may exacerbate existing shoreline erosion that results from subsurface offsite irrigation drainage and water level fluctuations in the Columbia River. Shoreline erosion and slumping are presently causing major adverse effects on White Bluffs deposits near Locke Island at river mile 366. However, adverse effects caused by motorboat-based fishing are anticipated to be negligible compared to the effects of irrigation drainage and frequent water level fluctuations.

Bank fishing activities primarily occur in the Ringold and Columbia River Units. Visitors pursuing bank fishing activities typically walk from a parking area to one or more desirable locations along the Columbia River, resulting in localized soil compaction and vegetation disturbance along these routes. In view of the localized nature of effects, and the lack of geological features in these areas, negligible effects on geological resources are anticipated.

4.1.2.4.3 Wildlife Observation and Photography

Under Alternative A, in the event that a wildlife observation or photography opportunity attracts repeated visitation to a sensitive area, minor, long-term, adverse effects could occur from foot traffic. Although they are possible, such effects have not been detected in the Monument. Under Alternatives B–F, minor, long-term, beneficial effects would result from concentrating activities in sites that are designed to provide a quality experience while minimizing adverse resource effects. Effects associated with site development and visitor use would still occur as described in Section 4.1.2.1.4. However, with implementation of BMPs described in Section 4.0.1.2, Alternatives B–F are anticipated to result in negligible adverse effects on geological resources.

4.1.2.4.4 Hiking

Alternative A would have minor, long-term, adverse effects on geological resources, primarily as a result of erosion where hiking occurs through sensitive dune and bluff areas in the Wahluke and Ringold Units. Effects may increase in severity over time as hiking activity increases in the Monument. All action alternatives would result in minor, long-term, beneficial effects on geological resources by concentrating use on designated trail systems and reducing cross-country foot traffic. Because sensitive resources would be avoided under Alternatives B–F, negligible adverse effects are anticipated from trail development.

4.1.2.4.5 Equestrian Use

Alternative A would have minor, long-term, adverse effects on geological resources resulting from erosion where horses travel through sensitive dune and bluff areas in the Wahluke and Ringold Units. Effects may increase in severity over time as equestrian use increases in the Monument (Newsome et al. 2004). Alternatives B–F would result in minor, long-term, beneficial effects on geological resources by establishing designated roads and trails and eliminating unrestricted cross-country equestrian use.

4.1.2.4.6 Boat Launches

With implementation of BMPs described in Section 4.0.1.2, the maintenance and/or development of boat launches is anticipated to have negligible effects on geological resources.

4.1.2.4.7 Camping

With implementation of the BMPs described in Section 4.0.1.2, campground development is anticipated to have negligible effects on geological resources. However, the availability of camping opportunities in the Monument would likely result in increased visitor use, which could have adverse effects as described in Section 4.1.2.1.4.

4.1.2.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Because no known sensitive geological resources occur in this area, negligible effects are anticipated under any alternative.

Sand Dunes. Under Alternatives C, C-1, D and E, adverse effects to the sand dunes may result from foot traffic and associated trampling and erosion along the trail corridor. However, in view of the relatively small area of potential effect, and with implementation of BMPs described in Section 4.0.1.2, these effects are anticipated to be minor.

South Shore. Under Alternatives C, C-1, D and E, with implementation of BMPs described in Section 4.0.1.2, the effects on geological resources are anticipated to be negligible.

North Shore. Under Alternatives D and E, with implementation of BMPs described in Section 4.0.1.2, effects on geological resources are anticipated to be negligible.

Ringold Unit

Parking Areas. Under all alternatives, negligible effects on geological resources are anticipated.

Auto Tour. Under Alternative D, visitors would gain improved access in the vicinity of fragile geological features (i.e., bluff features). Incidental public use within the travel corridor could result in effects as described in Section 4.1.2.1.4. With implementation of BMPs described in Section 4.0.1.2, including such restrictions as requiring visitors to remain on the roadway in fragile areas, adverse effects are anticipated to be minor.

Saddle Mountain Unit

Because no sensitive geological resources are known to occur in this area, negligible effects are anticipated under all alternatives.

Wahluke Unit

West Access. Alternatives B–F would provide public access to areas that have been closed to the public for more than sixty years. Adverse effects could occur as described in Section 4.1.2.1.4; however, with implementation of BMPs described in Section 4.0.1.2, these effects are anticipated to be negligible.

Auto Tour. Because sensitive geological features are not known in this area, an auto tour route under Alternative D is anticipated to have negligible effects.

4.1.2.4.9 Permit System

Under Alternative F, implementation of a permit system is anticipated to have negligible effects on geological resources.

4.1.3 Effects Analysis—Paleontological Resources

4.1.3.1 Effects Common to All Alternatives

4.1.3.1.1 Control of Non-native Invasive Species

Activities to control non-native invasive species that cause soil disturbance through the mechanical removal of vegetation (e.g., Russian olive removal) would have direct effects on paleontological resources through soil disturbance, exposure, or erosion. These effects would be mitigated through site stabilization, native seeding, and plantings. Such treatments would be expected to have moderate beneficial effects on paleontological resources through the reestablishment of native vegetation, soil stabilization, reduced soil erosion, and improved plant community health.

4.1.3.1.2 Restoration Activities

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions. Under all alternatives, effects would have negligible effects on paleontological resources because there are no recorded occurrences of such resources in the basalt formations on Rattlesnake Mountain.

Riparian/riverine restoration would indirectly benefit paleontological resources by improving plant community health and by increasing vegetative cover to camouflage exposed sites, stabilize soils, and reduce erosion through streambank stabilization actions.

4.1.3.1.3 Wildland Fire and Fire Suppression Activities

In areas where annual weed species are prevalent, increased fire intensity and duration could lead to the destruction and degradation of paleontological resources. In many cases, paleontological resources are protected from severe fire effects by their position on the landscape. However, fire would have moderate direct effects on paleontological resources, such as the loss of vegetative cover (increasing exposure and susceptibility to erosion), weathering, spalling, discoloration from fire retardant, and heat damage. Because of the tendency to explore previously vegetated areas on foot, by vehicle, or on horseback when vegetation is removed, fire events could lead to increased potential disturbance and looting of paleontological resources.

4.1.3.1.4 Public Use

Surface disturbance would result from development of visitor facilities, such as trails, interpretive sites, boat launches, restrooms and parking areas. Visitor use on and around facilities would result in soil compaction, vegetation disturbance, increased erosion, and exposure and degradation of paleontological resources. Illegal removal of fossil materials could occur with increased visitor use.

4.1.3.2 Effects of Biological Resource Management Actions

No direct effects on paleontological resources are anticipated to result from proposed upland and riparian restoration activities, integrated pest management activities, or inventory and monitoring procedures.

4.1.3.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.1.3.3.1 Interpretive Site Development

Under Alternative A, no interpretive sites would be established or planned that depict, explain, or interpret any of the Monument's paleontological resources. Several interpretive programs

highlighting these resources would be offered annually in the Monument, but they would result in negligible adverse effects.

The existence of fossil remains in the Ringold Formation is one of the distinctive features of the Monument. Under all action alternatives, several interpretive sites would present subject matter pertaining to paleontological resources. Prior to development, site inventories would be conducted to avoid any important and significant resources. Those sited away from such resources would have negligible adverse effects. Those at or near paleontological resources would be sited to minimize adverse effects. Visitor flow patterns, vehicle routes, and parking areas would be designed to minimize effects. Although heightened attention could potentially increase the level of attempts to vandalize and exploit these resources, the exact locations of fossil remains will not be disclosed. An increased law enforcement presence, along with educational materials, will help to mitigate any effects caused by the development of interpretive sites. It is anticipated that effects from interpretive site development would be minor.

4.1.3.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trail development would take place; consequently, no effects on paleontological resources are expected.

Under all action alternatives, interpretive trails would be sited to avoid any known paleontological sites and sites where resources could exist or become exposed in the future. Such sites are generally found in the exposed face of the White Bluffs; these areas would also be avoided because of visitor safety concerns. Certain interpretive trails would support some interpretation of paleontological resources. Before construction of interpretive trails, site inventories would be conducted, and all significant resources would be located and identified. Trails would be carefully sited to avoid significant resources and measures to mitigate collateral damage from erosion and visitor activities would be implemented. It is anticipated that each trail would have negligible effects on paleontological resources during development and that these effects would be of short duration.

Interpretive signage along trails would highlight unique and significant paleontological resources that are near to or visible from the trail. Information would be presented to educate visitors regarding the significance of the resources and any protective regulations that are in effect. The importance of protecting fragile resources would be emphasized, and the ongoing efforts to study and preserve them would be explained. In areas of potential visitor effects, directional and regulatory signs would be installed. It is anticipated that these actions would have beneficial long-term effects. Adverse effects on paleontological resources from increased visitation would be minimal; however, the possibility of vandalism, looting and destruction of fragile paleontological resources does exist if safeguards are not implemented (e.g., law enforcement patrols).

4.1.3.4 Effects of Visitor Services Management Actions—Recreation

4.1.3.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

The effects of hunting activities on paleontological resources would be similar to those described for geological resources; negligible effects are anticipated.

Hunting – Alternative B-1

As recreational hunting is believed to have negligible to minor impacts to paleontological resources on the Monument, there would be negligible impacts by discontinuing it.

4.1.3.4.2 Fishing

The effects of fishing activities on paleontological resources would be similar to those described for geological resources; negligible effects are anticipated.

4.1.3.4.3 Wildlife Observation and Photography

The effects on paleontological resources would be similar to those described for geological resources. Minor, long-term adverse effects are anticipated under Alternative A, and minor, long-term, beneficial effects are anticipated under Alternatives B–F.

4.1.3.4.4 Hiking

The effects of hiking on paleontological resources would be similar to those described for geological resources. Minor, long-term adverse effects are anticipated under Alternative A, and minor, long-term, beneficial effects from concentrating hiking activities on trails are anticipated under Alternatives B–F.

4.1.3.4.5 Equestrian Use

The effects of equestrian use on paleontological resources would be similar to those described for geological resources. Minor, long-term adverse effects are anticipated under Alternative A,

and minor, long-term, beneficial effects from concentrating equestrian use on trails are anticipated under Alternatives B–F.

4.1.3.4.6 Boat Launches

With implementation of BMPs described in Section 4.0.1.2, the maintenance and/or development of boat launches is anticipated to have negligible effects on paleontological resources.

4.1.3.4.7 Camping

With implementation of the BMPs described in Section 4.0.1.2, campground development is anticipated to have negligible effects on paleontological resources. However, the availability of camping opportunities in the Monument would likely result in increased visitor use, which could result in long-term, adverse effects as described in Section 4.1.3.1.4.

4.1.3.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Because no known sensitive paleontological resources occur in this area, negligible effects are anticipated under any alternative.

Sand Dunes. Under Alternatives C, C-1, D and E, with implementation of BMPs described in Section 4.0.1.2, the effects on paleontological resources are anticipated to be negligible.

South Shore. Under Alternatives C and C-1, D and E, with implementation of BMPs described in Section 4.0.1.2, the effects on paleontological resources are anticipated to be negligible.

North Shore. Under Alternatives D and E, with implementation of BMPs described in Section 4.0.1.2, the effects on paleontological resources are anticipated to be negligible.

Ringold Unit

Parking Areas. Under all alternatives, negligible effects on paleontological resources are anticipated.

Auto Tour. Under Alternative D, visitors would gain improved access in the vicinity of paleontological resources. Incidental public use within the travel corridor could result in effects

as described in Section 4.1.3.1.4. With implementation of BMPs described in Section 4.0.1.2, including such restrictions as requiring visitors to remain on the roadway in sensitive areas, adverse effects are anticipated to be minor.

Saddle Mountain Unit

Under Alternatives A, C-1, D and E, access to the Saddle Mountain summit could result in adverse effects as described in Section 4.1.3.1.4. However, with implementation of BMPs described in Section 4.0.1.2, these effects would be minor. Alternative B and B-1 would result in a minor beneficial effect by removing the sources of disturbance described above. Although Alternatives C and F are expected to result in reduced visitation to the summit, effects would be similar to those described for Alternatives A, D and E.

Wahluke Unit

West Access. Alternatives B–F would provide public access to areas that have been closed to the public for more than sixty years. Adverse effects could occur as described in Section 4.1.3.1.4; however, with implementation of BMPs described in Section 4.0.1.2, these effects are anticipated to be negligible.

Auto Tour. Because sensitive paleontological features are not known in this area, an auto tour route under Alternative D is anticipated to have negligible effects.

4.1.3.4.9 Permit System

Under Alternative F, implementation of a permit system is anticipated to have negligible effects on paleontological resources.

4.2 Effects on Shrub-Steppe, Other Upland Resources

The Monument Proclamation states: "The monument contains one of the last remaining large blocks of shrub-steppe ecosystems in the Columbia River Basin, supporting an unusually high diversity of native plant and animal species." Because they are important habitat for resident and migratory wildlife species, these large, intact plant communities are regionally and globally significant. These biological resources, which encompass large, interconnected natural systems, are among those the FWS has been given responsibility to manage and protect.

Upland shrub-steppe plant communities constitute a fundamental and vitally important element of the Monument's biological resources. More than 350 unique plant associations have been

mapped to date; distinctive variations of each community type are shaped by soil type, aspect, slope and microclimate.

Foundation shrub-steppe plant communities of the Columbia Basin have diminished significantly throughout their range as a result of past and present management actions and the consequences of those actions (e.g., grazing, agricultural development, urbanization, wildfire). The loss of sagebrush habitats and concern for sagebrush-dependent species were detailed more than twenty-five years ago by the Conservation Committee of the Wilson Ornithological Society (Braun 1976).

Although it has been protected since 1943, many areas of the Monument have experienced both small- and large-scale disturbances. These have commonly been caused by wildfire or by past grazing, homesteading and farming activities. Such disturbance, and the associated loss of biodiversity, can often result in indirect effects on other resources. Where effects on vegetation lead to soil erosion, that erosion has the potential to damage or degrade archeological, paleontological and historical resources, as well as water quality and air quality.

Various factors have contributed to the diversity and distinctive character of the Monument's flora. Geological processes that created the Columbia Basin; historic land use, land withdrawals, and isolation created by the Manhattan Project; and the presence of relict plant communities provide opportunities for biologically unique plant species. Two endemic species (i.e., species that occur nowhere else in the world) that are new to science—Umtanum desert buckwheat and White Bluffs bladderpod—are now considered by the FWS as candidates for listing under the ESA. Approximately 112 populations/occurrences of twenty-eight rare plant taxa are known to occur in riparian and upland areas of the Monument (TNC 2003a).

4.2.1 Assumptions

4.2.2 Effects Analysis—Wildlife and Habitat

A variety of management actions and controls would provide protection for upland habitats in the Monument. These include restrictions on surface-disturbing activities; controls on visitor access points and vehicle use; mechanisms to control visitor use (e.g., allocations, group size restrictions); monitoring of vegetation condition; NEPA analysis prior to restoration and revegetation actions; and an active program to control non-native invasive species.

4.2.2.1 Effects Common to All Alternatives

4.2.2.1.1 Habitat Modification

Effects on upland habitats and wildlife populations result directly from the modification of plant community structure and function. A variety of activities and conditions contribute to successional processes in native plant communities. These include vegetation modification resulting from the construction of facilities; trampling by visitors; establishment and spread of non-native invasive species; Hanford Site remediation activities; wildland fire effects; and wildlife effects.

4.2.2.1.2 Public Use

Wildlife disturbance would result from the visible and audible presence of people, vehicles, watercraft and domestic animals, such as horses and dogs. Grassland birds in Colorado were found to be less likely to nest near recreational trails; they also experienced higher nest predation rates near trails (Miller et al. 1998). A single pedestrian moving through a bird's territory was found to reduce the occurrence and consistency of song in breeding subalpine birds (Gutzwiller et al. 1994). Because singing plays an important role in territorial defense and mate attraction, altered singing behavior may influence a bird's reproduction success (Gutzwiller et al. 1997).

Trampling at levels lower than those required to alter the structure and composition of the plant community has been found to reduce numbers and diversity of invertebrates (e.g., beetles, spiders, snails, earthworms) found in grassland litter (Duffey 1975). Thus, trampling may have effects on the abundance and availability of invertebrate prey for birds.

Wildlife injury and mortality may result from the harvest of game fish and wildlife species, as well as from collisions between vehicles and wildlife (Ashley and Robinson 1996; Jones 2000).

Direct effects on wildlife resulting from these activities include disruption of behavioral patterns and cycles (nesting, foraging, roosting) and increased disturbance and stress.

4.2.2.1.3 Wildland Fire and Fire Suppression Activities

Fire danger and/or wildland fire would have minor to major short-term and long-term adverse effects on upland shrub-steppe habitats by removing vegetation; damaging long-term study plots; disturbing surface areas through suppression activities (e.g., bulldozer lines, hand lines, staging areas); and stimulating post-fire expansion of non-native invasive species. Vegetation recovery within burned areas is a slow process, with native grasses taking three to five years to resemble

pre-fire conditions, depending on weather and moisture conditions (Evans and Lih 2005). Further, shrub recovery in burned areas may require decades to resemble pre-fire conditions (Evans and Lih 2005). The effects of wildland fire on upland shrub-steppe wildlife and habitat depends on the size, timing, duration and location of the fire.

4.2.2.1.4 Wildlife Population Control Activities

Under all alternatives, wildlife population control actions—such as herding animals into trap corrals with aircraft, net gunning and helicopter transport of ungulates, government culling, controlled hunting, and hazing—would create some disturbance to upland habitats. Minor direct effects on upland habitats would include disturbed and crushed vegetation; increased short-term wildlife disturbance in capture areas; increased human activity involving vehicles; public entry into controlled access areas; construction of trails and corrals; and disturbed soils and microbiotic crust. However, these effects would be minimized through an integrated application of population control management options, as described in Section 2.10.1.5, and the implementation of BMPs as described in Section 4.0.1.2. Minor indirect effects would include erosion and the potential for non-native species introduction and encroachment into upland plant communities from disturbed areas. These effects would be reduced through activity/site planning and the rehabilitation of affected sites with native species following operations. Direct effects on wildlife resulting from population control activities include increased disturbance and stress and disruption of behavioral patterns and cycles (nesting, foraging, roosting) of both the wildlife targeted for control and other wildlife within or adjacent to the areas where control activities are taking place.

4.2.2.1.5 Visitor Facility Development

Indirect effects on wildlife from visitor use and facility development would occur from loss or modification of habitat, including soil compaction; increased soil erosion; changes in structure and composition of vegetation communities; spread of invasive species such as cheatgrass, yellow star-thistle, Russian thistle, rush skeletonweed, knapweed and others; and an increased potential of human-caused wildfire.

Minor direct effects on wildlife may occur, including localized disturbance and modification of behavior (e.g., movement and foraging patterns) associated with avoidance of developed areas. Because some species readily habituate to interpretive sites and some species do not, localized disturbance and behavior modification may constitute both short- and long-term effects. Indirect effects could include use of developed sites as roosting areas or thermal cover (shade). Species that become habituated to visitors could create nuisance or conflict situations, depending on the level of visitor use, the species involved, and the character of contact in interpretive areas.

Because the goal of interpretive sites and trails is to provide visitors with a chance to see and learn about unique and notable resources, care would be taken during site planning to protect sensitive habitat. The initial development of interpretive sites and trails is expected to have a moderate level of adverse short-term effects on localized areas. Adverse effects on shrub-steppe habitat and other upland resources would include site alteration, soil disturbance, habitat disturbance, and trampling of areas of approximately 0.25–0.5 acre per site. Effects of site development would be mitigated by the planting of native species and landscaping appropriate to the surroundings. Visitors would be strongly encouraged to refrain from leaving the trails and traversing undisturbed lands. Nevertheless, an estimated fifty-foot corridor on either side of the trails would experience minor adverse effects on soil and flora from visitors venturing off trail.

4.2.2.2 Effects of Biological Resource Management Actions

Treatments of non-native invasive plant populations along road corridors would have moderate effects on soils and vegetation within ten feet of the edge of road systems but would have negligible effects on upland habitats.

Spot spraying, hand pulling, and seeding with native species would be conducted on an annual basis on high-priority weed populations in off-road situations. Under Alternative A (i.e., under current staffing and funding conditions), only a small portion of known weed infestations (the highest priorities) would be mapped, treated and monitored annually. The treatment of isolated weed infestations away from established road systems would result in minor disturbance effects on soils and vegetation but would not affect plant community composition and function. Direct effects on wildlife include short-term displacement and disturbance in mechanical treatment and chemical application areas. Indirect effects include long-term major beneficial effects on native habitat through the early treatment of small weed populations and site restoration with native species, protecting associated plant communities and wildlife habitat from further degradation.

Under Alternatives B–F, potential impacts to soils, vegetation, watershed function, and biodiversity would be considered in all treatment recommendations. In sensitive plant communities, where soil disturbance and the spread of non-native invasive species would adversely affect upland habitats, the use of multiple tools (chemical, biological, mechanical, cultural) may be required. Moderate effects on upland habitats would be expected to result from mechanical and cultural treatments. Mechanical treatments (hand pulling, discing, mowing) and cultural treatments (reseeding of native species) would potentially disturb soils. Moderate direct effects include short-term disturbance of wildlife and localized soil disturbance. Moderate to major beneficial indirect effects include the reduction or elimination of invasive species in native plant communities, leading to improved resource conditions, wildlife habitat, and plant community stability and connectivity.

Because plant communities dominated by native species provide superior wildlife habitat, alternatives that entail more extensive programs to control non-native invasive species would be expected to have more extensive beneficial effects on wildlife and habitat than alternatives treating lesser areas. For a description of non-native invasive species control actions under each alternative, see Section 4.0.3.1.1 and the Monument's draft IPSIMP.

Shrub-steppe restoration is a high priority for the protection of Monument resources and upland habitats under all alternatives. Vegetation restoration methods have the potential to cause surface disturbance on approximately 90,000 acres over the fifteen-year planning horizon. Seeding and planting with native species would be used to restore native plant communities, primarily in areas disturbed or adversely affected by past management activities or by wildfire. Restoration efforts include control of non-native invasive species, native shrub plantings, and seeding (broadcast, broadcast/harrow, drill seeding) with native species.

Under Alternative A, moderate direct effects on wildlife would include short-term disturbance that may move wildlife temporarily out of specific project areas, potential effects associated with soil disturbance, and soil compaction during drill seeding and harrowing operations. Indirect effects would include reestablishment of native plant communities, improved biological diversity, improved hydrologic processes, increased site health, and enhanced plant community structure and function.

Under Alternatives B–F, restoration activities would have short-term adverse effects on upland habitats through soil and vegetation disturbance, but they would have long-term beneficial effects on wildlife through habitat improvement. Under Alternatives B, B-1 and F, 6,000 acres of upland habitat restoration would be undertaken annually; 4,000 acres would be treated under Alternatives C and E; 3,000 acres under C-1; and 2,000 acres would be treated under Alternative D. The degree of disturbance to wildlife would be related to the extent and characteristics of the areas to be treated annually. For example, restoration actions are needed in each of the proposed management units to achieve a biologically diverse landscape that would benefit the more than 1,500 species that occupy the Monument. The Wahluke Unit supports mature sagebrush plant communities with understory composed primarily of cheatgrass, short grass communities that benefit wildlife such as long-billed curlews and burrowing owls, and riparian habitat important to waterfowl and raptors such as bald eagles. Actions to restore these communities to an ecological state in which the understories are dominated by native bunchgrass species would vary depending on the long-term habitat objectives for each plant community type and the target species that utilize them. Ultimately, it would be the goal of restoration actions to reduce non-native invasive species, stabilize and improve ecological conditions, and improve habitat connectivity. The amount of disturbance in each of these plant community associations would vary depending on the extent of treatments that were required. For example, higher levels of ground disturbance would be expected to result from restoration activities in plant communities that are dominated by non-native species (e.g., abandoned farm fields that are dominated by cheatgrass). Mature sagebrush communities would potentially require less ground disturbance to achieve native forb and grass reestablishment in the understory. Monitoring of restoration

activities would be conducted through the installation of monitoring plots to document the success of treatment and the direct and indirect effects on upland habitat biodiversity, health and function. Monitoring efforts and the establishment of monitoring plots would have negligible effects.

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions. Under all alternatives, upland habitat would be improved through the demolition and disposal actions associated with scheduled DOE remediation activities on top of Rattlesnake Mountain. Buildings identified for cleanup would be removed and upland habitats would be restored. Minor direct effects on wildlife associated with clean-up work would include short-term displacement or disturbance as a result of human and vehicle activity around the project area. Moderate direct effects on upland habitats would result from ground-disturbing activities to remove building materials, asphalt, gravel, roadways and concrete foundations. Removal of the structures would have long-term beneficial effects through site stabilization by seeding with native species, reduced establishment of noxious weeds, a reduction in problem wildlife species, reduced avian and bat mortality from guide wire strikes, and improved upland habitat and connectivity.

Under alternatives B, B-1, C, C-1 and F, restoration activities would include the removal of the observatory (recommended), along with the other buildings and structures, the effects of which would be similar to those described above. Under alternatives A, D and E, the observatory building and associated utilities could be retained (see footnote 149, page 4-17). Vehicle traffic and visitation to the observatory would continue for maintenance, calibration and repairs. Minor adverse effects would include provision of an artificial perch for raptors, thereby increasing predation of rodent populations; wildlife disturbance through maintenance activities; and an increased risk of introduction of non-native invasive species into rehabilitated plant communities.

The effectiveness of restoration treatments is directly related to the quantity and quality of native plant materials that can be obtained. Currently, one year of lead time is required to collect native seed from the Columbia Basin and contract with government or privately operated nurseries to grow native plants. Alternatives B, B-1, C, C-1 and E provide for the proactive collection of native seed from the Monument to ensure ecological compatibility of native plantings and to multiply and expand native seed stocks through commercial production contracts with local native seed growers. Short-term disturbance of wildlife would occur as seed is harvested for various native species from June through December each year in all units of the Monument. However, native seed collection would have negligible effects on wildlife or wildlife habitat through the implementation of BMPs for seed collection, as described at 4.0.1.2.

Alternatives B–F would provide for the development of a native plant nursery in cooperation with other partners to supply native plant materials for restoration actions. These actions could be accomplished on Monument lands, such as the eighty irrigated agricultural acres in the Ringold Unit, or could be developed at off-Monument sites in the Columbia Basin.

Development of a native plant nursery would have negligible direct effects on Monument lands but would have major beneficial indirect effects on shrub-steppe and riparian habitats by providing locally grown, ecologically compatible, and genetically suitable plant materials for restoration efforts.

4.2.2.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.2.2.3.1 Interpretive Site Development

Alternative A would have negligible effects on upland habitats. Existing and potential interpretative signs and kiosks are placed at major entry points and along travel routes in the Monument that have been previously disturbed. Under Alternative D, the potential construction of twenty new interpretative sites would have the greatest amount of short-term effects; site development would result in direct effects on approximately thirty acres of areas open to the public. Effects would be less under all other alternatives. In addition to the direct effects of site development, visitor exploration of areas of shrub-steppe habitat is predicted to have minor long-term effects within a 1/4-mile radius of each interpretive site.

Indirect effects on upland habitats could include vegetation trampling, disturbance of microbiotic crust, soil disturbance, erosion, establishment of non-native invasive species, and potential displacement, disturbance or habituation of wildlife to human visitors.

4.2.2.3.2 Interpretive Trail Systems

No interpretive trails are planned under Alternative A; accordingly, negligible environmental effects on upland habitats are anticipated.

Under Alternatives B–F, creation of trail systems would entail direct impacts to upland habitats. These effects would be greatest under Alternative D. Localized, moderate, short-term direct effects of trail construction would include microbiotic crust disturbance, soil disturbance, and vegetation loss. Indirect effects would include soil erosion, establishment and spread of non-native invasive species, and an increased risk of wildland fire. Beneficial long-term effects would include the reduction of effects on sensitive upland habitats from trampling by allowing access through established trail systems and improved interpretation/education opportunities.

The establishment of interpretive trails would facilitate easier access to upland habitats and an associated increase in visitation. Increase visitation could lead to increased wildfire occurrence. These effects would be mitigated by informational signing educating visitors on the danger of

wildfire, the adverse effects of wildfire on the shrub-steppe habitat, and how visitors can contribute to fire prevention. Seasonal closure of interpretive trails through high-risk areas would be established and enforced to mitigate the potential of visitor-caused wildfire.

Proposed interpretive trail systems would have long-term effects on wildlife and their shrub-steppe, riverine and aquatic habitats. Research suggests that trail systems typically alter wildlife movement, habitat use, and foraging patterns. Direct effects on wildlife would include disturbance, displacement and altered habitat utilization. Beneficial effects of developing a trail system (as opposed to permitting uncontrolled cross-country travel) would include the reduction of effects on sensitive wildlife habitats by managing access through established trail systems.

No proposed trail routes have been developed. Future trails would be designed and sited only when an interpretive plan and resource inventories have been completed. Development of interpretive facilities in the Monument would require project-level inventories prior to construction to determine the presence of sensitive species and habitat. Trail systems would not be allowed where they would affect T&E species or sensitive cultural or natural resources. Trails may be closed during critical breeding and nesting seasons if necessary.

4.2.2.4 Effects of Visitor Services Management Actions—Recreation

4.2.2.4.1 Hunting

Although the Monument is a desert, the presence of the Columbia River, sands deposited by the Missoula Floods, artificial and natural wetlands, and varied terrain, have created a broad mosaic of habitat types, each filled with an amazing array of plant species. At least two plants—Umtanum desert buckwheat and White Bluffs bladderpod—are found nowhere else in the world.

Hunting – Alternatives A, B, C, C-1, D, E and F

Effects of a recreational hunting program on vegetation and habitat vary depending on soil type, vegetation cover type, topography and use intensity. Effects on vegetation and habitats resulting from foot and horse traffic include a combination of several factors influencing vegetation, soils, microbiotic crusts, and the potential for non-native species invasion. Such activities can increase compaction, remove microbiotic crusts, reduce water infiltration, increase runoff and erosion potential, inhibit seed germination and plant growth, increase the potential for non-native species invasion, and trample underground burrows and surface runways of small animals (Alessa and Earnhart 2000; British Columbia Ministry of Water 2004; Cole 1995a; Cole 2004a; McClaran and Cole 1993; Pickering 2003).

Direct effects on vegetation occur primarily through trampling. Trampling of vegetation bends, weakens and breaks leaves and branches and damages photosynthetic surfaces, seed production, and carbohydrate reserves, eventually killing some species (Cole 1995c). Other direct effects from trampling include the disruption of microbiotic crust, which can result in decreased crust organism diversity (i.e., lichens, mosses, etc.), soil nutrients, stability and organic matter (Belnap et al. 2001).

Indirect effects of vegetation trampling and resultant soil compaction and erosion can include the exposure of roots, leading to plant mortality (Cole 1995b; Cole 2004a). Other indirect effects include disturbance to soil crust—when soil crust is broken, soil is more susceptible to wind and water erosion—and non-native plant species invasion. Further, hunting activities can spread invasive species by varied mechanisms—such as transport on recreational equipment, clothing, footwear and hunting dogs—and through equestrian uses, either in fecal material or in feed. Vehicle undercarriages can rapidly collect and distribute weed seeds (Sheley et al. 2002; Sheley and Petroff 1999). Additional indirect effects to vegetation and habitats include the increased risk from human-caused wildfires.

The invasion of non-native invasive plant species can alter ecosystem structure and function; disrupt food chains and other ecosystem characteristics vital to wildlife; and dramatically modify key ecosystem processes, such as hydrology, productivity, nutrient cycling, and fire regime (Mack et al. 2000; Brooks and Pyke 2001; Randall 1996). Such species can displace native species; reduce forage and cover for wildlife; and increase the rate, intensity and severity of wildfires.

Visitors pursuing big and upland game hunting activities in the Monument typically walk cross-country, travel by horseback, or follow game trails. The extent of adverse effects to vegetation and habitat from hunters is unknown, but it is anticipated to be negligible to minor due to the seasonal and dispersed nature of hunting activities, as well as the level of current use and use anticipated into the foreseeable future.

Visitors hunting waterfowl in the Monument typically walk from a parking area to a desirable location, set up a blind, and remain stationary. Along the White Bluffs, a relatively small number of hunters have created pit-blinds by digging depressions for pass-shooting geese; however, digging of blinds or pits is no longer allowed. Existing pits are still used to pass-shoot geese. Most waterfowl hunters tend to use common footpaths between parking areas and hunting locations, resulting in localized trampling and soil compaction along the Columbia River and associated bluffs and around the WB-10 Ponds. In view of the localized nature of effects, and because waterfowl hunting takes place primarily in riparian or wetland habitats or sandy soils, negligible to minor effects are anticipated. Microbiotic crusts do not generally occur within these types of habitats, so impacts to crust are not anticipated.

Because hunting season takes place in the autumn/winter months, typically the months in which the Monument receives most of its precipitation for the year, fire danger is generally low.

During the winter, humidity is higher, temperatures are cooler, and fire risk is typically lower than during the spring and summer months. It is anticipated that best management practices and current regulations which prohibit campfires, open fires, fireworks, and other sources of fire ignition on the Monument will be adequate to prevent human-caused wildfires due to hunting activity.

If visitor use patterns change in the future, or visitor facility improvements are made within hunting areas, there may be a need for implementing strategies—such as increased outreach and establishing specific access points and routes—to minimize impacts to vegetation and habitats.

Impacts to Hunted Wildlife

Human activities can affect animals through four primary mechanisms—exploitation or harvest, disturbance, habitat modification, and pollution (Knight and Cole 1995a). It is assumed that effects specific to hunted species on the Monument would occur primarily through harvest, disturbance and habitat modification, with additional effects anticipated from nonpoint source pollution such as litter, car exhaust, and marine engine emission.

Hunting activity in the Monument results in mortality of individual game animals, including deer, elk, waterfowl and upland game birds; however, based upon annual game population and harvest surveys conducted by the FWS and the WDFW, effects are anticipated to be negligible at a population level. Hunting mortality to wildlife is compensatory mortality, rather than additive mortality.

In the absence of large predators, removal of individual animals through the hunting program may help to control the population of hunted species. Controlling population expansion may sometimes be needed for the general health of the population by reducing inter- and intra-specific competition for resources, such as food and shelter, and reducing the probability of the spread of diseases.

During hunting seasons, activities such as game stalking and firearm discharge result in wildlife disturbance of both game and non-game species. However, because of the limited hunting seasons and the dispersed nature of disturbance, minor adverse effects to individual animals and negligible effects on wildlife populations are anticipated.

Hunters occasionally leave behind litter, shell casings or other refuse; however, these items seldom reach a level that would interfere with the life cycle or productivity of wildlife on the Monument. Because of the limited hunting seasons, the dispersed nature of pollution, and its general lack of toxicity, minor adverse effects to individual animals and negligible effects on wildlife populations are anticipated.

It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the Monument will not be measurably lessened from

hunting activities. The relatively limited number of individuals expected to be removed from wildlife populations due to hunting will not cause wildlife populations to materially decline, the physiological condition and production of hunted species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted.

Many of the hunted species on the Monument (including ring-necked pheasants, California quail, chukar partridge, gray (Hungarian) partridge) were introduced to the area solely to establish and provide for huntable populations;[153] ring-necked pheasant populations are supplemented every season through WDFW release programs to enhance the harvestable population. These species are not native to the Monument area, would not have historically been present on the Monument, and have populations that are currently self-sustaining on Monument lands. The impact from hunting to these species is negligible, because populations of these species were established within this area solely for the purpose of recreational harvest.

The Monument area has several large areas that serve as sanctuaries for animals during the hunting season. Adjacent to the Wahluke Unit, where hunting occurs, is the Saddle Mountain Unit, which is closed to hunting. The ALE is also closed to hunting, as well as most of the Columbia River corridor, and the McGee Ranch/Riverlands Unit. The juxtaposition of the non-hunted lands with the hunted area allows for the majority of the Monument area to serve as a sanctuary for hunted wildlife species, mitigating whatever minor impacts that do occur.

Hunting activities may indirectly benefit wildlife through fostering increased appreciation and support for conservation of wildlife habitat.

Impacts to Other Wildlife

Human activities can affect animals through four primary mechanisms—exploitation or harvest, disturbance, habitat modification, and pollution (Knight and Cole 1995a). It is assumed that effects specific to other non-hunted wildlife on the Monument would occur primarily through disturbance and habitat modification, with additional effects anticipated from nonpoint source pollution, such as litter, car exhaust, and marine engine emission.

A variety of animal behavior responses could result from human activity, depending on a range of variables associated with the activity. Examples of such variables include type, distance, direction of movement, speed, predictability, frequency, magnitude and location of the activity (Knight and Cole 1995b). Wildlife disturbance can precipitate behavioral changes such as avoidance, habituation, or attraction (Knight and Temple 1995). Disturbance of wildlife species that habituate to human use tends to be greater when recreational activities occur away from

[153] At the time that these populations were established, no monitoring studies were conducted to determine if these species had an effect on native wildlife populations in the area.

established use areas, such as parking areas and trails (Gutzwiller et al. 1994; Riffell et al. 1996; Gutzwiller et al. 1997; MacArthur et al. 1982). Physiological responses can include the "fight or flight" response, with elevated heart and respiratory rates, or the "freeze" response, with inhibition of activity and reduced heart and respiratory rates. The implications of disturbance are heightened during sensitive life stages, such as breeding, overwintering and rearing of dependent young. Depending on the disturbance variables listed above, the long-term effects on individual animals can be altered behavior, reduced vigor, lower reproductive success, and death (Knight and Cole 1995a; Knight and Cole 1995b).

The hunting program on the Monument takes place during the autumn/winter months. Many species of resident animals are not as active during this season as they are during spring/summer breeding seasons. Small mammals, including bats, have reduced activity periods, and many hibernate or experience torpor during fall and winter months. These species are also primarily nocturnal. Both of these qualities make hunter interactions with small mammals very rare. Amphibians and reptiles on the Monument are dormant or hibernating during these months, which limits their surface presence during the hunting season when temperatures are low. Hunters would rarely encounter reptiles and amphibians during most of the hunting season. Invertebrates are also not active during cold weather and would have few interactions with hunters during the hunting season. Migratory bird nesting is completed for the year, and neo-tropical migrant birds have migrated to their wintering grounds for the season.

Overwinter survival is a critical component of healthy resident wildlife populations. The Monument area has several large areas that serve as refuges for resident animals during the winter months. Adjacent to the Wahluke Unit, where hunting occurs, is the Saddle Mountain Unit, which is closed to hunting. The ALE is also closed to hunting, as well as most of the Columbia River corridor, and the McGee Ranch/Riverlands Unit. The juxtaposition of the non-hunted lands with the hunted area allows for the majority of the Monument to serve as a sanctuary for a broad diversity and abundance of native wintering wildlife species.

Due to the seasonality and timing of the hunting program, as well as the availability of other non-hunted areas throughout the Monument, any impacts from hunting to other wildlife are considered to be minor.

Hunting – Alternative B-1

The hunting program itself is believed to have negligible to minor impacts to the vegetation and habitats on the Monument, which would be eliminated under Alternative B. However, if populations of hunted species increase dramatically on the Monument due to the absence of hunting, there could potentially be adverse impacts to habitat. Populations of hunted species could increase to the point that they degrade the habitat through excessive grazing, browsing, or through physical damage (trampling/digging/mucking). Habitat disturbance from an overabundance of certain species (e.g., deer and elk) could cause the invasion of non-native plant species that would further degrade the habitat. This could permanently decrease the

carrying capacity of the Monument for certain species and would potentially cause some wildlife die-offs. Indirect effects would be the need to conduct habitat restoration to mitigate damage from overabundant wildlife populations. Habitat restoration is often very labor intensive and expensive and would be an added expense for management of habitat resources.

Impacts to Hunted Wildlife

Discontinuing the hunting program would eliminate any direct impact to individual animals that are harvested during hunting seasons. Because hunting is considered to be a "compensatory" form of mortality, meaning that hunting substitutes for other forms of mortality, more individuals would die from natural causes. Individuals could be taken by predators, be killed by vehicles, succumb to disease or illness, or starve.

If populations of hunted species increased on the Monument, because other forms of mortality are absent (i.e., the absence of some types of predators), there could potentially be impacts to habitat. Populations of hunted species could increase to the point that they degrade the habitat through excessive grazing, browsing, or through physical damage (trampling/digging/mucking). Habitat disturbance from an overabundance of certain species could cause the invasion of non-native plant species that would further degrade the habitat. This could permanently decrease the carrying capacity of the Monument for certain species, including those that are hunted, and would potentially cause some wildlife die-offs. With increasing populations of certain species, competition for resources may also occur, in which case rarer species might be overcrowded or out-competed by more abundant and commonly occurring species. Other effects could be the spread of disease among expanded populations of hunted species.

Human disturbance to wildlife during the hunting season would also be reduced since this recreational activity would not occur. This may increase the overwinter survival of some species, leading to expanding populations, and could potentially lead to impacts to habitat from an overabundance of certain species, as described above. For migratory species, such as waterfowl, these impacts could occur on wintering grounds further south and/or breeding grounds further north. Further, if disturbance is reduced, there may be areas of use by certain species that experience greater wildlife residence times and thus greater impacts to habitat (e.g., natural springs might be a place where animals congregate and cause damage if they are not periodically disturbed and forced to move to other areas).

Impacts to Other Wildlife

No disturbance to other wildlife due to hunting would occur under Alternative B. Any disturbance effects to other wildlife from hunting would be eliminated. However, since the disturbance due to hunting was determined to be minor, this would only alleviate a minor form of disturbance. Other activities, such as hiking, wildlife observation, driving, picnicking and fishing, would all still occur during this seasonal time frame, and so disturbance of wildlife would not be eliminated, although it would be lessened.

4.2.2.4.2 Fishing

Effects related to fishing are discussed in Section 4.3.2.5.2.

4.2.2.4.3 Wildlife Observation and Photography

Under Alternatives B–F, a number of sites would be developed to provide wildlife observation and photography opportunities. It is anticipated that disturbance from site development activities would result in short-term adverse effects. In addition, intensified visitor use patterns near developed sites would result in long-term adverse effects through increased wildlife disturbance, vegetation trampling, soil compaction, introduction of noxious weeds, and increased risk of human-caused wildfire. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.[154] Minor beneficial effects of this action would result from concentrating wildlife observation and photography activities in sites specifically designed to provide a quality experience while shielding wildlife from observers and minimizing potential effects on wildlife and habitat.

4.2.2.4.4 Hiking

Hiking activities under Alternative A would continue to have minor adverse effects on wildlife and habitat associated with disturbance, vegetation trampling, soil compaction, and introduction of invasive plant species. If cross-country hiking activities increase in the Monument under Alternative A, the severity of adverse effects would also increase. Alternatives B–F could result in minor beneficial effects on wildlife by concentrating use on designated trail systems and reducing cross-country hiking and the associated effects described above. However, developed trail systems would likely result in increased hiking activity in the Monument, with concomitant increased wildlife and habitat disturbance as described in Section 4.2.2.1.4. Short-term disturbance of wildlife would occur during trail development activities. Intensified visitor use within 1/4-mile of trailheads and increased use along trail corridors would result in adverse effects as described in Section 4.2.2.1.5. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

4.2.2.4.5 Equestrian Use

Under Alternative A, cross-country equestrian travel is currently permitted in the Wahluke, Ringold and Columbia River Units. Equestrian activities can result in adverse effects on wildlife

[154] For example, research indicates that birds are less sensitive to disturbance if they are visually shielded from observers (Knight and Temple 1995).

and habitat through disturbance; vegetation trampling and loss of plant cover; soil compaction (McClaran and Cole 1993); trampling of underground burrows and surface runways of small animals; crushing of bird, amphibian and reptile eggs (Grassland Conservation Council of British Columbia 2004); and introduction of noxious weeds (Pickering et al. 2003). The extent of these effects on the Monument is unknown, but it is anticipated to be minor due to the low amount of use. Under Alternative A, an increase in equestrian use from current levels would result in an increased severity of effects. Alternatives B–F would result in beneficial effects on wildlife habitat by establishing designated roads and trails for equestrian use and reducing or eliminating cross-country use. However, equestrian use would continue to have long-term, adverse effects on wildlife and habitat (as described above) along designated trail corridors. With implementation of BMPs described in Section 4.0.1.2, adverse effects would be minor.

4.2.2.4.6 Boat Launches

Effects related to boat launches are addressed in Section 4.3.2.5.6.

4.2.2.4.7 Camping

Vernita

Effects related to camping at Vernita are addressed in Section 4.3.2.5.7.

Boat-In

Effects related to boat-in camping are addressed in Section 4.3.2.5.7.

Saddle Mountain

Under Alternative D, developed camping opportunities would attract increased visitor use in the Monument, resulting in adverse effects on wildlife through wildlife disturbance, vegetation trampling, soil compaction, introduction of noxious weeds, and increased risk of human-caused wildfire. Construction activities associated with campground development would result in short-term adverse effects on wildlife. Intensified visitor use within 1/4-mile of the campground would result in adverse effects on wildlife from the disturbance factors described above. With implementation of BMPs described in Section 4.0.1.2, and because the proposed campground would be developed in a previously disturbed area, adverse effects on wildlife are anticipated to be minor.

4.2.2.4.8 Modified Public Access

Columbia River Unit

Effects related to modified public access in the Columbia River Unit near the Vernita Bridge and the South and North shores are addressed in Section 4.3.2.5.8.

Sand Dunes. Under Alternatives C, C-1, D and E, access to the sand dunes on established trails would result in adverse effects through wildlife, habitat and vegetation disturbance; introduction of invasive non-native plant species; and increased risk of human-caused wildfire. With implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

Ringold Unit

Parking. Under Alternatives B–F, fewer parking lots would reduce the Monument's maintenance workload, allowing additional resources for management actions (e.g., invasive species control, fire prevention) that would benefit habitat. Resultant beneficial effects on wildlife and habitat are anticipated to be minor.

Auto Tour. Under Alternative D, vehicle travel and incidental public use along the auto tour route would result in long-term adverse effects through introduction and dispersal of invasive non-native species, habitat fragmentation, wildlife disturbance, and wildlife injury or fatality from vehicle strikes (Spellerberg 1998). In addition, vehicle traffic and public use along the route would increase the risk of human-caused wildfire ignitions. Road construction activities would have both short- and long-term adverse effects on wildlife through disturbance, mortality and alteration of the physical environment (Trombulak and Frissel 2000). An auto tour route would attract increased visitor use in this area, with a concomitant increase in wildlife disturbance. However, with the implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be moderate. In addition, the auto tour route would provide some benefit to wildlife through reduced disturbance resulting from visitors traveling through areas in vehicles rather than engaging in out-of-vehicle activities (Holmes et al. 1993; Klein 1993).

Saddle Mountain Unit

Alternative B and B-1 would have minor beneficial effects on uplands by reducing adverse effects associated with public use, such as disturbance and disruption of wildlife behavioral patterns; habitat effects associated with soil compaction, vegetation disturbance, and introduction of non-native invasive plants; and increased risk of human-caused wildfire. Under Alternatives A, C, C-1, D, E and F, public access in this area would result in adverse effects as described above. Under Alternatives A, C-1, D and E, increased visitation associated with motorized access would result in greater effects than under Alternatives C and F. With

implementation of BMPs described in Section 4.0.1.2, adverse effects under Alternatives A, C, C-1, D, E and F are anticipated to be minor.

Wahluke Unit

West Access. Under Alternatives B–F, non-motorized access is anticipated to result in long-term wildlife disturbance, soil compaction, vegetation disturbance, introduction of non-native invasive plants, and increased risk of human-caused wildfire. With implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

Auto Tour. Effects under Alternative D would be similar to those described above for the auto tour route in the Ringold Unit under Alternative D.

4.2.2.4.9 Permit System

Under Alternative F, implementation of a permit system is anticipated to have negligible effects on wildlife and habitat.

4.2.3 Effects Analysis—Microbiotic Crust

4.2.3.1 Effects Common to All Alternatives

4.2.3.1.1 Surface-Disturbing Activities

Although microbiotic crust occurs in every unit of the Monument, its extent and frequency are in many cases related to past land use, fire history, soil types, and plant community structure. Farming, grazing, fire, irrigation and human disturbances have altered crust occurrences and connectivity. Under the CCP, direct effects on microbiotic crust would result primarily from surface-disturbing activities such as construction of facilities, vehicle traffic, and trampling. These activities lead to an increased risk of erosion and the introduction of invasive non-native species.

Trampling breaks up the sheaths and filaments holding the soil together and drastically reduces the capability of soil organisms to function, particularly in nitrogen fixation (Evans and Ehleringer 1993; Belnap et al 1994; Belnap 1995). Studies of trampling disturbance have noted that losses of moss cover, lichen cover, and cyanobacterial presence can be severe (10%, 33%

and 50% in different studies (Anderson et al. 1982)). As a result, runoff can increase by half, and the rate of soil loss can increase six times (Harper and St. Clair 1985).

Reasonably foreseeable activities, such as development of recreation facilities, rights-of-way, and interpretation/visitor services over the fifteen-year planning horizon, carry a potential for cumulative surface disturbance. Much of the surface disturbance associated with recreational facilities would occur in areas already disturbed by existing roads or other uses. In addition, visitor and equestrian use have the potential to cause surface disturbance and damage of microbiotic crust. Because microbiotic crust has not been extensively mapped in the Monument, the potential extent of damage resulting from public use and restoration efforts is difficult to estimate. However, it has been documented that damage to microbiotic crust structure occurs with only fifteen trampling passes, while visual evidence of bacteria and cryptogam cover was reduced to near zero after fifty passes. Some soil crust redevelops in just one to three years, with little visual evidence of disturbance after five years. However, surface irregularity remained low after five years, suggesting that recovery was incomplete (Cole 1990). Crust regeneration and recovery would be dependent on elimination of a continuing disturbance and distance to a source of crust innoculant (distance from an intact microbiotic crust area). Based on use estimates and BMPs, it is anticipated that effects to microbiotic crusts from reasonably foreseeable activities will be minor to moderate over the planning time frame.

4.2.3.1.2 Control of Non-native Invasive Species

Non-native plants and noxious weeds displace native species and affect the structure and function of microbiotic crust in surrounding areas. The threat of weed expansion in the Monument under all alternatives may have moderate indirect adverse effects on microbiotic crusts and microbiotic crust recolonization by altering plant community structure and function.

4.2.3.1.3 Restoration Activities

Vegetation restoration methods have the potential to cause some microbiotic crust disturbance over the fifteen-year planning horizon. However, revegetation methods would be used to restore native plant associations and would occur primarily in areas where soil crusts have been previously disturbed or have been recently disturbed by development or wildland fire. Other restoration activities in microbiotic crust areas would avoid disturbance through site planning and avoidance; however, some microbiotic crust may be disturbed through drill seeding or broadcast/harrowing activities associated with reestablishment of native species. Additionally, increased research on restoration ecology and microbiotic crust has the potential to develop new methods to restore disturbed areas to pre-disturbance conditions.

Restoration and maintenance of riparian areas to proper functioning condition would not adversely affect microbiotic crust because crusts are located primarily in upland shrub-steppe communities and not associated with riparian/riverine plant community associations.

4.2.3.1.4 Wildland Fire and Fire Suppression Activities

The degree to which microbiotic crusts are damaged by fires depends on the intensity of the fire. In areas where annual grass and weed species are prevalent, destruction and degradation of soil crusts would likely result from wildfires, as these fires burn hotter and faster than do wildfires under normal fire regimes in shrub-steppe ecosystems. Low-intensity fires, such as those in bunchgrass communities, do not remove all the structure of the crust, which allows for regrowth without significant loss (Natural Resources Conservation Service 1997a and 1997b). Perversely, although native vegetation in these low-intensity fire areas would regrow, damage to microbiotic crust from fire within intact native plant communities may lead to an increased chance for invasion of weed species and associated effects.

Fire suppression activities could result in adverse effects associated with surface disturbance. See the discussion of surface-disturbing activities above.

4.2.3.1.5 Wildlife Population Control Activities

Control methods would be used to reduce populations to a level consistent with species management objectives and in a manner that controls target populations without impairing Monument resources (e.g., soil, vegetation, habitats of other wildlife species). Site-specific control actions, such as aircraft herding of animals into trap corrals, net gunning, and helicopter transport of ungulates, would have some minor disturbance effects on microbiotic crust. Direct effects on microbiotic crust could result at trails, corrals, transport sites, staging areas, and other areas with soil-disturbing activities. Site-specific research on microbiotic crust would be initiated in potential control areas; disturbance would be minimized through site placement and operational controls/stipulations prior to plan initiation.

4.2.3.1.6 Public Use

Effects of visitor use on microbiotic crust would occur primarily from trampling and disturbance related to activities such as hiking and equestrian use. As described above, crust disruption can result in decreased organism diversity, soil nutrients, stability and organic matter. When the integrity of the crust is broken, soil is more susceptible to wind and water erosion and non-native plant species invasion. In addition, intact crust areas adjacent to disturbed areas can be buried through wind and water erosion processes (USGS 2001).

4.2.3.2 Effects of Biological Resource Management Actions

Under Alternative A, the use of IPM techniques (chemical, biological, cultural, mechanical) would be expected to cause minor disturbance of microbiotic crust. Currently, 5,000-9,000 acres are treated annually, with most control efforts conducted along existing roads, firebreaks and travel-ways. Spot treatments of isolated weed infestations away from established road systems by backpack and ATV-mounted sprayers (approximately 2,000 acres/year) cause minor disturbance of microbiotic crust; the effects are mitigated by the timing of treatments (i.e., conducting off-road work during spring and fall when soils and microbiotic crust are moist and resilient) and ensuring that disturbance does not occur repeatedly on the same area to the point that it exceeds disturbance threshold levels. Mechanical treatments include hand pulling of small infestations; this technique disturbs soils in localized areas only.

Restoration management actions planned for each alternative are described in Section 4.0.3.1.2. Shrub-steppe restoration activities carried out under Alternative A would focus primarily on lands disturbed by wildfire events, maintenance-related project work, Hanford Site mitigation, and noxious weed control efforts. Native plant reestablishment provides protection of microbiotic crust from displacement and competition from aggressive non-native species. Moderate microbiotic crust effects may occur through soil disturbance resulting from revegetation efforts (drill seeding, native shrub plantings, harrowing of broadcast native seed).

Alternatives B–F, as described in Section 4.0.3.1.2, provide for restoration of degraded shrub-steppe habitats and other disturbed areas to a natural range of native plant associations. Under Alternatives B–F, weed populations would be prioritized and treated annually on the basis of threats analysis and their potential for spreading and infesting adjacent lands. Alternatives B, B-1, C, C-1, E and F would treat significantly more acres than Alternatives A and D. Treatments would be followed with seeding/planting of native species to reclaim the lands once occupied by non-native species.

Alternatives B–F would have minor direct effects on microbiotic crust through increased ground disturbance resulting from mechanical weed treatments and native species restoration actions. Likewise, some minor short-term effects on microbiotic crust may occur through soil disturbance resulting from drill seeding or harrowing of broadcast seed applications. Levels of disturbance would be commensurate with the extent of restoration treatments. In many cases, microbiotic crust disturbance would be negligible because restoration efforts would be focused on lands that have little or no remaining crusts, and microbiotic crust disturbance would be further minimized through the implementation of BMPs prior to restoration activities. Research on the restoration of microbiotic crust would be initiated in these restoration areas. By improving plant community health, shrub-steppe restoration activities would ultimately benefit microbiotic crust reestablishment. Accordingly, microbiotic crust protection and recovery would be greatest under Alternatives B, B-1 and F, moderate under Alternatives C, C-1 and E, and least under Alternatives A and D. Beneficial indirect effects of non-native invasive species control would

include improving the health of native plant communities and reducing localized effects of weeds on microbiotic crust in shrub-steppe community interspaces.

Restoration activities on Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions. Under all alternatives, the demolition and disposal actions associated with scheduled DOE remediation activities on top of Rattlesnake Mountain would have little to no effects on microbiotic crust. Buildings identified for cleanup are on concrete foundations surrounded by gravel. Because microbiotic crust has long been absent from the site, cleanup efforts would not affect microbiotic crust. Intact microbiotic crust on adjacent lithosol soils could recolonize these rehabilitated areas over time following completion of cleanup and revegetation activities, resulting in a minor improvement in microbiotic crust conditions over the life of the CCP.

Effects on microbiotic crust of prescribed fires and emergency fire restoration projects would be evaluated prior to implementation, areas of intact microbiotic crust could be identified and avoided, and BMP's related to implementation of these projects would be used to protect microbiotic crust. The use of equipment to implement emergency fire rehabilitation actions has the potential for moderate effects on microbiotic crust by disturbing the soil surface. These actions also increase the short-term potential for wind and water erosion. In some cases, short-term minor-to-moderate detrimental effects to microbiotic crust would occur from these activities. However, long-term effects are anticipated to have minor to moderate benefits to microbiotic crusts, because reestablishment of native plant diversity and reduction of non-native plant species would increase the potential for microbiotic crust to re-colonize fire damaged areas.

4.2.3.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.2.3.3.1 Interpretive Site Development

Alternative A would have negligible effects on microbiotic crust, mainly because any potential interpretive sites would be located along major travel routes and constructed to avoid adverse effects. Interpretive sites under Alternatives B–F would be designed and placed to reduce effects on microbiotic crust; however, moderate long-term effects within the footprint of specific development sites may be unavoidable. Secondary effects from increased visitor use in and around the interpretive sites may occur. Minor, long-term effects on microbiotic crust are expected within a 1/4-mile radius of each development site.

Construction of other visitor facilities (e.g., trailheads, parking areas, pullouts, restrooms) causes surface disturbance; construction of visitor facilities in previously undisturbed areas could have

moderate effects on microbiotic crust. Additionally, visitors can be a primary transport vector for non-native invasive plant species. Construction of new sites has the potential to introduce weeds into areas where they have not previously been found. Prior to any construction, areas would be surveyed for microbiotic crust, and appropriate mitigation measures would be developed. Areas containing microbiotic crust would be avoided to the extent possible during placement of visitor facilities.

4.2.3.3.2 Interpretive Trail Systems

Because Alternative A does not provide for development of interpretive trails, negligible effects on microbiotic crust are anticipated.

Interpretive trails are anticipated to be an average of 1.5 miles and would be located to highlight examples of high-quality vegetation and other noteworthy resources. Care would be taken to site trails, trailheads and parking areas away from sensitive resources, while optimizing interpretation opportunities. Interpretive signs would convey the vulnerability of microbiotic crust and ask visitors to remain on the trail. Concentrating traffic on trails would avoid impacts to microbiotic crust, and consolidating existing traffic to trails could have minor, long-term beneficial effects on microbiotic crust.

4.2.3.4 Effects of Visitor Services Management Actions—Recreation

4.2.3.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Visitors pursuing big and upland game hunting activities in the Monument typically walk cross-country or follow game trails. These activities are dispersed across large areas that are open to hunting, the extent of which varies by alternative. Adverse effects of big and upland game hunting on microbiotic crust are anticipated to be negligible due to the seasonal use and the dispersed nature of travel used by hunters. Visitors hunting waterfowl in the Monument typically walk from a parking area to a desirable location, set up a blind, and remain stationary. In the past, hunters would dig waterfowl pass-shooting depressions along bluffs in the Wahluke Unit; however, this activity is no longer allowed. Most waterfowl hunters tend to use common footpaths between parking areas and hunting locations, resulting in surface disturbance along the Columbia River in the Ringold Unit and around the WB-10 Ponds and along bluffs above the Columbia River in the Wahluke Unit. Because waterfowl hunting takes place primarily on riparian or sandy soils where microbiotic crust is generally not present, negligible effects are anticipated.

Hunting – Alternative B-1

As the hunting program is believed to have negligible impacts to microbiotic crust on the Monument, there would be negligible impacts from discontinuing it.

4.2.3.4.2 Fishing

Because fishing activities occur on riparian soils where microbiotic crust is not present, negligible effects are anticipated.

4.2.3.4.3 Wildlife Observation and Photography

Under Alternatives B–F, minor beneficial effects would result from concentrating wildlife observation and photography activities in sites specifically designed to provide a quality experience while minimizing potential effects on microbiotic crust from trampling and disturbance. With implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be negligible.

4.2.3.4.4 Hiking

Under Alternative A, hiking activities are believed to have adverse effects on microbiotic crust as a result of trampling and disturbance at localized sites. Overall effects are believed to be minor due to the low level of use and relatively small area where hiking activity occurs. If cross-country hiking activities increase in the Monument under Alternative A, the severity of adverse effects could also increase.

Alternatives B–F could result in minor beneficial long-term effects on microbiotic crust by concentrating use on designated trail systems, reducing cross-country hiking and the likelihood of trampling in areas occupied by microbiotic crust. However, developed trail systems would likely result in increased hiking activity in the Monument. Intensified visitor use within 1/4 mile of trailheads and increased use along trail corridors would result in adverse effects as described above. Alternatives C, C-1, D and E would provide one or more hiking trails in the Rattlesnake Unit. However, with implementation of BMPs described in Section 4.0.1.2, and in view of the relatively small areas of microbiotic crust that would be affected by potential trail alignments, adverse effects under Alternatives B–F are anticipated to be minor.

4.2.3.4.5 Equestrian Use

Under Alternative A, cross-country equestrian travel is permitted in the Wahluke, Ringold and Columbia River Units. These activities are believed to have adverse effects on microbiotic crust as a result of trampling and disturbance. The extent of these effects is unknown, but they are estimated to be minor due to the low amount of use. Under Alternative A, an increase in equestrian use would result in increased severity of effects.

Under Alternatives B–F, the establishment of designated roads and trails for equestrian use and reducing or eliminating cross-country use could benefit microbiotic crust by reducing trampling effects. Again, developed trail systems would likely result in increased equestrian use in the Monument. Increased use within 1/4 mile of trailheads and increased use along trail corridors would result in adverse effects as described above. However, with implementation of BMPs described in Section 4.0.1.2, Alternatives B–F are anticipated to result in minor adverse effects on microbiotic crust.

4.2.3.4.6 Boat Launches

Under all alternatives, actions proposed at Vernita, White Bluffs, Ringold and the South Shore of the Columbia River are anticipated to have negligible effects on microbiotic crust because vehicle travel, boat launching, and ancillary activities would take place on existing hardened surfaces or in riparian plant communities where microbiotic crust does not occur.

4.2.3.4.7 Camping

Vernita

Under Alternative A, illicit camping activities are believed to have negligible adverse effects on microbiotic crusts because microbiotic crusts are not found in the affected area, which consists of riparian vegetation and sandy cobblestone substrate along the river. Under Alternatives D and E, providing developed camping opportunities at Vernita would lead to year-round increases in visitor use in the Monument. Depending on the associated visitor activities, increased visitation could have minor, long-term, adverse effects on microbiotic crust.

Boat-In

Under Alternatives C, C-1, D and E, campsites would be situated in the riverine corridor where microbiotic crust is not generally found; accordingly, negligible effects are anticipated. If campsites were located in areas near microbiotic crust, camping activities could result in long-

term adverse effects on crusts within a 1/4-mile radius of the campsites. However, with implementation of BMPs described in Section 4.0.1.2, effects are anticipated to be minor.

Saddle Mountain

Under Alternative D, provision of developed camping opportunities in the Monument would result in increased visitor use in the Monument overall. Campground development itself would have negligible effects on microbiotic crust, because it would occur in previously disturbed locations. Intensified visitor use within 1/4 mile of the campground could result in long-term adverse effects on microbiotic crust from trampling and disturbance. However, with implementation of BMPs described in Section 4.0.2 and the relatively limited occurrence of microbiotic crust in the previously disturbed proposed campground vicinity, Alternative D is anticipated to result in minor, long-term, adverse effects on microbiotic crust.

4.2.3.4.8 Modified Public Access

Columbia River Unit

Riverlands. Under Alternative A, public access would continue to result in trampling and disturbance of microbiotic crust, although effects are anticipated to be minor due to the limited occurrence of crusts in the habitat types that occur in this area. Alternatives B, B-1, C, C-1, D, E and F could result in minor beneficial effects by removing disturbance factors under Alternative A.

Sand Dunes. Under Alternatives C, C-1, D and E, trail access in the sand dunes is anticipated to have negligible effects due to the limited occurrence of crusts in the sand dune area.

South Shore. Under Alternatives C, C-1, D and E, access to the south shore is expected to result in negligible adverse effects on microbiotic crust because they do not occur in association with riparian or riverine plant communities in the Monument.

North Shore. Effects would be similar to those described for the South Shore.

Ringold Unit

Parking. Under Alternatives B–F, removal of excess parking lots is expected to result in negligible short-term effects on microbiotic crust, because parking lots are located in highly disturbed vegetation communities with no crust component. Over the long term, with restoration and protection from disturbance, these alternatives could result in beneficial effects on microbiotic crust by providing opportunities for their reestablishment.

Auto Tour. Under Alternative D, establishment of an auto tour route and incidental public use within the route corridor would result in long-term, adverse effects on microbiotic crust as described in Section 4.2.3.1.6. With implementation of BMPs described in Section 4.0.1.2 and the previously disturbed condition of this area, adverse effects on microbiotic crust are anticipated to be minor.

Saddle Mountain Unit

Alternatives B and B-1 would have minor beneficial effects on microbiotic crusts by reducing trampling and disturbance associated with public use. Public access in this area under Alternatives A, C, C-1, D, E and F would result in some effects through increased trampling and disturbance. Alternatives A, C-1, D and E would allow motorized access to the top of Saddle Mountain, leading to greater numbers of visitors and greater adverse effects than Alternatives C and F. However, with implementation of BMPs described in Section 4.0.1.2, and the relatively small expected occurrence of microbiotic crust within the habitats of the affected area, adverse effects under Alternatives A, C, C-1, D, E and F would be minor.

Wahluke Unit

West Access. Alternative A would result in no change on microbiotic crust by continuing to limit access and associated disturbance in the western portion of the Wahluke Unit. Alternatives B–F would provide for non-motorized access in this area, with resultant trampling and disturbance of microbiotic crust. Intensified visitor use within 1/4 mile of access points would result in additional effects as described above. However, with implementation of BMPs described in Section 4.0.1.2 and the relatively small expected occurrence of microbiotic crust in this area, adverse effects from Alternatives B–F are expected to be minor.

Auto Tour. Effects would be similar to those described above for the auto tour route in the Ringold Unit.

4.2.3.4.9 Permit System

Implementation of a permit system under Alternative F is anticipated to have negligible effects on microbiotic crust.

4.2.4 Effects Analysis—Sensitive Plant Communities

To date, approximately 80,057 acres of existing high-quality, functional shrub-steppe plant communities have been mapped and characterized in the Monument.[155] These communities are considered 'sensitive.'[156] Currently there are 9,568 acres of sensitive plant communities mapped in the Columbia River Unit, 50,505 acres in the Rattlesnake Unit, 1,074 acres in the Ringold Unit; 3,490 acres in the Saddle Mountain Unit; and 16,420 acres in the Wahluke Unit. A more extensive vegetation inventory needed for the Rattlesnake Unit would increase this total. On the other hand, since the creation of the Monument in June 2000, five catastrophic fire events have altered the shrub component on more than 100,000 acres of Monument lands. With every major fire event, the importance of remaining native plant communities in the Monument increases.

4.2.4.1 Effects Common to All Alternatives

4.2.4.1.1 Restoration Activities

Upland habitat restoration efforts would be implemented on identified at-risk rare and sensitive plant communities. Restoration activities would focus on disturbed sites within sensitive plant communities or on adjacent sites that threaten the ecological integrity of these communities. Over time, habitat restoration efforts are expected to result in long-term benefits by improving the longevity and population numbers of at-risk rare and sensitive plant communities.

4.2.4.1.2 Public Use

Visitor use would affect sensitive plant communities primarily through the introduction and spread of invasive species and through human-caused wildfire events. The spread of non-native invasive species in remote areas of the Monument is of particular concern, because populations may become established within sensitive plant communities before they are detected and treated. In addition, such species can increase the fuel loads and flammability of sensitive plant communities, thus increasing the severity of wildfire events. However, because public use

[155] These plant communities are generally characterized by 10–25% native shrub cover (sagebrush species, spiny hopsage, antelope bitterbrush, winterfat, and black greasewood), at least 20% native grass cover as dominant species in the understory, and a low incidence (less than 20% cover) of non-native species.

[156] Sensitive plant communities, for the purpose of this analysis, are plant communities that represent foundation shrub-steppe plant associations of the Columbia Basin that have been diminished throughout their range by past and present land management activities; the designation includes those plant communities identified as "element" occurrences by the WNHP.

activities would be allowed to occur at locations away from at-risk rare and sensitive plant communities, impacts to at-risk rare and sensitive plant communities from public use activities are expected to be minor.

4.2.4.2 Effects of Biological Resource Management Actions

Under Alternative A, the use of IPM techniques (chemical, biological cultural, mechanical) would be expected to cause minor disturbance of sensitive plant communities. Most control efforts are conducted along existing roads, firebreaks and travel-ways. Spot treatments of isolated weed infestations away from established road systems by backpack and ATV-mounted sprayers would have minor effects because treatments would be conducted in early spring and fall when plant communities are less susceptible to injury. Mechanical treatments include hand pulling of small infestations; this technique disturbs soils in the immediate treatment area only.

Under Alternatives B–F, weed populations would be prioritized and treated annually on the basis of threats analysis and potential for spreading and infesting adjacent lands. Alternatives B, B-1, C, C-1, E and F would treat significantly more acres than Alternatives A and D. Many treatments would need to be followed with seeding/planting of native species to reclaim the lands once occupied by non-native species.

Alternatives B–F would entail conducting annual shrub-steppe restoration activities on degraded shrub-steppe habitats or otherwise disturbed areas to return these sites to a natural range of native plant associations. Restoration activities would focus on disturbed sites within sensitive plant communities or on adjacent sites that threaten the ecological integrity of these communities. Treatments could include non-native invasive species treatment, native shrub plantings, and seeding of native species (broadcast, broadcast/harrow, drill seeding). Hand planting of shrubs and native seedlings and IPM techniques would have minor effects on sensitive plant communities. On undisturbed ground, Alternatives B–F would have minor direct effects on sensitive plant communities through increased ground disturbance resulting from mechanical weed treatments and native species restoration actions.

Minor effects on existing shrub cover may occur through revegetation efforts (drill seeding, native shrub plantings, harrowing of broadcast native seed). Shrub-steppe restoration activities would improve plant community health and longevity; direct effects are expected to be minor. Reestablishment of native plant communities would improve habitat and protect native species from displacement and competition by aggressive non-native species. Beneficial indirect effects of non-native invasive species control would include improving the health of native plant communities, improving habitat function, reducing the potential rates of spread of wildland fire, and protecting sensitive plant communities from disturbance and non-native species invasion or encroachment. For example, in the Wahluke Unit, shrub-steppe restoration activities could

include treatment of approximately 25,000 acres over a fifteen-year period to protect and improve big sagebrush plant communities.

No reasonably foreseeable effects on sensitive plant communities would be expected through the implementation of wildlife population control efforts in the Monument.

4.2.4.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.2.4.3.1 Interpretive Site Development

Under Alternative A, interpretive activities are limited and have negligible adverse effects on sensitive plant communities. If such activities increased in the future under Alternative A, the severity of adverse effects would also increase.

Under Alternatives B–F, reasonably foreseeable effects on sensitive plant communities would be minor. New interpretive sites would be sited, designed and constructed to avoid significant adverse impacts to sensitive plant communities. Interpretative messages would address ongoing management activities to study, protect and enhance sensitive plant communities and techniques to minimize impacts from recreational use. Indirect adverse effects would include the increased danger of wildfire from visitor use; however, the risk would not increase significantly.

4.2.4.3.2 Interpretive Trail Systems

Impacts under Alternative A would be similar to those described above for interpretive site development.

Under Alternatives B–F, interpretative trail systems would be designed to avoid adverse impacts to sensitive plant communities, although it would be desirable to route trails near such areas to provide visitor with first-hand views of these communities. Interpretive messages would address ongoing management activities to study, protect and enhance sensitive plant communities, and techniques to minimize impacts from recreational use. Beneficial effects could include the reduction of trampling in sensitive areas by concentrating existing visitor use on established trails.

4.2.4.4 Effects of Visitor Services Management Actions—Recreation

4.2.4.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Under all alternatives, hunting activities would occur on the Wahluke, Ringold and Saddle Mountain Units. Hunting activities, especially those that involve remote areas of the Monument, would result in some degree of invasive weed spread and an increased risk of human-caused wildfire. However, with implementation of BMPs described in Section 4.0.1.2 and the stipulations in the Hunting Compatibility Determination (see Appendix I), adverse effects on sensitive plant communities are anticipated to be minor.

Hunting – Alternative B-1

As the hunting program is believed to have minor impacts to sensitive plant communities and an increased risk of human-caused wildlife on the Monument, there would be negligible impacts from discontinuing it.

4.2.4.4.2 Fishing

Effects of fishing activities on sensitive upland plant communities are anticipated to be negligible. Effects on sensitive plant communities associated with riverine habitats are addressed in Section 4.3.2.5.2.

4.2.4.4.3 Wildlife Observation and Photography

With implementation of BMPs described in Section 4.0.1.2, effects under all alternatives are anticipated to be negligible.

4.2.4.4.4 Hiking

Under Alternative A, hiking activities are believed to be minimal, with negligible adverse effects on sensitive plant communities. If hiking activities increase under Alternative A, the severity of adverse effects would also increase. Alternatives B–F would concentrate hiking on designated trail systems that would be routed to avoid sensitive plant communities to the extent possible. Because trail systems would not likely be able to entirely avoid these communities, and because it is anticipated that developed trail systems would result in increased hiking

activity in the Monument, some degree of adverse effect is anticipated, as described in Section 4.2.4.1.2. However, with implementation of BMPs described in Section 4.0.1.2, the severity of adverse effect is anticipated to be minor.

4.2.4.4.5 Equestrian Use

Because of their low levels, equestrian activities under Alternative A are believed to have negligible adverse effects. However, an increase in equestrian use over current levels, especially cross-country use, would likely result in increased adverse effects to sensitive plant communities. Alternatives B–F would protect sensitive plant communities by establishing designated roads and trails for equestrian use. However, equestrian use is anticipated to increase with the advent of designated trails with a commensurate increase in adverse effects, especially the spread of non-native invasive plants, though with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

4.2.4.4.6 Boat Launches

The effects related to boat launches are addressed in Section 4.3.2.5.6.

4.2.4.4.7 Camping

Vernita

The effects related to camping at Vernita are addressed in Section 4.3.2.5.7.

Boat-In

The effects related to boat-in camping are addressed in Section 4.3.2.5.7.

Saddle Mountain

Under Alternative D, campground development would have negligible effects as development would occur in a previously disturbed area away from sensitive plant communities. However, developed camping opportunities would promote increased visitor use in the Monument, with a probable increase in adverse effects from the activities discussed in Section 4.2.4.1.2. With implementation of BMPs described in Section 4.0.1.2, these adverse effects would be minor.

4.2.4.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore; North Shore; and South Shore. Effects related to modified public access are addressed in Section 4.3.2.5.8.

Sand Dunes. Access to the sand dunes on designated trails under Alternatives C, C-1, D and E would result in adverse effects as described in Section 4.2.5.1. With implementation of BMPs described in Section 4.0.1.2, those adverse effects are anticipated to be minor.

Ringold Unit

Parking. Under Alternatives B–F, removal of excess parking lots would reduce the number of areas needing operations maintenance and upkeep in the Monument, freeing additional resources for management actions that support sensitive plant communities such as invasive species control and fire prevention. Beneficial effects are anticipated to be minor.

Auto Tour. Under Alternative D, vehicle travel and incidental public use occurring along the auto tour route would contribute to an increased risk of the spread of non-native invasive species and human-caused wildfire events. With implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

Saddle Mountain Unit

Alternative B and B-1 would have minor beneficial effects by reducing adverse effects associated with public use, including the spread of invasive non-native species and human-caused wildfire events. Public access in this area under Alternatives A, C, C-1, D, E and F would result in adverse effects as described above. Alternatives A, C-1, D and E would allow motorized access to the top of Saddle Mountain, causing increased visitation and a correspondingly higher risks of the spread of invasive non-native species and wildfire events from vehicle use than would Alternatives C and F. With implementation of BMPs described in Section 4.0.1.2, adverse effects under Alternatives A, C, C-1, D, E and F are anticipated to be minor.

Wahluke Unit

West Access. Under Alternatives B–F, non-motorized access would result in adverse effects on sensitive plant communities as described in Section 4.3.2.1.5. With implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

Auto Tour. Effects under Alternative D would be similar to those described for the auto tour route in the Ringold Unit.

4.2.4.4.9 Permit System

Under Alternative F, implementation of a permit system is anticipated to have negligible effects on sensitive plant communities.

4.2.5 Effects Analysis—Threatened, Endangered and Sensitive Species

A number of plant and animal species that are considered to be rare and of management concern occur in the Monument. Species are listed by the federal government as endangered, threatened, or candidate species under the ESA (50 CFR 17), or as species of concern; species are also listed as endangered, threatened, or candidate species by the state of Washington (WNHP 2004; WDFW 2004). Section 3.9.5 (Endangered, Threatened, Rare or Sensitive Plants) presents complete descriptions of these species and their respective habitats.

Federally listed T&E and candidate species and species of concern on the Hanford Site comprise three fish species, one bird species, one mammal species, and two plant species. Spring-run Chinook salmon and steelhead are federally listed as endangered, although only upper Columbia River steelhead spawn in the Hanford Reach; the extent of natural spawning is not known. Bull trout are federally listed as threatened. Western sage grouse, Washington ground squirrel, White Bluffs bladderpod, and Umtanum desert buckwheat are federal candidates for listing under the ESA.

Persistent sepal yellowcress, Umtanum desert buckwheat, American white pelican, and sandhill crane are state-listed endangered species. Awned halfchaff sedge, desert dodder, Geyer's milkvetch, grand redstem, loeflingia, lowland toothcup, rosy pussypaws, White Bluffs bladderpod, white eatonella, bald eagle, ferruginous hawk, and western sage grouse are state-listed threatened species. Awned halfchaff sedge, grand redstem, lowland toothcup, and persistent sepal yellowcress are wetland species restricted to river riparian zones. Bull trout, spring-run Chinook salmon, and Upper Columbia steelhead are state candidate species.

Chapter 3 provides an exhaustive list of Washington State candidate and sensitive plant and wildlife species that occur in the Monument. Six shrub-steppe dependent species worth noting for this analysis are burrowing owl, loggerhead shrike, sage sparrow, sagebrush lizard, Townsend's ground squirrel, and black-tailed jack rabbit. These species depend on shrub-steppe habitat for most if not all of their life stages and have suffered substantial decline, due primarily

to the conversion of shrub-steppe lands through agricultural and urban development, wildland fires, and invasion of non-native species.

Section 3.10.3.1 describes insect species that occur on the Monument. Approximately 1,500 species of insects have been identified; however, the number of insect species that actually occur in the Monument may be as high as 15,500. Surveys conducted by TNC identified 43 taxa new to science and 142 new findings in Washington State (Soll et al. 1999). Butterflies, grasshoppers and darkling beetles are among the most conspicuous of these findings, suggesting that the Monument still retains an assemblage of microhabitats large enough to support fauna that was once widespread throughout the arid interior West.

In addition to those species on the Hanford Site, four additional federally listed species may be present in Benton, Franklin and Grant Counties. The Columbia Basin Pygmy rabbit is a state- and federally listed endangered species that was most recently restricted to a few small populations north of the Monument in Grant and Adams Counties; however, recent survey efforts have failed to locate this species in the wild. Ute ladies-tress is a federally listed threatened orchid that has never been observed near the Hanford Site, but it is documented in Chelan and Okanogan Counties (WNHP 2007) and could potentially be found along the Columbia River. Yellow-billed cuckoo is a federal candidate species that has rarely been observed in southeastern Washington. Northern wormwood is a federal candidate and state-listed endangered species that occurs along the Columbia River near Wanapum Dam, although extensive surveys along Hanford Reach shorelines have failed to locate this species in the Monument.

4.2.5.1 Effects Common to All Alternatives

Effects on TE&S species populations result primarily from loss or modification of habitat through disturbance; soil erosion and compaction; vegetation trampling; and the introduction and spread of invasive non-native species, such as salt cedar, knapweed, purple loosestrife, and reed canarygrass. The implications or consequences of adverse effects on TE&S species are often exacerbated by such species' smaller and sometimes localized populations and specialized habitat requirements. Restrictions on surface-disturbing activities, mechanisms to control visitor use, fire prevention and control, habitat restoration, and an active weed control program all contribute to the protection and promote recovery of special-status plant species.

4.2.5.1.1 Control of Non-native Invasive Species

Actions to control non-native invasive species could have minor effects on TE&S species. For example, under Alternative A, IPM control measures coupled with restoration activities on degraded shrub-steppe areas totaling approximately 5,500 acres per year would have minor

effects on TE&S species. Projects would be designed and implemented to reduce adverse effects on listed species. Nevertheless, some effects could occur; these could include temporary wildlife disturbance brought about by human activity and the operation of machinery in treatment areas, as well as short-term effects on certain non-target plant species during IPM treatments. Anticipated effects on TE&S species may include short-term adverse effects on individual plants, but this would not reduce or substantially affect the population of such species locally, regionally, or globally.

4.2.5.1.2 Restoration Activities

Most restoration actions would likely be beneficial to the recovery and conservation of these species. Complete inventories of the Monument are necessary to more accurately identify TE&S species and their associated habitats in order to implement comprehensive protection measures through land management actions. All restoration projects would require field inventories, project design and layout, NEPA analysis, and the avoidance of known and identified TE&S species prior to project implementation. The FWS would continue to work with private, county, state and federal partners, as well as adjacent land managers, to protect and restore TE&S populations and habitat.

4.2.5.1.3 Wildlife Population Control Efforts

No reasonably foreseeable effects on TE&S species are expected to result from the implementation of wildlife population control efforts in the Monument.

4.2.5.1.4 Public Use

Adverse effects of visitor-related activities on TE&S species would result primarily from loss or modification of habitat, including changes in vegetation community structure and composition, soil compaction, and establishment of invasive species; disturbance and modification of diurnal and seasonal wildlife behavioral patterns caused by the visible and audible presence of people, vehicles, watercraft, and domestic animals such as horses and dogs; habitat fragmentation associated with trails, roads and other recreation site development; and injury and mortality from vehicle strikes. In addition, effects would result from human-caused wildfire.

4.2.5.2 Effects of Biological Resource Management Actions

4.2.5.2.1 TE&S Plants

Alternative A

Non-native invasive plant species pose a serious threat to TE&S plant species. Under Alternative A, the use of IPM techniques (chemical, biological, cultural, and mechanical) would have minor effects on TE&S plant species. Spot applications that treat isolated weed infestations off established road systems may create minor disturbance of soils and vegetation, but would not affect plant community composition or non-target species. More general invasive species treatments, such as broad-spectrum weed control techniques (chemical and mechanical) along major transportation routes and within established firebreaks, may affect non-target native plants. The use of chemicals in broadcast spraying operations to treat non-native invasive species has the potential to directly affect some non-target species. These effects can be minimized through the use of carefully planned applications guided by GPS technology. Employees or contractors with appropriate licence and certification would be responsible for using chemicals according to federal and state guidelines and would take precautions to prevent possible effects on non-target plant species.

An active noxious weed control program would focus on the removal of non-native invasive species in the most sensitive of habitats, such as special-status species populations. Priority weed treatments are conducted annually, and known rare plant populations are avoided. The early treatment of small weed populations protects associated plant communities from further degradation; this is an indirect beneficial effect.

Under Alternative A, rehabilitation activities described in Section 4.0.3.1.2 would ensure that existing TE&S inventories are reviewed and field verified, or that new surveys are conducted prior to initiation of rehabilitation treatments. Known TE&S populations are avoided and are consequently not disturbed by seeding and planting efforts.

Alternatives B–F

Under Alternatives B, B-1, C, C-1, D, E and F mechanical and cultural IPM treatments would have minor effects on TE&S plant species. Both treatment types would potentially disturb soils through mechanical removal (hand pulling, disking, mowing) of weed species followed by the seeding of native species. Such treatments would be conducted only when it has been determined that these areas should be considered high priority for treatment because non-native invasive species threaten the ecological integrity of the area. Moreover, spot treatments would be used to avoid effects on non-target species. TE&S plants species known to exist in the project areas would be protected from disturbance through project-level inventories followed

by appropriate planning and implementation. Moderate to major indirect beneficial effects would be expected to result from the reduction or elimination of invasive species in sensitive plant communities, leading to reduced erosion and sedimentation, improved plant community stability, enhanced wildlife habitat, and increased habitat connectivity.

Rattlesnake Mountain

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions through the demolition and disposal actions associated with scheduled DOE remediation activities. Under all alternatives these actions would provide improved upland habitat for TE&S species on top of Rattlesnake Mountain. Direct effects on TE&S species would be minor. Disturbance from demolition activities and soil disturbance in the removal of building materials, asphalt, gravel and concrete foundations would have limited and short-term effects on TE&S species. Minor, indirect, beneficial effects would include improvement of upland habitat by using native plantings for site stabilization, reduced noxious weed establishment, and reduced mortality of wildlife species from guy wires and entrapment in existing structures. Known TE&S populations would be avoided during cleanup activities. Under alternatives B, B-1, C, C-1 and F, restoration activities could include the removal of the observatory, along with the other buildings and structures, and the effects would be similar to those described above. Under alternatives A, D and E, the observatory building and associated utilities could be retained, and therefore minor effects, including disturbance of TE&S wildlife species and plant communities and the potential for the introduction or spread of non-native invasive species, although reduced (due to the removal of other structures), would not be eliminated.

Fire

Direct effects of wildland fire on TE&S species and habitats can range from minor to major, depending on the size, location and intensity of the fire. Effects include loss of individual specimens or local populations; modification of habitat structure (litter, soil temperature, hydrologic function, nutrients, soil microbial action, and plant community function); and loss of habitat. Indirect effects include a loss of shrub-steppe habitats, native seed banks, and species diversity; increased erosion; and establishment of non-native invasive species.

4.2.5.2.2 TE&S Fish

Wildland fire and upland habitat degradation pose the largest threat to habitat loss for listed species. For example, the sloughing of the White Bluffs is currently affecting spawning habitat for steelhead; erosion leads to silt deposition on spawning gravels and is causing the Columbia River channel to shift southward. Wildland fires and the spread of non-native invasive species

that adversely affect shrub-steppe habitats could degrade hydrologic functions of upland areas and cause additional sediment transport into the Columbia River.

Management actions proposed in this CCP would not significantly impact TE&S fish species. IPM and restoration actions would have negligible effects on fish species because wide buffers would be maintained to protect riverine and aquatic habitats. Restoration actions would have minor, indirect, beneficial effects on all fish populations by improving upland and riparian habitat conditions, thereby reducing erosion, improving hydrologic cycles, and improving water quality and quantity. Improved upland and riparian habitats could lead to increased viability of fish populations through habitat stabilization and improvement.

4.2.5.2.3 TE&S Birds

Under all alternatives, implementation of management actions would cause short-term disturbance of some listed species, such as bald eagle and ferruginous hawk. For example, IPM actions and restoration activities could temporarily displace wintering bald eagles from roosting areas, but these would be minor effects of short duration as treatments would be timed to avoid potential disturbance of TE&S species (Stalmaster and Newman 1978; White and Thurow 1985).

4.2.5.2.4 TE&S Mammals and Reptiles, Species of Concern, and Species New to Science

Proposed management actions would have negligible effects on mammals and reptiles, species of concern, and species new to science. As described above, IPM and restoration actions would cause short-term disturbance of insects and other species (e.g., burrowing owls, loggerhead shrikes, sage sparrows, sagebrush lizards, black-tailed jack rabbits). The planning and implementation of projects would take into account the critical life stages of each of these species and would time implementation of activities to avoid adverse effects. Restoration and IPM activities would cause short-term disturbance and displacement of these species but would have negligible direct effects. Restoration actions would have moderate indirect effects related to improving upland and riparian habitat conditions, thereby reducing erosion, improving hydrologic cycles, and improving habitat quality and connectivity. Improved upland and riparian habitats could lead to an increase in the viability of individual species through habitat stabilization and improvement.

Wildland fire and the spread of non-native invasive species would adversely affect shrub-steppe habitats through shrub and perennial vegetation loss, habitat degradation and fragmentation, direct mortality, and increased predation. Loss of late-successional habitat could be a serious threat to biological diversity because it would reduce the diversity of available habitats and microhabitats (Smith 1996).

4.2.5.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.2.5.3.1 Interpretive Site Development

Interpretive site development is not planned under Alternative A; therefore, negligible adverse effects on TE&S species are anticipated.

Under Alternatives B–F, foreseeable direct effects on TE&S species would be minor. New interpretive sites would be sited, designed and constructed to avoid impacts. Interpretive site design could reduce existing effects by placing parking lots, trails and interpretative facilities away from sensitive habitats or, if appropriate, installing protective devices for sensitive plants where needed. Adverse effects would include the increased danger of wildfire from visitor use and the potential removal of sensitive plants by vandals; these effects would be minor. An increase in developed interpretive sites under Alternatives B–F would provide the visiting public the opportunity to learn about these species; ongoing management activities to study, protect and enhance their populations and habitat; and techniques to minimize impacts from recreational use.

4.2.5.3.2 Interpretive Trail Systems

Under Alternative A, interpretive trails would not be established in the Monument. There would be a negligible effect on TE&S species.

Under Alternative B–F, interpretive trails would provide increased opportunities to learn about TE&S species, their habitats, reasons for their decline, and techniques to minimize impacts from recreational use. The likely corresponding increase in visitation from providing interpretive trails could have a minor adverse effect on TE&S and their habitats. However, providing visitors with specific trails would likely have minor beneficial effects on TE&S species as visitors would be directed away from sensitive species or areas.

4.2.5.4 Effects of Visitor Services Management Actions—Recreation

4.2.5.4.1 Hunting

Compared to many national wildlife refuges, the Monument has few endangered plant or wildlife species, and several of those are anadromous fish, which would not be impacted by a recreational hunting program.

Hunting – Alternatives A, B, C, C-1, D, E and F

Adverse effects of hunting activities on T&E species would result primarily from loss or modification of habitat, including changes in vegetation community structure and composition, soil compaction, and establishment of invasive species; disturbance and modification of diurnal and seasonal wildlife behavioral patterns caused by the visible and audible presence of people, vehicles, watercraft and domestic animals, such as horses and dogs; and/or habitat fragmentation associated with trails, roads and recreation site development. In addition, adverse effects could result from human-caused wildfire. Impacts to vegetation and habitat from hunting were determined to be minor; any impacts to T&E species from habitat modification would also be considered to be minor. The impact to wildlife from disturbance related to hunting was also identified as localized and minor; any impact to T&E animal species from disturbance would also be considered minor.

Because hunting season takes place in the autumn/winter months, typically the months in which the Monument receives most of its precipitation for the year, fire danger is generally low. As such, the risk of fire that would modify vegetation or habitat that would subsequently affect T&E species on the Monument is considered to be a very low probability.

Hunting activities could result in the take of T&E species through mistaken identity or illegal poaching. Species that may be susceptible include American white pelican (state endangered), bald eagle (state threatened), ferruginous hawk (federal species of concern, state threatened), sandhill crane (state endangered), and western sage grouse (federal candidate, state threatened). Of these, sage grouse would be the most likely to be misidentified as one of the legally taken upland game birds; however, there are no known sage grouse present at this time. Other species, such as pygmy rabbits, are unlikely to be shot through misidentification as the Monument is closed to all rabbit hunting. The same is true of Washington ground squirrels as there is no varmint hunting of any type allowed. This does not preclude these species take through poaching. However, based on discussions with Monument staff, state wildlife personnel, and local law enforcement officers, such incidents—poaching and misidentification of species—are believed to be rare and isolated; thus the effects at the population level are anticipated to be negligible.

Hunting would not have any effect on listed fish species—spring Chinook, steelhead, or bull trout.

Hunting would have little direct effect on bald eagles, even though they may be present during hunting seasons, as hunting is not permitted within 1/4-mile of the Columbia River shoreline in the area most frequently used by bald eagles, which are generally found within 100 yards of the shoreline. There could be some minor disturbance impacts or a slight reduction of the prey base (i.e., waterfowl). Inversely, hunting of waterfowl species may serve to move ducks and geese within the Monument area, which could benefit bald eagles which rely on waterfowl for their primary prey during the winter months.

Hunting on the Wahluke Unit would have no effect on pygmy rabbits. Pygmy rabbits had been extirpated from Washington State, and the only known population in the wild is a recently introduced/experimental population on state land north of the Monument in Grant and Douglas Counties. In addition, the Wahluke Unit is closed to rabbit hunting of any kind.

Washington ground squirrels are a candidate species, and a small population of these squirrels occur on the Wahluke Unit near the crest of the Saddle Mountains. However, Washington ground squirrels are fossorial animals that are only above ground generally from mid-February through June each year. The rest of the year, they are estivating/hibernating inside burrows underground. During hunting season, these squirrels are not active and are underground. In addition, the Wahluke Unit is not open for hunting of squirrels of any kind. Except for the rare trampling of burrows by hunters or horses, hunting activity is unlikely to impact Washington ground squirrels in any way.

The population of sage grouse in Washington is considered to be a candidate for listing as a distinct population segment of greater sage grouse. Hunting on the Wahluke Unit would not likely jeopardize sage grouse as currently sage grouse have not been documented on this area of the Monument. Further, no hunting of grouse is allowed on the Monument.

Listed plant species are not likely to be affected by hunting on the Wahluke Unit. The majority of these plants are desert adapted forbs (broadleafed wildflowers); many of these plants actively grow and flower during the spring and summer and are dormant during the autumn and winter months when hunting occurs. Some of the plants are annuals and only appear in the spring under the right conditions and would not be affected by autumn/winter hunting seasons.

The White Bluffs bladderpod is a biannual plant that occurs along the river bluffs within the Wahluke Unit. During the hunting season, this plant will have already flowered and seeded for the season. Small rosette plants would be apparent, but these plants tend to grow in a small band on steep slopes of the White Bluffs. The few hunters that may walk through the area of the White Bluffs bladderpod populations would have negligible impact on the population.

In general, due to the seasonality and relatively low-level of hunting use currently on the Monument, impacts to listed T&E species are considered to be negligible to minor.

Hunting – Alternative B-1

Discontinuing hunting would have little impact to T&E species. As stated above, most T&E species are separated from impacts from hunting, either by seasonality or spatial relationship to hunted areas. Discontinuing hunting would not likely change conditions for these species.

4.2.5.4.2 Fishing

Fishing activities could result in the take of TE&S fish species—bull trout, spring-run Chinook salmon, and Upper Columbia steelhead—through mistaken identity, illegal harvest, or injury received from catch and release activities. In addition, litter, such as discarded hooks, lures, and fishing line, could injure or kill TE&S bird species such as American white pelican and bald eagle. Because such incidents are believed to be rare and isolated, effects at the population level are anticipated to be negligible.

4.2.5.4.3 Wildlife Observation and Photography

Under Alternative A, watercraft-based wildlife observation and photography activities would continue to disturb species that are seasonally conspicuous along the river corridor, such as American white pelicans and bald eagles, through noise, approaching or pursuing individuals, or lingering in important habitat areas. Wintering bald eagle foraging activities were found to be disrupted by boat and foot traffic on Washington's Skagit River (Stalmaster and Kaiser 1998). Current low levels of winter recreational use on the Hanford Reach are believed to have negligible adverse effects on TE&S species populations; however, if wildlife observation and photography activities increase over time, effects would increase in severity. Alternatives B–F could have a limited impact on TE&S species by concentrating wildlife observation activities in sites designed to provide a quality experience while minimizing potential effects; some degree of disturbance would likely occur as described in Section 4.2.5.1.4, especially from boating-based observation and photography activities in the river corridor. However, with implementation of BMPs described in Section 4.0.1.2, effects are anticipated to be minor.

4.2.5.4.4 Hiking

In general, the presence of trails and trail use can adversely affect TE&S species as described in Section 4.2.2.1.2. For example, curlews in the Monument nest in short grasslands, which are attractive to cross-country hikers because they are easier to traverse than denser vegetation communities dominated by trees or shrubs. Repeated disturbance of curlew nesting habitat can cause nest abandonment (Hamann et al. 1999). Hiking trails can create edge habitat for predators, potentially adversely affecting nesting habitats for species such as loggerhead shrikes, sage sparrows, and sage thrashers. Grassland birds have been found more likely to nest away from, rather than near, hiking trails in Colorado, and nests near trails experienced lower survival rates than nests away from trails (Miller et al. 1998). There is evidence that hiking activity in breeding songbird territories causes curtailment of singing activity in some species, which may reduce breeding activity (Gutzwiller et al. 1998).

Trail construction and use can affect vegetation communities along the trail. Mechanisms of change include vegetation removal, drainage and grading. Resulting changes in moisture and sunlight intensity, coupled with new vectors for invasive weed dispersal, can affect plant communities along trails (Cole 1978).

Under Alternative A, hiking activities would result in some degree of adverse effects through factors described in Section 4.2.2.1.2. Because of low use levels, these effects are believed to be negligible; however, if hiking activities increase over time, effects would increase in severity. Alternatives B–F would have beneficial effects by concentrating existing use on designated trail systems and reducing cross-country hiking and its associated effects. However, developed trail systems are also anticipated to result in increased visitor use and hiking activity in the Monument, contributing to some additional disturbance along designated trail corridors as described in Section 4.2.2.4.2, although with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

4.2.5.4.5 Equestrian Use

Effects of equestrian use and trails would be similar to those described above for hiking, with additional impacts from the increased severity of trampling and the spread of invasive species through horse excrement. Trampling effects of horses are more severe than those of humans due to hoof size and animal weight (Newsome et al. 2004). Trampling causes soil compaction and shearing as hooves cut through the soil surface. Erosion can increase after trampling because soil compaction reduces water infiltration and shearing dislodges soil particles (McClaran and Cole 1993). In addition, horse use on trails has been found to result in greater trailside vegetation disturbance, trail depth, and trail width than does hiking use; these effects are attributed to horses' size and weight as well as their tendency to wander from the trail (Weaver and Dale 1978).

Under Alternative A, continued equestrian use would adversely affect TE&S species through factors described in Section 4.2.2.5.5. The extent of these effects is unknown, but it is anticipated to be minor due to the infrequency of use. Under Alternative A, an increase in equestrian use over current levels would result in increased severity of effects. Alternatives B–F would result in beneficial effects on wildlife habitat by establishing designated roads and trails for existing and future equestrian use and reducing or eliminating cross-country use. However, equestrian use would continue to have long-term, adverse effects on wildlife and habitat along designated trail corridors as described above. With implementation of BMPs described in Section 4.0.1.2, adverse effects would be minor, though.

4.2.5.4.6 Boat Launches

Vernita

Due to the absence of habitat for TE&S species in the Vernita Bridge area, boat launching activities are anticipated to result in negligible effects. Boat launch development under Alternatives C, C-1, D and E is anticipated to result in increased boating use on the Columbia River; however, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

White Bluffs

The effects would be similar to those described for the Vernita Bridge area above.

Ringold

The effects would be similar to those described for the Vernita Bridge area above.

South Shore

Under Alternative D, providing developed boat launches could adversely affect bald eagle habitat by causing disturbance during the nesting season. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects would be minor.

4.2.5.4.7 Camping

Vernita

Due to the absence of habitat for TE&S species in the Vernita Bridge area, camping activities under Alternatives A, D and E are anticipated to result in negligible effects.

Boat-In

Establishment of non-motorized, boat-in campsites under Alternatives C, C-1, D and E, could adversely affect bald eagles, American white pelicans, long-billed curlews, and ferruginous hawks through disturbance as described above (see "Wildlife Observation and Photography" at 4.2.5.5.3). Seasonal closures and implementation of BMPs described in Section 4.0.1.2 would result in adverse effects being minor.

Saddle Mountain

The effects of a developed campground under Alternative D would be similar to those described for the Vernita Bridge campground above.

4.2.5.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Because this area does not overlap with sensitive habitat for TE&S species, effects are anticipated to be negligible under all alternatives.

South Shore. Providing access to the south shore could result in adverse effects on species, such as bald eagles, American white pelicans, long-billed curlews, and ferruginous hawks, through disturbance as described above (see "Wildlife Observation and Photography" at 4.2.5.5.3). However, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

North Shore. The effects would be similar to those described for south shore access.

Sand Dunes. Providing access to the sand dunes could result in adverse effects on species such as sagebrush lizards, Columbia River tiger beetles, loggerhead shrikes, burrowing owls, long-billed curlews, and Townsend's ground squirrels through disturbance as described in Section 4.2.2.1.2. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

Ringold Unit

Parking Lots. Because the affected areas do not provide sensitive habitat for TE&S species, effects are anticipated to be negligible under all alternatives.

Auto Tour. The presence of a road and vehicle use can adversely affect many TE&S species. For example, songbirds are sensitive to low noise levels and generally exhibit lower breeding densities and reduced species richness along roads than in control areas. Roads can serve as barriers to movement of wildlife taxa such as beetles and small mammals. Amphibians and reptiles are particularly susceptible to vehicle mortality on roads with low to moderate traffic (Formann and Alexander 1998). Roads also serve as conduits for invasive weed seed transport on vehicle undercarriages, which can rapidly collect and distribute weed seeds (Montana State University Extension Service 2002). An auto tour route under Alternative D is anticipated to result in adverse effects on species such as sage sparrows, loggerhead shrikes, sage thrashers, black-tailed jackrabbits, sagebrush lizards, striped whipsnakes, and a variety of insects through

disturbance as described in Section 4.2.2.1.2. However, with implementation of BMPs described in Section 4.0.1.2, effects are anticipated to be minor.

Saddle Mountain Unit

Under Alternatives A, C-1 and D, public access to the Saddle Mountain summit area would result in adverse effects on TE&S species such as sagebrush lizards, loggerhead shrikes, sage thrashers, sage sparrows, and black-tailed jackrabbits through disturbance as described in Section 4.2.2.1.2. With implementation of BMPs described in Section 4.0.1.2, effects are anticipated to be minor, though.

Alternatives B and B-1 would result in minor beneficial effects by removing the disturbance factors on the summit described above. Alternatives C and F would result in minor beneficial effects by removing the disturbance factor of vehicle use and reducing the number of visitors to the Saddle Mountain summit area.

Wahluke Unit

West Access. Non-motorized public access under Alternatives B–F would result in adverse effects on several TE&S species (long-billed curlews, sagebrush lizards, black-tailed jackrabbits, burrowing owls) through disturbance factors described in Section 4.2.2.1.2. However, with implementation of BMPs described in Section 4.0.1.2, effects are anticipated to be minor.

Auto Tour. The effects would be similar to those described for the Ringold auto tour route.

4.2.5.4.9 Permit System

The effects of a permit system under Alternative F are anticipated to be negligible.

4.3 Effects on Riverine and Other Aquatic/Wetland Resources

4.3.1 Assumptions

Effects on riparian resources are broadly similar to effects on wildlife and vegetation; these effects have been discussed in earlier sections where applicable. Comprehensive data collection

on riparian resources has not been completed at this time, but preliminary inventory information is available and has been used in the analysis where possible.

Effects on riparian resources result directly and indirectly from the removal of vegetation; the degradation of water quality; the construction and maintenance of facilities (e.g., recreation, communication, power transmission, irrigation); and vegetation trampling. Daily fluctuations in water levels caused by water releases for hydroelectric generation also affect riverine plant communities, shoreline integrity, individual species, and aquatic habitats. These activities change the composition of vegetative associations by causing surface disturbance and spread of non-native invasive species; increase erosion along shorelines; increase sediment deposition into riparian plant communities, leading to habitat degradation; and may directly affect roost and nest sites (Davis 1986).

Visitor use has the potential to cause surface disturbance; however, the extent and effects of such disturbance are difficult to quantify. Numerous factors could cause disturbance of these habitats, including bank fishing, recreational boating and associated shoreline use activities, beaching of watercraft, and boat wake effects.

Vegetation restoration methods have the potential to cause surface disturbance on approximately 800 acres within the Columbia River Unit over the fifteen-year planning horizon.

Protecting riparian resources in the Monument could include area and use restrictions; site-specific design plans and inventories for construction/improvements of facilities in riparian areas; limitations and restrictions on surface-disturbing activities; mechanisms to control visitor use; closure to vehicular travel of designated routes; monitoring of riparian areas; monitoring of vegetative conditions; restoration and revegetation provisions for all associated activities affecting riparian and wetland areas; and an active noxious weed removal program. Additionally, research would facilitate increased knowledge of these areas of the Monument, and the application of adaptive management principles would provide mechanisms for changing management based on the best available science.

River users constitute a large portion of the visiting public. Accordingly, many interpretive efforts will focus on providing Monument information and resource interpretation specifically targeting the boating public. The importance of protecting nesting and feeding wildlife from disturbance will be highlighted, as will be the fragility of riparian and riverine habitats.

4.3.2 Effects Analysis—Wildlife and Habitat

4.3.2.1 Effects Common to All Alternatives

4.3.2.1.1 Control of Non-native Invasive Species

Species such as salt cedar, rush skeletonweed, purple loosestrife, Russian knapweed, and Russian olive are prevalent in riparian areas, irrigation wasteways and settling ponds, seeps and spring areas. Non-native species would be treated as needed to complement riparian area restoration objectives. Adaptive management strategies and IPM techniques would be used to initiate treatment in sensitive and biologically diverse riparian plant communities. Project work would focus primarily on spot treatments of non-native invasive species populations that threaten the ecological integrity of adjacent lands and habitats. Spot treatments could use chemical, biological, mechanical or cultural (native species plantings) techniques to eradicate or reduce non-native invasive species in riparian habitats. Since non-native invasive species generally tend to reduce native biological integrity, control of non-native invasive species is expected to generally benefit native habitats and wildlife supported by native habitats.

4.3.2.1.2 Restoration Activities

Shrub-steppe restoration in upland areas as described in Section 4.0.3.1.2 would complement restoration activities in riverine and aquatic areas and would have negligible effects on riparian habitats. Beneficial indirect effects would be moderate; these would include the reduction or elimination of invasive species in native plant communities, leading to improved wildlife habitat conditions and wildlife biodiversity; improved hydrologic functions; stabilization of soils; and improvement of plant community structure, function and connectivity.

4.3.2.1.3 Wildland Fire and Fire Suppression Activities

Catastrophic wildfire is a major disturbance component that can destroy and degrade riverine/aquatic/wetland habitats. High-intensity fire events lead to an increased chance for invasion of weed species and associated effects on wetland habitats. Direct effects can be minor to major and include the loss of vegetation and riparian/aquatic habitat structure and function. The loss of trees in riverine systems directly affects nesting, roosting and foraging activities for avian species. Wetland areas are resilient in nature and recover more quickly than shrub-steppe habitats; however, wetland areas are also prone to encroachment of non-native invasive species. Some effects can be mitigated through BAER actions, but such efforts take some time to reverse

the adverse effects of catastrophic wildlife. Indirect effects would be minor to major depending on fire intensity and burn severity and would include loss of wildlife habitat and connectivity, vegetation biodiversity, wildlife diversity, increased erosion, and establishment of non-native invasive species.

4.3.2.1.4 Public Use

The effects of visitor use and facility development on riverine wildlife are associated with loss or modification of habitat, including soil compaction; increased soil erosion; changes in vegetation community structure and composition; spread of invasive species such as salt cedar, perennial pepperweed, purple loosestrife, reed canarygrass, Eurasian water milfoil, hydrilla and others; and an increased potential of human-caused wildfire.

Wildlife disturbance would result from the visible and audible presence of people, vehicles, watercraft and domestic animals such as horses and dogs. Disturbance effects on wildlife are well-documented and include altered behavior, such as flight and selection of suboptimal habitat (Klein 1993); physiological changes such as altered temperature and heart rate (Buckley 2004); and reduction of time and energy spent in primary activities such as feeding, resting, mating displays, and parental care (Frid and Dill 2002). Waterbirds can be especially vulnerable to disturbance because their size and physical beauty tend to attract humans (Carney and Sydeman 1999). Human disturbance of colonial nesting waterbirds, such as great blue herons and great egrets, has been found to cause reproductive failure, population decline, and displacement (Erwin 1989; Rodgers and Smith 1995; Skagen et al. 2001). In addition, wildlife injury and mortality would result from the harvest of game fish and wildlife species and from collisions between vehicles and wildlife (Ashley and Robinson 1996; Jones 2000).

The effects of boating on wildlife vary depending on the wildlife species; the season; and boat size, speed, noise level, and proximity (Delong 2002). The number of boats present is not necessarily an accurate indicator of disturbance level because the presence of a single boat can be just as disturbing as the presence of many (Knight and Knight 1984). Motorboats have been found to have the greatest disturbance potential because they involve both movement and noise, whereas non-motorized boats involve only movement (Knight and Cole 1995b). However, non-motorized boats can navigate along shallow shorelines and get very close to nesting waterbirds, also causing considerable disturbance (Speight 1973 as cited in DeLong 2002). During the breeding season, disturbance can cause nest abandonment, increased predation of young, and stress young birds (DeLong 2002). Breeding colonial waterbirds can be particularly susceptible because of their high-density nesting habits (Rodgers and Smith 1995). In the Hanford Reach, where there are relatively few stands of trees, colonial waterbird nesting areas are easily identified by the casual observer, further contributing to the vulnerability of such colonies to disturbance.

4.3.2.2 Effects of Biological Resource Management Actions

Under Alternative A, no riparian restoration is proposed; consequently, no direct or indirect effects on wildlife or habitat are anticipated.

Under Alternatives B–F, threats or actions adversely affecting the aquatic environment would be mapped and treated. A full range of treatments would be used to accomplish rehabilitation efforts; these include IPM techniques, removal of non-native vegetation, soil stabilization, and native plantings and seeding. Rehabilitation treatments would be prioritized and implemented annually on the basis of threat analysis, with the objective of restoring at-risk riparian areas to proper functioning condition. Moderate direct effects of project implementation would include soil disturbance in riparian plant communities associated with removal of non-native vegetation (e.g., Russian olive) and soil contouring; effects on soil stability, refuge and thermal cover, ecotones, edge effect, and nesting habitat; and short-term wildlife disturbance or displacement. In sensitive riparian plant communities where non-native species dominate and soil disturbance would adversely affect riverine habitats, the integrated application of many tools may be required (Katz and Shafroth 2003). Adaptive management strategies in concert with IPM techniques would be used to initiate treatment on sensitive and biologically diverse riparian plant communities. Restoration of wildlife habitat would be subject to project-level NEPA analysis.

Reduction or elimination of invasive species in native plant communities would have moderate, indirect, beneficial effects on resource conditions; wildlife habitat; and plant community structure, function and connectivity. Large populations of noxious weeds present in riverine areas of the Monument would require extensive treatments carried out in an integrated fashion to control species such as Russian olive, purple loosestrife, salt cedar, rush skeletonweed, and Russian knapweed. Indirect benefits of riparian restoration efforts include long-term soil and streambank stabilization, improvement of hydrologic function, reduced sedimentation, improved fish and wildlife habitat, and improved wildlife diversity.

Under Alternatives C, C-1, D and E, water control structures, dikes and ponds would be installed or repaired in appropriate areas surrounding irrigation waterways and artificial seeps on approximately 800 acres in the Wahluke Unit and 320 acres of seasonal wetlands in the Ringold Unit. These management activities would allow for enhancement of riparian habitat characterized by a mosaic of native shrubby thickets with patches of deciduous trees and grass/forb dominated understory and would benefit wetland-dependent species over the life of the CCP. Water management in these areas would allow for improved waterfowl and aquatic habitat characteristic of native faunal communities of the Columbia River; reduce non-native invasive species that now occupy the sites; provide opportunities for the reestablishment of native species; and create long-term wildlife habitat benefits for migratory species. However, the restoration of functional wetland systems overall would have minor indirect, beneficial effects, due to the small number of acres involved in these projects relative to the number of acres contained in the Monument. Minor direct effects would include short-term soil

disturbance and erosion associated with removal of non-native invasive species (e.g., Russian olive), dike construction, and soil recontouring activities. There would be minor long-term disturbance associated with annual ditch cleaning and system maintenance activities to maintain wetland vegetation and water control structures.

Under Alternatives B, B-1, C, C-1 and F, all restoration activities would be prioritized on the approximately 1,200 acres of riparian areas within the Columbia River and Rattlesnake Units where natural succession has been altered by disturbance. Disturbance factors have included river fluctuations associated with hydroelectric production; wildland fire; infrastructure development (power lines, monitoring stations, pumping stations, nuclear development and cleanup activities); public use effects; and accelerated erosion of the White Bluffs. Restoration activities would have minor direct effects on riparian areas; these effects would include soil disturbance and short-term sedimentation related to control of non-native invasive species, native plantings, and streambank stabilization projects. Indirect benefits from riparian restoration efforts include long-term soil and streambank stabilization, improved hydrologic function, reduced sedimentation, improved fish and wildlife habitat, and improved wildlife diversity.

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions through the demolition and disposal actions associated with scheduled DOE remediation activities. Under Alternatives B–F, DOE management activities on the summit of Rattlesnake Mountain would improve the aquatic habitat of one spring near the summit.[157] Buildings identified for cleanup would be removed and upland habitats would be restored. Minor direct effects would be anticipated to result from ground-disturbing activities to remove building materials, gravel and concrete foundations. Minor beneficial indirect effects would include site stabilization through seeding with native species, reduced noxious weed populations, and improved wetland habitat conditions.

Under Alternatives B–F, Monument-wide population control/herd management actions would be undertaken as needed on the basis of scientific resource management data. No direct effects on riverine/aquatic habitats are foreseeable or expected to result from these actions. Site-specific control actions, such as aircraft herding of animals into trap corrals, net gunning, and helicopter transport of ungulates, would not be conducted in areas where these activities would adversely affect riverine/aquatic habitats.

[157] A well and pumphouse at the spring on the north face of Rattlesnake Mountain was developed to provide water to the NIKE missile control center during the Cold War era. Removal of these facilities would improve this wetland habitat through scheduled DOE remediation activities on top of Rattlesnake Mountain.

4.3.2.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.3.2.3.1 Interpretive Site Development

Alternative A would have negligible effects on riverine and aquatic habitats. To minimize effects, existing informational signs are located at previously disturbed areas along major entry points and travel routes in the Monument.

Under Alternatives B, B-1, C, C-1 and F, interpretive sites would be located near visitor facilities (e.g., boat launches, river access points, trails, roads); under Alternatives D and E, they would be more widely dispersed. Developing visitor facilities and interpretive sites directly affects riparian resources by removing vegetation and causing ground disturbance, leading to erosion and increased sedimentation, and by visitor use around sites, resulting in further surface disturbance and soil erosion. Moreover, human activity is a primary mechanism for the transport of noxious weed species. Construction of new sites has the potential of introducing invasive non-native species into areas where they have not previously been found. The effects of such introductions are described in Section 4.4.2.4.1. Projected increases in use of all facilities would result in an increase in all these effects. Ease of access generally limits minor effects from use of interpretive sites to within 1/4 mile of the sites. Proper planning and placement of interpretive sites would be coupled with the use of informational signs, educational materials, trails, physical improvements, and law enforcement patrols to reduce and mitigate these effects.

4.3.2.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trails are planned. This would continue long-term adverse effects on aquatic and riverine ecosystems as these areas are currently subjected to the highest levels of visitor use and off-trail travel, and resource disturbance is uncontrolled in areas open to public use. With the increased visitation that is anticipated, these adverse effects would also increase.

Under Alternatives B–F, interpretative trail systems would directly affect riverine and aquatic habitats through the creation of some trail systems in and around riparian habitats. Trail construction would have moderate short-term effects and minor long-term effects. Effects include soil disturbance, vegetation loss, soil erosion, the spread and establishment of non-native invasive species, and an increased risk of wildland fire. Beneficial long-term effects include the reduction of impacts on surrounding sensitive riverine and aquatic resources by concentrating uses on established trail systems and enhancing interpretation and education opportunities.

4.3.2.4 Effects of Visitor Services Management Actions—Recreation

4.3.2.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

The effects would be similar to those described in Section 4.2.2.4.1.

Hunting – Alternative B-1

Effects would be similar to those described under Alternative B in Section 4.2.2.4.1.

4.3.2.4.2 Fishing

Fishing activities on the Monument result in the mortality of salmon, steelhead, bass, northern pikeminnow, whitefish and other species; however, annual population and harvest surveys conducted by the NOAA-Fisheries indicate that population-level effects from fishing are negligible. Angler wading activity in incubation (redd) areas has been found to cause mortality of salmon eggs during certain stages of embryonic development (Roberts and White 1992). Adverse effects of wading in the Hanford Reach are believed to be minor due to the lack of overlap between wading areas and redds. Under all alternatives, fishing and related activities (e.g., walking along shorelines, wading, float tubing, and boating) would continue to cause wildlife disturbance as described in Section 4.3.2.1.4. Discarded fishing line would continue to cause injury and mortality of birds through entanglement. With implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor because fishing pressure will not cause fish stocks to markedly decline, the physiological condition and production of fish populations will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted. Additionally, fishing activities may provide indirect beneficial effects by fostering increased appreciation and support for conservation of fish and associated natural resources.

4.3.2.4.3 Wildlife Observation and Photography

The effects would be the same as those described in Section 4.2.2.5.3.

4.3.2.4.4 Hiking

The effects would be the same as those described in Section 4.2.2.4.4.

4.3.2.4.5 Equestrian Use

The effects would be the same as those described in Section 4.2.2.4.5.

4.3.2.4.6 Boat Launches

Vernita

Under all Alternatives, vehicle access and recreation activities in the launch vicinity would result in minor adverse effects through disturbance and disruption of wildlife behavioral patterns, such as nesting, roosting, foraging and migration, as well as through increased rates of introduction of non-native invasive plant species. Under all alternatives, restricting vehicles to designated routes and a designated boat launch would have beneficial effects on wildlife by concentrating vehicle use in designated areas and eliminating cross-country vehicle use. However, unless rehabilitation efforts are implemented to restore areas affected by years of cross-county vehicle use, these beneficial effects would be negligible. Under Alternatives C, C-1, D and E, a developed boat launch would likely draw increased visitor use to this site and along the Columbia River Unit. Increased visitor use in the Columbia River Corridor Unit would result in adverse effects through disturbance as described in Section 4.3.2.1.4. In addition, minor, short-term adverse effects on wildlife would result from boat launch development. However, with implementation of BMPs described in Section 4.0.1.2, these effects are anticipated to be minor, especially in light of the area's proximity to a busy highway.

White Bluffs

Under Alternatives A, B, B-1, C-1, D, E and F, vehicle access and recreation activities in the White Bluffs launch vicinity would continue to have long-term, minor adverse effects through wildlife and habitat disturbance as described in Section 4.3.2.1.4. However, Alternatives C, E and F may result in reduction of these effects because the launch would be closed to motorized use, presumably decreasing usage levels. Alternative C would result in minor, beneficial, long-term effects on wildlife by increasing the difficulty of access for other boaters and reducing overall visitor use and disturbance of wildlife and habitat in the area. The seasonal waterfowl closure and the limited seasonality of use also mean that impacts are transitory and are greatest at times when wildlife is impacted the least (e.g., nesting seasons).

Ringold

Under Alternatives B–F, effects on wildlife and habitat from boat launch development are anticipated to be negligible due to the previously disturbed nature of this area associated with hatchery and irrigation return canal operations. Development of this launch site would result in increased use at the Ringold Fish Hatchery site, resulting in long-term, minor adverse effects

on wildlife in the immediate area through wildlife and habitat disturbance as described in Section 4.3.2.1.4. Providing a developed boat launch in this area would likely result in increased visitor use in the river corridor, resulting in disturbance factors constituting long-term, minor adverse effects as described in Section 4.3.2.1.1.

South Shore

Under Alternative D, vehicle travel, boat launching, and other activities would adversely affect wildlife through wildlife and habitat disturbance as described in Section 4.3.2.1.4. Development of a boat launch and associated site improvements (e.g., parking areas, toilets) would have minor, short-term, adverse effects by causing wildlife disturbance during construction activities. Providing a developed boat launch on the south shore would likely result in increased visitor use in the river corridor, resulting in long-term adverse effects through disturbance factors described above. However, with implementation of BMPs described in Section 4.0.1.2, these effects are anticipated to be minor.

4.3.2.4.7 Camping

Vernita

Under Alternative A, camping activities are believed to cause minor adverse effects on riverine wildlife and habitat as described in Section 4.3.2.1.4. Alternatives B, B-1, C, C-1 and F would result in minor beneficial effects by eliminating camping activities. This discontinuation of camping activities would likely displace overnight users to nearby camping areas outside the Monument, such as the Benton County Horn Rapids Park or developed campgrounds in the communities of Mattawa and Desert Aire. Under Alternatives D and E, developed camping opportunities would lead to year-round increases in visitor use. Depending on the number of visitors, minor to moderate adverse effects would result from increased visitor use in the Monument.

Boat-In

Under Alternatives C, C-1, D and E, non-motorized boat-in campsites would attract increased use by non-motorized boaters on the Hanford Reach from spring through fall. Increased non-motorized boating activity would result in wildlife disturbance along the river corridor. Camping activities would result in adverse effects on wildlife through disturbance as described above. Camping activities would affect vegetation through disturbance and trampling, although these vegetation effects would be minimized by locating campsites on terrain that is resistant to these effects and by strictly requiring visitors to camp within designated sites (Cole and Monz 2004). Implementation of other BMPs as described in Section 4.0.1.2 will result in effects being minor.

Saddle Mountain

The effects related to camping in the Saddle Mountain Unit are addressed in Section 4.2.2.5.7.

4.3.2.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Under Alternative A, factors associated with the presence of humans and vehicles (i.e., wildlife disturbance, soil compaction, vegetation disturbance, introduction and establishment of invasive non-native plant species, and increased risk of human-caused wildfire) would continue have minor adverse effects on wildlife. Alternatives B, B-1, C, C-1, D and F would result in minor beneficial effects on wildlife by removing these disturbance factors. However, this action would likely displace users to the north side of the river, resulting in minor increases in adverse effects on wildlife there. Alternative E would result in minor beneficial effects on wildlife by limiting use to designated roads and trails.

South Shore. Under Alternatives C, C-1, D and E, providing access to the south shore would result in adverse effects on riverine wildlife and habitat through wildlife disturbance, soil compaction, vegetation disturbance, introduction and establishment of invasive non-native plant species, and increased risk of human-caused wildfire. With implementation of BMPs described in Section 4.0.1.2, the effects of providing access to the south shore are anticipated to be minor.

North Shore. The effects would be similar to those described for the South Shore.

Ringold, Saddle Mountain, and Wahluke Units

The effects related to modified public access in the Ringold, Saddle Mountain, and Wahluke Units are addressed in Section 4.2.2.5.8.

4.3.2.4.9 Permit System

Under Alternative F, implementation of a permit system is anticipated to have negligible effects on wildlife and habitat.

4.3.3 Effects Analysis—Sensitive Plant Communities

Several sensitive plant species occur in riparian areas—persistent sepal yellowcress (persistent sepal yellowcress has been identified at eighteen locations north of the 300 Area), false pimpernel, and shining flatsedge.

The restoration of riparian areas to proper functioning condition would enhance sensitive aquatic habitats throughout the Monument. Approximately 100 linear miles of riparian habitat have been inventoried in the Monument, constituting 80% of the total riparian habitat assumed to occur within the Monument boundaries. Due to the significance of riparian plant communities in this desert environment, the majority of riparian communities have been classified as sensitive. Additional surveys are needed to determine riparian health and function in order to prioritize treatments. Non-functioning and at-risk riparian areas have the potential for continued degradation until remediation actions are taken to stop or reverse effects.

4.3.3.1 Effects Common to All Alternatives

In general, effects would be similar to those described for sensitive plant communities in Section 4.2.4.1.

4.3.3.2 Effects of Biological Resource Management Actions

Under Alternative A, no active riparian restoration is proposed; consequently, no effects on sensitive plant communities are anticipated.

Under Alternatives B–F, threats or actions adversely affecting the aquatic environment and sensitive riparian plant communities would be mapped and treated. A full range of treatments would be utilized to accomplish rehabilitation efforts; these include IPM techniques, non-native vegetation removal, soil stabilization, and native plantings and seeding. Rehabilitation treatments would be prioritized and implemented annually on the basis of threat analysis. Soil disturbance, removal of non-native vegetation, and soil contouring would have moderate direct effects on sensitive riparian plant communities. Although moderate effects are anticipated because of the limited size, access and sensitivity of these aquatic plant associations, the effects would be of short duration due to the resiliency of these mesic communities. The reduction or elimination of invasive species in native plant communities would have moderate beneficial effects, including improvement of resource conditions, wildlife habitat, and plant community structure, function and connectivity.

4.3.3.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.3.3.3.1 Interpretive Site Development

Alternative A would have negligible effects on sensitive plant communities. Interpretative signs and kiosks at major entry points and travel routes in the Monument are in locations that have already been affected; this condition ensures protection of sensitive plant communities.

Under Alternatives B–F, a variety of interpretive sites are planned. Interpretive sites would be located in and adjacent to areas that may contain sensitive plant communities. Such choice of location is necessary to properly interpret the significance and fragility of these resources in aquatic and riverine habitats. Minimal short-term adverse effects are anticipated to result from site development. Design features would be incorporated to minimize effects following the initial construction phase. All interpretive sites would expressly avoid any locations supporting aquatic and riverine plants that are considered rare, threatened, or endangered by state or federal standards. Proposed interpretive sites would highlight the Monument's sensitive plant communities in aquatic and riverine habitats while encouraging visitors to protect them.

4.3.3.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trails are planned, so there would be no impacts. Under Alternatives B–F, interpretive trails would be sited traversing or adjacent to areas that contain sensitive plant communities (e.g., Saddle Mountain Lakes, Columbia River shoreline). Because the visiting public has already expressed interest in these resources, and would seek them out with or without the advantage of interpretive trails, these particular resources would be included in the proposed interpretive trail system. It is anticipated that an interpretive trail system would have long-term beneficial effects on the protection and appreciation of sensitive plant communities by promoting education and increased visitor awareness.

4.3.3.4 Effects of Visitor Services Management Actions—Recreation

4.3.3.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Under all alternatives, waterfowl hunting activities would occur along the north shoreline within the Columbia River Corridor Unit downstream of the old Hanford Townsite. While these activities have the potential to adversely affect sensitive plant communities by increasing the risk of invasive weed spread and human-caused wildfire, the effects are anticipated to be negligible due to the lack of overlap of sensitive riverine plant communities and waterfowl hunting areas and the time of year hunting occurs; sensitive plants on the Monument are dormant or less susceptible to damage in the fall.

Hunting – Alternative B-1

As the hunting program is believed to have negligible impacts to the physical environment on the Monument, there would be negligible impacts from discontinuing it.

4.3.3.4.2 Fishing

Under all alternatives, fishing and related activities would include walking along shorelines, potentially affecting sensitive plant communities through trampling and by spreading invasive non-native plant species. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

4.3.3.4.3 Wildlife Observation and Photography

The effects would be the same as those described in Section 4.2.4.5.3.

4.3.3.4.4 Hiking

The effects would be the same as those described in Section 4.2.4.5.4.

4.3.3.4.5 Equestrian Use

The effects would be the same as those described in Section 4.2.4.5.5.

4.3.3.4.6 Boat Launches

Because proposed boat launch areas would be located in previously disturbed areas with no sensitive plant communities, effects are anticipated to be negligible.

4.3.3.4.7 Camping

Because camping activities would not occur in sensitive plant communities in the Vernita area and boat-in sites, negligible effects are anticipated. However, developed camping opportunities would attract increased visitor use in the Monument, with a probable increase in adverse effects associated with various recreational activities as discussed throughout this section. However, with implementation of BMPs, adverse effects are anticipated to be minor.

Saddle Mountain

The effects are addressed in Section 4.2.4.5.7.

4.3.3.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Under Alternative A, adverse effects on sensitive plant communities as described in Section 4.2.4.1.2 would continue. Alternatives B, B-1, C, C-1, D and F would result in minor beneficial effects by removing disturbance factors associated with public use in this area. Under Alternative E, limiting use to designated roads and trails would reduce effects; however, the spread of invasive non-native species and the risk of human-caused wildfire events would continue to be minor adverse effects.

Sand Dunes. Effects are addressed in Section 4.2.4.5.8.

South Shore. Under Alternatives C, C-1, D and E, public access is anticipated to result in adverse effects on sensitive plant communities as described in Section 4.2.4.1.2. With implementation of BMPs described in Section 4.0.1.2, these adverse effects are anticipated to be minor.

North Shore. Under Alternatives D and E, effects would be similar to those described above for South Shore access.

Ringold Unit

The effects are addressed in Section 4.2.4.5.8.

Saddle Mountain Unit

The effects are addressed in Section 4.2.4.5.8.

Wahluke Unit

The effects are addressed in Section 4.2.4.5.8.

4.3.3.4.9 Permit System

Under Alternative F, implementation of a permit system is anticipated to have negligible effects on sensitive plant communities.

4.3.4 Effects Analysis—Threatened, Endangered and Sensitive Species

4.3.4.1 Effects Common to All Alternatives

Effects on TE&S species populations occur primarily from loss or modification of riparian habitat, disturbance, soil compaction, trampling and introduction of invasive non-native plant species. As described in Section 4.2.5, the primary TE&S species occurring within riparian areas are bald eagles, upper Columbia River steelhead (rearing habitat), persistent sepal yellowcress, and American white pelicans. Water fluctuations in the Hanford Reach continue to adversely affect some TE&S species, such as persistent sepal yellowcress. Restrictions on surface-disturbing activities, mechanisms to control visitor use, fire control, restoration activities, and an active weed control program would all contribute to the protection and recovery of TE&S species. Most actions described in this CCP would likely be beneficial to the recovery and conservation of these species. Complete inventories of the Monument are necessary to more accurately identify at-risk riparian plant communities and their importance to TE&S populations and associated habitats in order to implement comprehensive protection measures through land management actions. The FWS would continue to work with private,

county, state and other federal partners, as well as adjacent land managers, to protect and restore TES populations and habitat. For a more complete discussion of effects on species in this community, refer to Sections 4.3.2 and 4.3.3.

4.3.4.2 Effects of Biological Resource Management Actions

Under Alternatives B, B-1, C, C-1 and D, riparian restoration activities would have negligible effects on TE&S species. Restoration of riparian areas to proper functioning condition and maintenance of those conditions would enhance habitat for riparian-dependent species (e.g., persistent sepal yellowcress) and would contribute to the overall protection of TE&S species dependent on these areas for food and shelter. Projects will avoid known TE&S populations and will be timed to reduce disturbance to migratory species. If restoration actions along the Columbia River are implemented during the fall and winter months, there could be minor short-term disturbance of bald eagles. Such disturbance would be confined to the immediate project vicinity and would have negligible effects on eagles and their roosting and foraging activities along the Hanford Reach. Indirect effects include plant community stabilization, reestablishment of native vegetation, and control of invasive non-native species.

No reasonably foreseeable effects on TE&S species would be expected to result from efforts to control wildlife populations in the Monument.

4.3.4.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.3.4.3.1 Interpretive Site Development

Alternative A would have negligible effects on TE&S species. Interpretive signs and kiosks are located along major entry points and travel routes within the Monument and pose no threat to TE&S species.

An increase in developed interpretive sites under Alternatives B–F would result in an increase of interpretation and education offerings highlighting TE&S species. These materials would provide the visiting public with an increased opportunity to learn about these species; ongoing management activities to study, protect and enhance their populations and habitat; and the FWS' mission to protect and conserve wildlife and habitat. The likely corresponding increase in visitation could have a minor adverse effect on TE&S species, which may be more than offset by visitors learning how to protect these species. All interpretive sites would be designed to mitigate any potential direct adverse effects on TE&S species.

4.3.4.3.2 Interpretive Trail Systems

Under Alternative A, interpretive trails would not be established in the Monument. There would be a negligible effect on TE&S species.

An expanded interpretive trail system would provide the visiting public with increased opportunities for experiencing the Monument and viewing and learning about TE&S species, their habitats, and reasons for their decline. The likely corresponding increase in visitation could have a minor adverse effect on TE&S and their habitats. Establishing interpretive trails would have beneficial impacts on TE&S by concentrating visitors on trails designed to minimize impacts, as well as educating visitors about species conservation.

4.3.4.4 Effects of Visitor Services Management Actions—Recreation

These effects are addressed in Section 4.2.5.1.4.

4.4 Effects on Invasive Species

Settlement of the Columbia River Basin brought the conversion of shrub-steppe habitats for agriculture, urban development, and national defense. Non-native invasive species, such as cheatgrass, yellow star-thistle, Russian thistle, rush skeletonweed, and knapweed, have become established and now constitute the second largest threat to the biological integrity of the shrub-steppe ecosystem (following wildland fire).

4.4.1 Assumptions

Invasive species are extremely adaptable to disturbance influences and often outcompete native species following ground disturbance, fire and drought conditions (D'Antonio et al. 1992). Many species can produce seed that remains dormant in the soil for decades and will germinate when growing conditions are favorable. Invasive species are easily spread by wind, water, animals, vehicles and clothing, expanding their foothold into shrub-steppe habitats as conditions allow.

4.4.2 Effects Analysis—Invasive Species

4.4.2.1 Effects Common to All Alternatives

4.4.2.1.1 Effects of Invasive Species on Native Vegetation Communities

Some weed populations are the result of past human activities—farming, grazing, emigrant travel, and homesteading. Currently, visitors, vehicles and wind are the primary vectors for the dispersal of noxious weed species. Most noxious weed populations mapped to date are adjacent to major travel corridors (roads, trails, irrigation canals, railroad lines). Human activity, vehicles and wind have distributed these weeds farther into the shrub-steppe plant communities as activity levels have increased in the Monument. The construction of new facilities and increased visitor use of these areas have the potential to introduce weeds into areas where they have not previously been found.

4.4.2.1.2 Wildland Fire and Fire Suppression Activities

Fire suppression activities can have moderate to major direct effects on the spread of non-native invasive species by surface-disturbing factors such as fireline creation and erosion. Some of these effects can be mitigated through BAER actions. Emergency use of equipment (e.g., disking) for fire suppression has the potential to affect invasive species abundance by clearing vegetation and microbiotic crust and by dispersing seed from other weed populations. However, fireline construction is also an effective method to contain fires when they are small, thereby limiting the expansion of invasive species expansion into thousands of acres that could otherwise burn without the use of aggressive suppression tactics. The effects of fire suppression activities can be mitigated through pre-suppression planning, initial attack stipulations, use of existing firebreaks and roads to confine and contain wildland fire, and properly implemented rehabilitation treatments.

4.4.2.1.3 Wildlife Population Control Activities

All alternatives provide for wildlife population control in the Monument, as needed, on the basis of scientific resource management data. Site-specific control actions, such as aircraft herding of animals into trap corrals, net gunning, and helicopter transport of ungulates, would create some disturbance of upland habitats and increase the potential for expansion of non-native invasive species. However, direct effects would be minor; these would include crushed vegetation, vehicle tracks, trails, corrals, disturbed soils, and effects on vegetation around

transport sites and staging areas. Direct effects on upland habitats and the associated potential for expansion of non-native species would occur with each trapping effort; however, these effects would be minimized through the use of integrated application of all population control management options. Minor indirect effects of population control management efforts would include erosion and the potential for non-native species encroachment into disturbed areas of upland plant communities. These effects would be lessened through the rehabilitation of affected sites with native species following operations.

4.4.2.1.4 Public Use

Under all alternatives, visitor use activities would play a role in invasive species transport, both to and within the Monument. Section 3.13 provides a complete discussion of invasive species issues specific to the Monument. Invasive species may be spread by horse excrement; human clothing and footwear; and vehicles, watercraft and equipment that travel through infested areas and carry seeds or plant fragments to non-infested areas (DiTomaso 2000). Introduced plant species threaten ecosystem integrity through native species displacement, plant community simplification, habitat fragmentation, increasing fuel loads, strengthening wildfire intensity, and increasing wildfire frequency (Brooks et al 2004). Ground disturbance from visitor facility development and visitor use would provide favorable opportunities for invasive weeds to spread and/or become established in new areas.

4.4.2.2 Effects of Biological Resource Management Actions

Under Alternative A, the use of IPM techniques (chemical, biological, cultural, mechanical) would have moderate effects on non-native invasive species. Weeds are treated along major transportation corridors annually to prevent the spread of non-native invasive species into adjacent upland plant communities. Road corridor treatments have moderate effects on soils and vegetation within ten feet of the edge of road systems, but they have negligible effects on upland habitats. Spot spraying, hand pulling, and seeding with native species (cultural control) are conducted annually on high-priority weed populations in off-road situations. With current staffing and funding, only a small portion of known weed infestations (the highest priorities) are mapped, treated and monitored each year. The treatment of isolated weed infestations away from established road systems can cause minor disturbance of soils and vegetation but does not adversely affect plant community composition and function or increase the potential for further weed establishment or expansion. The early treatment of small weed populations, protecting associated plant communities from further degradation, is an indirect beneficial effect.

Alternatives B–F would use IPM techniques for control efforts on larger acreages each year as funding allows. Under these alternatives, weed populations would be prioritized and treated annually on the basis of threat analysis and each population's potential for off-site movement

and infestation of adjacent lands. Direct effects on soils, vegetation, watershed function, and biodiversity would be considered in all treatment recommendations. In those sensitive plant communities where disturbance of soil and plant community structure and function would adversely affect upland habitats, the use of multiple tools (chemical, biological, mechanical, cultural) may be required. Moderate short-term adverse effects would be expected from mechanical and cultural treatments. Both treatment types would potentially disturb soils through mechanical removal (hand pulling, disking, mowing) of weed species and the seeding of native species using cultural treatments. The reduction or elimination of invasive non-native species in native plant communities would be considered moderate to major indirect beneficial effects; these effects would lead to improved resource conditions, plant community stability, wildlife habitat, and habitat connectivity. Extensive integrated treatments throughout the Monument will be necessary to control species such as yellow star-thistle, rush skeletonweed, and knapweed. Each weed treatment would be conducted in accordance with the Monument's IPM Plan and in accordance with stipulations set forth in annual PUPs.

Alternatives B–F would entail annual restoration activities on approximately 6,000, 4,000, 3,000 and 2,000 acres, depending on the alternative. Restoration methods would be used to restore degraded shrub-steppe habitats or disturbed areas to proper functioning condition. Treatments would include the use of prescribed fire; additionally, prescribed fires would be followed by seeding, hand planting of nursery stock, drill or broadcast seeding, or broadcast/harrowing activities. Moderate adverse effects would occur through soil disturbance and effects on plant community structure resulting from revegetation efforts. Beneficial indirect effects would be expected to include native plant reestablishment and improved biological diversity, hydrologic processes, site health, and plant community structure and function. Shrub-steppe restoration activities would also include the treatment of non-native invasive species. The level of treatment would be based on the species present in the restoration site and the threats that each poses to the health of shrub-steppe plant communities.

Some species, such as cheatgrass, may never be eradicated from a community. However, the level and type of treatment implemented could reduce direct competition with native species, and natural succession could, once natives are reestablished on site, reduce cheatgrass percentages. Reducing the percentage of cheatgrass within a plant community could reduce future fire effects by reducing fire intensity and burn severity (Link and Hill 2003).

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions. Under all alternatives upland habitat would be improved through the demolition and disposal actions associated with scheduled DOE remediation activities on top of Rattlesnake Mountain. Buildings identified for cleanup would be removed and upland habitats would be restored; such disturbance without subsequent native seeding/planting of native species would be conducive to invasive species spread. In those instances where the removal of buildings also reduces the amount of access, especially vehicular access, the associated reduction in the spread of invasive species would be an indirect effect of cleanup, resulting in improvements of upland habitat. Under alternatives B, B-1, C, C-1 and F,

restoration activities could include the removal of the observatory, along with the other buildings and structures, and the effects would be similar to those described above. Under alternatives A, D and E, the observatory building and associated utilities could be retained, and therefore the potential for the introduction or spread of non-native invasive species, although reduced (due to the removal of other structures), would not be eliminated.

4.4.2.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.4.2.3.1 Interpretive Site Development

Alternative A would have negligible effects on invasive species. Interpretative signs and kiosks at major entry points and travel routes in the Monument are in locations that have already been disturbed; they are also within active invasive species treatment areas to ensure protection of natural resources.

Under Alternative D, the Monument-wide establishment of twenty interpretive sites would entail the greatest extent of interpretive development of any alternative. This development could disturb up to approximately thirty acres of the area opened to the public. Developing visitor facilities and interpretive sites can directly affect vegetation associations in upland and riparian habitats by removing plants and microbiotic crust. The risk of spreading non-native invasive species would increase proportionately to the amount of ground disturbed, the number and placement of interpretative sites, and visitor numbers. All improvements would be evaluated, planned, and constructed after the completion of project-level NEPA analysis, site inventories, and evaluations to avoid habitat degradation and to reduce the spread of non-native invasive species.

Indirect effects that would contribute to the spread of non-native invasive species include vegetation trampling, microbiotic crust disturbance, soil disturbance, and erosion. To avoid this, proper planning and placement of interpretive sites would be coupled with use of informational signs, educational materials, trails, physical improvements, and law enforcement patrols to reduce these effects. Disturbed ground surfaces prone to infestations of invasive species would be treated and landscaped with native species.

Long-term beneficial effects from interpretative site development would include heightened visitor awareness and appreciation of the fragility of shrub-steppe ecosystems, the dangers associated with the spread of invasive species, methods visitors can employ to stop the spread of invasive species, and the development of partnerships for habitat protection and preservation.

4.4.2.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trails are planned; accordingly, there would be negligible effects on invasive non-native species.

Under Alternatives B–F, interpretive trail development would directly affect the spread of non-native invasive species spread by the creation of trail systems through shrub-steppe and riparian habitats. Minor effects include microbiotic crust disturbance, soil disturbance, and vegetation loss. Indirect effects could include soil erosion, spread and establishment of non-native invasive species, and increased risk of wildland fire. Beneficial effects would include the reduction of trampling in sensitive upland habitats by concentrating existing use onto established trail systems, the creation of a corridor of activity that could be monitored and treated for new infestations, and improved interpretation and education opportunities. None of the proposed interpretive trails have been sited; trail design and alignment would not be undertaken until a thorough site plan and inventory of each area has been completed. Any construction of interpretive trails in the Monument would require surveys prior to construction to identify the presence of sensitive resources.

4.4.2.4 Effects of Visitor Services Management Actions—Recreation

4.4.2.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Visitors pursuing hunting activities in the Monument would transport invasive weed seeds as described at 4.0.1.1.8. With implementation of BMPs described in Section 4.0.1.2, effects would be minor.

Hunting – Alternative B-1

As the hunting program is believed to have minor impacts to the effects of invasive species on native vegetation communities, there would be negligible impacts from discontinuing it.

4.4.2.4.2 Fishing

The effects would be similar to those described for hunting.

4.4.2.4.3 Wildlife Observation and Photography

Under Alternatives B–F, intensified visitor use patterns within 1/4 mile of developed sites would result in long-term adverse effects from the spread of invasive non-native species. With implementation of BMPs described in Section 4.0.1.2, these effects would be minor. Under these alternatives, minor beneficial effects would result from concentrating wildlife observation and photography activities in sites that can be readily targeted for invasive species control.

4.4.2.4.4 Hiking

Under Alternative A, hiking activities would continue to contribute to the spread of non-native invasive species by transporting weed seeds from outside the Monument and spreading existing populations within the Monument. Due to relatively low use levels, though, adverse effects are believed to be minor; however, if cross-country hiking activities increase in the Monument, the severity of adverse effects would also increase.

Alternatives B–F would result in minor beneficial effects by concentrating use on designated trail systems that can be readily targeted for invasive species control. However, developed trail systems would likely result in increased hiking activity in the Monument, with concomitant increased transport of invasive weeds. Furthermore, ground disturbance associated with trail development would contribute to favorable conditions for weed establishment. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

4.4.2.4.5 Equestrian Use

Under Alternative A, equestrian activities would continue to contribute to the spread of invasive non-native species through the transport and spread of weed seeds. If cross-country equestrian activities increase under Alternative A, the severity of adverse effects would also increase. In addition, ground disturbance from hoof effects would contribute to favorable conditions for weed establishment.

Alternatives B–F would result in minor beneficial effects by concentrating use on designated trail systems that can be readily targeted for invasive species control. However, developed trail systems would likely result in increased equestrian activity in the Monument, with a concomitant increased transport of invasive non-native species. Ground disturbance associated with trail development activities would contribute to favorable conditions for weed establishment. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

4.4.2.4.6 Boat Launches

Vernita

Under all alternatives, vehicle access and recreational activities in the launch vicinity would continue to have minor adverse effects through the transport and spread of invasive non-native species. Under Alternatives C, C-1, D and E, ground disturbance related to boat launch development would further contribute to favorable conditions for weed establishment. Boat launch improvements would also likely result in increased watercraft using the Hanford Reach, with a concomitant increase in the transport of invasive species. However, with implementation of BMPs described in Section 4.0.1.2, the overall effects are anticipated to be long term and minor.

White Bluffs

Under Alternatives A, C-1, D, E and F, vehicle access and recreation activities in the White Bluffs launch vicinity would continue to result in long-term, minor adverse effects through the transport and spread of invasive non-native species. Alternative C would result in long-term, minor beneficial effects by increasing the difficulty of access and reducing overall visitor use and associated invasive species transport. However, this benefit would be relatively minor in the context of the potential for invasive species transport associated with powering and irrigation canal operations and maintenance. Alternatives B and B-1 would have minor beneficial effects by eliminating all vehicle and recreational use in the area.

Ringold

Under alternatives B–F, the effects of boat launch development on non-native invasive species introduction and spread are anticipated to be negligible with implementation of BMPs described in Section 4.0.1.2. This action would result in increased use at the Ringold Fish Hatchery site, resulting in long-term, minor adverse effects on transport of invasive species in the river corridor. Boat launch improvement would also likely result in increased watercraft use of the Hanford Reach, with a concomitant increase in transport of invasive species. However, with implementation of BMPs described in Section 4.0.1.2, the overall effects are anticipated to be long-term and minor.

South Shore

The effects under Alternative D would be similar to those described for the Ringold launch development above.

4.4.2.4.7 Camping

Vernita

Under Alternative A, dispersed camping activities are believed to cause minor effects through the transport and spread of invasive species. Alternatives B, B-1, C, C-1 and F would result in minor beneficial effects by eliminating effects associated with camping. Under Alternatives D and E, developed camping opportunities would lead to year-round increases in visitor use at this location and on the Monument, with a concomitant increase in the transport and spread of invasive species. However, with implementation of BMPs described in Section 4.0.1.2, these effects are anticipated to be minor.

Boat-In

Under Alternatives C, C-1, D and E, camping activities would result in the increased transport and spread of invasive species in the campsites. In addition, non-motorized boat-in camping opportunities would attract increased use by non-motorized boaters on the Hanford Reach, with a concomitant increase in the transport and spread of invasive species. However, with implementation of BMPs described in Section 4.0.1.2, these effects are anticipated to be minor.

Saddle Mountain

Under Alternative D, developed camping opportunities would attract increased visitor use, resulting in increased transport and spread of invasive species. In addition, ground disturbance during campground development would provide opportunities for invasive weed establishment. However, with implementation of BMPs described in Section 4.0.1.2 and siting of the proposed campground in a previously disturbed area, adverse effects are anticipated to be minor.

4.4.2.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Under Alternative A, visitor use would continue to result in the transport and spread of invasive species, with anticipated minor, long-term, adverse effects. Alternatives B, B-1, C, C-1, D and F would result in minor, long-term, beneficial effects by removing visitor use from this area, which would likely increase the effectiveness of invasive species control efforts by reducing transport and establishment mechanisms. Alternative E would result in minor, long-term, beneficial effects by limiting visitor use to designated roads and trails.

South Shore. Under Alternatives C, C-1, D and E, providing access to the south shore would contribute to the transport and spread of invasive species by expanding the number of sites accessible to people, outdoor equipment, and vehicles. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be long term and minor.

North Shore. The effects would be similar to those described above for the South Shore.

Sand Dunes. The effects would be similar to those described above for the South Shore.

Ringold Unit

Parking Lots. Under Alternatives B–F, removal of excess parking lots would reduce the number of areas potentially serving as dispersal sites for invasive species. The number of sites requiring operations maintenance and upkeep would also be reduced, potentially allowing additional resources to be directed to invasive species control efforts. Beneficial effects are anticipated to be long-term and minor.

Auto Tour. Under Alternative D, an auto tour route would result in adverse effects by opening up a new corridor for invasive weed introduction. In addition, ground disturbance resulting from road construction activities would have adverse effects by providing opportunities for invasive species to become established. However, with careful implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be long-term and minor.

Saddle Mountain Unit

Alternatives B and B-1 would result in minor beneficial effects on the Saddle Mountain summit by eliminating public use and associated modes of invasive species dispersal. Under Alternatives A, C, C-1, D, E and F, continued public access in this area would contribute to the transport and spread of non-native invasive species; greater adverse effects would result from Alternatives A, C-1, D and E, which would allow motorized access. Under all alternatives, the implementation of BMPs described in Section 4.0.1.2 would result in minor adverse effects.

Wahluke Unit

West Access. Under Alternatives B–F, public access in this area would result in the transport of invasive plant species seeds and disturbance of soil and vegetation. These effects could provide favorable conditions for invasive weed establishment. Much of this area presently contains invasive weed populations, such as cheatgrass, knapweed, yellow star-thistle, rush skeletonweed, and kochia. However, with implementation of BMPs described in Section 4.0.1.2, additional adverse effects are anticipated to be minor.

Auto Tour. The effects under Alternative D would be similar to those described for the auto tour route in the Ringold Unit.

4.4.2.4.9 Permit System

Under Alternative F, implementation of a permit system is anticipated to have negligible effects on the introduction and spread of invasive species.

4.5 Effects on Habitat Connectivity

Connectivity of habitats is one of the features that promotes and sustains the biological diversity of species (Beir and Noss 1998) and habitats in the Monument. Resource management plans for the Hanford Site call for preserving and enhancing ecosystem integrity by managing biological resources at a scale commensurate with the scale of the natural processes that sustain them; protecting communities, ecosystems and landscapes to ensure protection for a large number of species and their interrelationships; managing to maintain evolutionary and ecological processes; minimizing fragmentation by promoting the natural pattern and connectivity of habitats; restoring degraded resources to enhance ecosystem integrity; avoiding the introduction of non-native species and expansion of existing non-native species into native communities; protecting rare and ecologically important species and unique or sensitive environments; maintaining or mimicking natural structural diversity; and monitoring ecosystem integrity. Although adversely affected by wildland fire and past land management practices, sensitive habitats on the Hanford Site have recovered and endured, aided by sixty years of minimal disturbance.

4.5.1 Assumptions

Monitoring of restoration activities will be conducted to document treatment success and to evaluate the direct and indirect effects on site connectivity and habitat fragmentation.

4.5.2 Effects Analysis—Habitat Connectivity

4.5.2.1 Effects Common to All Alternatives

4.5.2.1.1 Ground-Disturbing Activities

Direct effects on habitat connectivity result primarily from surface-disturbing activities, such as the construction of facilities (e.g., power lines, irrigation delivery and return systems, roads);

agricultural development; wildland fire effects; and the encroachment of non-native invasive species, leading to the modification of habitat structure and function. There is a potential for cumulative surface disturbance of approximately 1,000 acres from reasonably foreseeable activities, such as the development of recreation facilities, rights-of-way, and interpretation/ visitor services over the fifteen-year planning horizon. Much of the surface disturbance associated with recreational facilities would occur in areas already disturbed by existing roads or other uses.

4.5.2.1.2 Restoration Activities

Vegetation restoration methods have the potential to cause surface disturbance on 90,000 treatment acres over the fifteen-year planning horizon. Revegetation methods would be used to restore native plant associations; these would be implemented—primarily in areas already disturbed, or areas disturbed by development or wildland fire—to improve habitat function and connectivity. Restoration efforts would be based on detailed inventories and prioritized to improve connectivity and habitat effectiveness. Partnerships with adjacent landowners and cooperating agencies would be developed to preserve and promote connectivity between land ownerships, to actively control infestations of non-native invasive species, and to ensure adequate controls on visitor and vehicle use in the Monument. These efforts would contribute to the increased protection afforded by the actions in this CCP. Additionally, increased research on restoration ecology has the potential to develop new methods to restore disturbed areas to pre-disturbance conditions.

4.5.2.1.3 Wildlife Population Control Activities

Population control and herd management activities would be implemented as needed and based upon scientific resource management data. No effects on connectivity or habitat fragmentation are anticipated to result from these efforts.

4.5.2.1.4 Public Use

Adverse effects of visitor facilities on habitat connectivity would result from loss or modification of habitat. Trails and roads can act as significant barriers to the movement of many wildlife species, both large and small (Buckley 2004). Trails and roads can interfere with, or preclude seasonal migration and/or dispersal of, smaller species (Joslin and Youmans 1999), leading to isolated populations and inbreeding. Inbreeding can result in lower birth weight, survival and resistance to disease and predation; reduced genetic diversity; and increased extinction rates (Keller and Waller 2002). Facilities and roads can provide avenues for generalist predators—such as coyotes, raccoons, foxes, magpies and crows—as well as non-native species—such as

starlings and mice—to expand their range, which can reduce the success of specialized species with narrower habitat requirements.

4.5.2.2 Effects of Biological Resource Management Actions

Section 4.0.3.1 presents a description of restoration and IPM activities. Non-native invasive plant species pose a serious threat to native biodiversity, wildlife habitat, and connectivity. Weeds alter ecosystem structure and function; disrupt food chains and other ecosystem characteristics vital to wildlife (including TE&S species); and can dramatically alter key ecosystem processes such as hydrology, productivity, nutrient cycling, and fire regimes (Mack et al. 2000; Brooks and Pyke 2001; Tu et al. 2001).

Under Alternative A, the use of IPM techniques (chemical, biological, cultural, mechanical) would not affect connectivity. The treatment of isolated weed infestations away from established road systems would have negligible effects on soils and vegetation and would not cause fragmentation of existing plant communities.

Weed populations would be prioritized and treated annually on the basis of threat analysis and the target population's potential for off-site movement and infestation of adjacent lands. Under Alternatives B, B-1, C, C-1 and F, a greater number of acres would be mapped and treated using an integrated approach of methods (chemical, biological, mechanical, and cultural; see Section 4.0.3.1.1). Under Alternatives D and E, the number of acres treated would be limited due to staffing and financial limitations from focusing on different priorities. Under all alternatives, minor effects on connectivity would be expected to result from mechanical and cultural treatments of non-native invasive species. Both treatment types would potentially disturb soils through mechanical removal (hand pulling, discing, mowing) of weed species and reseeding of native species using cultural treatments. These effects could have short-term effects on ecotones, edge effects, and connectivity between habitats. The reduction or elimination of non-native invasive species in native plant communities would have moderate to major indirect effects, leading to improved resource conditions, wildlife habitat, and connectivity.

Under Alternative A, restoration activities would focus primarily on lands disturbed by wildfire events, maintenance-related project work, Hanford Site mitigation, and noxious weed control efforts. Minor effects on connectivity may result from revegetation efforts that cause soil and ecotone disturbance. Indirect effects include benefits to connectivity through native plant reestablishment and the improvement of biological diversity, site health, and plant community structure and function.

Under Alternatives B–F, restoration activities would be implemented to restore degraded shrub-steppe habitats or otherwise disturbed areas to a natural range of native plant associations and to improve habitat connectivity. These treatments would consist of BAER activities, prescribed

fires followed by drill seeding, hand planting of nursery stock, broadcast seeding, and/or broadcast/harrowing activities. Some restoration activities would be limited to planting activities. These activities would be used to restore a natural range of native plant associations that will directly and indirectly improve the condition of native vegetation throughout the Monument.

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions. Under all alternatives, habitat connectivity would be improved through the demolition and disposal actions associated with scheduled DOE remediation activities. Buildings identified for cleanup would be removed, and upland habitats would be restored. Minor direct effects on connectivity would result from ground-disturbing activities to remove building materials, asphalt, gravel, roadways and concrete foundations. Moderate indirect beneficial effects to connectivity would include site stabilization through seeding with native species, reduced establishment of noxious weeds, and improved upland habitat and connectivity. Proper restoration of these cleanup sites, along with native vegetation reestablishment, would improve connectivity between the lithosol plant communities on top of Rattlesnake Mountain and the bunchgrass communities on the mountain's northern and southern aspects. Under alternatives B, B-1, C, C-1 and F, restoration activities could include the removal of the observatory, along with the other buildings and structures, and the effects would be similar to those described above. Under alternatives A, D and E, the observatory building and associated utilities could be retained; however, the effect of the observatory on connectivity is considered negligible.

Under Alternatives B–F, restoration of riparian areas to proper functioning condition and maintenance of these areas would enhance native vegetation and contribute to overall habitat connectivity in the Monument. Direct effects on connectivity in riparian areas would be negligible. As part of site-specific riparian restoration activities, removal of non-native species (e.g., Russian olive, salt cedar) could have minor effects on habitat connectivity by disturbing soils, hiding and thermal cover, ecotones and nesting habitat. These effects would be mitigated through native plantings and area rehabilitation. Indirect beneficial effects of riparian restoration efforts include soil stabilization and improved habitat function, connectivity and wildlife diversity.

Fire suppression activities can have moderate to major effects on connectivity through the creation of firelines and erosion. These effects can be mitigated by BAER actions, but they take time to remedy, especially in dry climates such as the Monument's. Emergency use of equipment (e.g., disking) for fire suppression has the potential to affect connectivity by clearing vegetation and microbiotic crust, in turn allowing for erosion and the invasion of non-native species. Effects caused by fire suppression activities can be mitigated through pre-suppression planning, adherence to initial attack stipulations, use of existing fire breaks and roads to confine and contain wildland fire, and properly implemented rehabilitation treatments.

4.5.2.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.5.2.3.1 Interpretive Site Development

No interpretive site development would occur under Alternative A; therefore, negligible adverse effects on habitat connectivity are anticipated.

The maximum of twenty sites proposed under Alternative D would disturb approximately thirty acres in the areas accessible to the public. All improvements would use BMPs to avoid habitat fragmentation and protect habitat connectivity. Proper planning and placement of visitor facilities and visitor use patterns on the landscape would have indirect effects on connectivity. Beneficial long-term effects would include visitor awareness and appreciation for the fragility of shrub-steppe ecosystems, preservation of connectivity, and development of partnerships between the Monument and adjacent landowners for habitat protection and conservation of connectivity.

4.5.2.3.2 Interpretive Trail Systems

Under Alternative A, interpretive trails would not be established on the Monument. There would be no effect on habitat connectivity.

Under Alternatives B–F, interpretive trails would be located in a variety of shrub-steppe and riparian habitats. This trail system would introduce visitor foot traffic into areas that previously received only light and intermittent use. However, trails would be designed and sited to minimize habitat fragmentation; accordingly, they would have minor effects on connectivity.

4.5.2.4 Effects of Visitor Services Management Actions—Recreation

4.5.2.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Most visitor amenities for hunting would be temporary and minimal, potentially comprising hunting blinds and hunter check stations. In addition, depending on the outcome of step-down planning, permanent access development, such as access points and parking areas, would serve multiple user groups where possible (e.g. hunters, anglers, hikers, and other visitors). With

implementation of BMPs described in Section 4.0.1.2, effects on connectivity are anticipated to be negligible.

Hunting – Alternative B-1

As the hunting program is believed to have negligible impacts on habitat connectivity on the Monument, there would be negligible impacts from discontinuing it.

4.5.2.4.2 Fishing

Visitor facility developments for fishing would be co-located with those already existing or would be planned for multiple use (e.g., parking areas would be sited to provide for hunting, fishing, hiking and other recreational activities). With implementation of BMPs described in Section 4.0.1.2, effects on connectivity are anticipated to be negligible.

4.5.2.4.3 Wildlife Observation and Photography

Under Alternative A, effects on connectivity would be negligible. Under alternatives B–F, development of wildlife observation and photography sites could include permanent developments such as observation blinds, footpaths, signs and parking areas. With implementation of BMPs described in Section 4.0.1.2, adverse effects on connectivity are anticipated to be minor.

4.5.2.4.4 Hiking

Hiking activities under Alternative A are believed to have minor adverse effects on habitat connectivity through the establishment of user-created hiking routes and associated habitat disturbance and fragmentation. If hiking activities increase under Alternative A, the severity of adverse effects would also increase. Alternatives B–F would result in minor beneficial effects on habitat connectivity by concentrating hiking activity onto trail systems that are designed to minimize connectivity effects. Some effects on connectivity are unavoidable from development of trails, trailheads, parking areas, and signs. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

4.5.2.4.5 Equestrian Use

Connectivity effects would be similar to those described for hiking.

4.5.2.4.6 Boat Launches

Vernita

Boat-launching activities under Alternative A are believed to have adverse effects on connectivity as a result of habitat loss associated with vehicle traffic on user-created routes in the area. Under all alternatives, restricting vehicles to designated routes and boat launch could result in beneficial effects on habitat connectivity by concentrating vehicle use in designated sites. However, unless rehabilitation efforts were implemented to restore areas affected by years of cross-county vehicle use, beneficial effects would be negligible. Under Alternatives C, C-1, D and E, a developed boat launch would result in minor adverse effects by hindering movement of species from the river to adjacent uplands. However, because nearby areas are available with unimpeded connections between river and uplands, adverse effects are anticipated to be minor.

White Bluffs

Under Alternatives A, B, B-1, C-1, D, E and F, the access road, parking areas, and boat launch would have minor adverse effects on habitat connectivity by hindering wildlife movement from the river to adjacent uplands and by causing habitat loss from site hardening. Alternative C would result in minor beneficial effects on connectivity by removing the boat and parking areas.

Ringold

Under alternatives B–F, the effects of boat launch development on habitat connectivity and habitat are anticipated to be negligible as the area is already disturbed by the fish hatchery and irrigation canal operations.

South Shore

Under Alternative D, development of an access road, parking area, and boat launch would adversely affect connectivity through habitat loss and fragmentation. Because of the previously disturbed nature of this area and the availability of nearby areas with unimpeded connections between river and uplands, with implementation of BMPs described in Section 4.0.1.2 the adverse effects are anticipated to be minor.

4.5.2.4.7 Camping

Vernita

Under Alternative A, camping activities are believed to cause minor adverse effects on connectivity through habitat loss associated with user-created vehicle routes and dispersed

camping areas. Alternatives B, B-1, C, C-1 and F would result in minor beneficial effects on habitat connectivity and habitat by eliminating these effects. Under Alternatives D and E, development of a campground would adversely affect connectivity through habitat loss and fragmentation. However, because of the previously disturbed nature of this area and the availability of nearby areas with unimpeded connections between river and uplands, with implementation of BMPs described in Section 4.0.1.2 the adverse effects are anticipated to be minor.

Boat-In

Under Alternatives C, C-1, D and E, it is anticipated that establishment of boat-in campsites would require minimal development and/or site hardening. However, visitor use at the designated campsites would cause habitat loss through soil compaction and vegetation disturbance. Campsite development and the possible creation of 'social' trails would cause further fragmentation of habitat for species moving along the river corridor or between the river and upland areas. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

Saddle Mountain

Under Alternative D, a developed campground would result in adverse effects on habitat connectivity through habitat loss and fragmentation. With implementation of BMPs described in Section 4.0.1.2, and the location of the proposed campground in a previously disturbed area near an existing highway, these adverse effects are anticipated to be minor.

4.5.2.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Alternative A would continue minor adverse effects on connectivity through habitat loss and fragmentation resulting from user-created vehicle routes throughout the area. Under Alternatives B, B-1, C, C-1, D and F, minor beneficial effects would result from removing these disturbance factors, although these beneficial effects would be minimized if habitat restoration efforts are not implemented. Alternative E would result in minor beneficial effects by concentrating use on designated roads and trails.

Sand Dunes. Alternatives C, C-1, D and E would result in adverse effects on habitat connectivity by causing habitat and vegetation disturbance and increasing the risk of introduction of non-native invasive species and human-caused wildfire. However, with implementation of BMPs described in Section 4.0.1.2, these effects would be minor.

South Shore. Alternatives C, C-1, D and E would result in adverse effects on connectivity through habitat loss and fragmentation associated with access and trail development. However, with implementation of BMPs described in Section 4.0.1.2, these effects would be minor.

North Shore. Under Alternatives D and E, the effects would be similar to those described for the South Shore.

Ringold Unit

Parking Lots. By reducing the number of developed parking lots, Alternatives B–F would have minor beneficial effects on connectivity for some wildlife species.

Auto Tour Route. Under Alternative D, development of an auto tour route would cause fragmentation between habitat areas on either side of the tour route. With implementation of BMPs described in Section 4.0.1.2, and because of the existing road corridor in this area, adverse effects are anticipated to be minor.

Saddle Mountain Unit

Under Alternatives A, C-1, D and E, minor adverse effects on connectivity would continue from the Saddle Mountain Road. Under Alternatives B, B-1, C and F, although the road would be closed totally or in part to public vehicle use, it would remain in place as an administrative road used to access communication facilities and would consequently continue to affect habitat connectivity through fragmentation. This break in continuity has minor impacts, though.

Wahluke Unit

West Access. Alternatives B–F would result in adverse effects on connectivity through habitat loss from increased soil compaction, vegetation disturbance, introduction of non-native invasive plants, and increased risk of human-caused wildfire. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects on habitat connectivity would be minor.

Auto Tour Route. Under Alternative D, development of an auto tour route would cause fragmentation between habitat areas on either side of the tour route. However, with implementation of BMPs described in Section 4.0.1.2, and because of the existing road corridor in this area, adverse effects are anticipated to be minor.

4.5.2.4.9 Permit System

Under Alternative F, implementation of a permit system is anticipated to have negligible effects on connectivity.

4.6 Effects on Cultural Resources

The Monument Proclamation specifies the protection and preservation of cultural resources. Cultural resources are limited and non-renewable, unlike many natural resources that can be preserved, restored and enhanced through adaptive management strategies.

The cultural history of the area is replete with a continuum of traditions for both Native American and Euro-American settlers. Time, functional elements, and the influx of people have changed the natural landscape, but the intangible values of the area remain intact for both cultural groups. This land has supported historical and spiritual experiences, as well as everyday uses and special ceremonies that may have meaning only to certain people or groups—such areas are potential TCPs (see Section 3.20.5) and involve consideration under the NHPA and specific regulations, especially 36 CFR 800 and 36 CFR 60. Although no TCPs have been officially designated in the Monument, two areas—the Saddle Mountains and Rattlesnake Mountain—have special significance to Native Americans in the region.[158] These areas are recognized and treated as if they are TCPs, and pursuit of official designation as such is a possibility under any of the proposed alternatives.

The protection, preservation and perpetuation of the remaining cultural resources, and minimization of further disturbance and destruction, are primary goals. Another potential goal that may be applicable in this context is the possibility of enhancing and regenerating Native American natural resources, such as foods, medicines and other utility material resources. Prior to the implementation of any proposed project or ground-disturbing activity, the appropriate level of cultural resource investigation will be undertaken in accordance with all applicable laws, procedures and protocols.

4.6.1 Assumptions

It is assumed that, prior to any project initiation, all management actions will utilize the best available information to avoid known cultural resource sites, implement a survey protocol in compliance with Section 106 of the NHPA, and analyze project effects on cultural resources through the NEPA process. Emergency actions, such as fire suppression, would use available information to protect cultural resources where possible.

Population control management actions, including trap and relocate efforts and government culling, will move wildlife across the landscape. The Monument is rich with cultural resources that have not been discovered or inventoried to date, and it is possible that cultural resources

[158] The DOE is currently working with local tribes in delineating and assessing the eligibility of Rattlesnake Mountain and associated areas as a TCP.

could be disturbed through herding, trampling, soil disturbance, and erosion following control efforts. However, mitigation actions as noted above would minimize disturbance of cultural sites in and around capture sites and handling facilities.

4.6.2 Effects Analysis—Pre-Contact Resources

4.6.2.1 Effects Common to All Alternatives

Due to the non-renewable nature of cultural resources, all adverse effects would likely be irreversible and permanent. To avoid impacts, prior to implementing all ground-disturbing projects, the applicable cultural resource compliance investigation would be undertaken. If cultural resources are found, appropriate procedures and protocols would be followed to protect them. Wherever possible, resources would be avoided, or the effects would be mitigated. Mitigation options, in addition to relocating or redesigning facilities, would include data recovery, using either collection techniques or *in situ* site stabilization protection.

4.6.2.1.1 Restoration Activities

Section 4.0.3.1 presents a description of restoration and IPM techniques. Restoration activities carried out under all alternatives would be used primarily to restore degraded shrub-steppe habitats or disturbed areas to a natural range of native plant communities. Under all alternatives, direct effects on pre-contact cultural resources would be minor. All projects involving potential ground-disturbing activities would avoid cultural sites through Section 106 compliance reviews prior to project implementation. Any sites identified during the project reviews would be avoided. Project implementation would be monitored to mitigate adverse effects on undetected sites exposed during restoration activities.

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions. Under all alternatives, upland habitat would be improved through the demolition and disposal actions associated with scheduled DOE remediation activities on top of Rattlesnake Mountain. No foreseeable effects on pre-contact cultural resources are expected to result from implementation of restoration activities.[159]

[159] Restoration of Rattlesnake Mountain may potentially enhance the cultural significance of the mountain to Native American tribes in the area.

4.6.2.1.2 Wildland Fire and Fire Suppression Activities

Fire suppression activities, such as fireline construction and subsequent erosion, may have direct effects on pre-contact cultural resources. Some effects can be mitigated through BAER actions. With the use of trained personnel scouting and marking firelines ahead of equipment, the effects of the emergency use of equipment (e.g., discing equipment, bulldozers) on cultural resources can be reduced or avoided. The effects of wildland fire and suppression actions on pre-contact cultural resources would be moderate.

4.6.2.1.3 Public Use

Surface disturbance would result from development of visitor facilities, such as trails, interpretive sites, boat launches, restrooms and parking areas. Visitor use on and around facilities would result in soil compaction, vegetation disturbance, and increased erosion, all of which could expose pre-contact resources if any are present. Exposure leaves resources susceptible to degradation from weather, as well as disturbance associated with animal activity, human foot traffic, vandalism and theft. In general, visitor use would likely entail some degree of effect through illegal collection, vandalism, crushing and scattering of cultural artifacts (Des Jean 2000; Hartley and Vawser 2004; British Columbia Ministry of Water 2004), with increased visitation implying an increase in effects (Ison et al. 1981 as cited in Des Jean 2000). Studies have shown little relationship between site remoteness and looting, although sites located close to trails and public facilities may receive less disturbance because of the increased chance of detection (Des Jean 2000). The presence of surface artifact scatter is one critical element that site looters use to identify site locations (Des Jean 2000). Cultural resources in the Monument are more visible following wildfire events and are thus more vulnerable to detection until vegetation becomes reestablished.

4.6.2.2 Effects of Biological Resource Management Actions

All projects involving potential ground-disturbing activities would avoid cultural sites through Section 106 compliance reviews prior to project implementation. Any sites identified during the project reviews would be avoided. Project implementation would be monitored to mitigate adverse effects on undetected sites exposed during restoration activities. Section 4.0.1.2 describes BMPs that will be implemented to ensure protection of pre-contact resources. As noted earlier, as the land holds cultural significance to area Native American tribes, restoration may enhance this.

4.6.2.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.6.2.3.1 Interpretive Site Development

Alternative A would have negligible effects on pre-contact cultural resources. Informational signs have been placed along major entry points and travel routes in the Monument that have previously been disturbed.

Under Alternatives B–F, interpretive sites would be located away from sensitive cultural resources to prevent disturbance by the visiting public. With implementation of BMPs described in Section 4.0.1.2, effects are anticipated to be negligible.

4.6.2.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trails are planned; accordingly, no effects on pre-contact cultural resources are anticipated.

Under Alternatives B–F, trailheads, parking areas, trail routes, and interpretive sign locations would be sited away from any sensitive cultural resources to prevent disturbance by the visiting public. With implementation of BMPs described in Section 4.0.1.2, effects are anticipated to be negligible.

4.6.2.4 Effects of Visitor Services Management Actions—Recreation

4.6.2.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Visitors pursuing big and upland game hunting activities in the Monument typically walk cross-country or follow game trails, with a very small percentage of deer hunters traveling by horseback (likely less than 1%). These activities are dispersed across areas open to hunting, the extent of which varies by alternative. Physical effects on cultural resources and their use by Native Americans resulting from big and upland game hunting activities are anticipated to be negligible due to the seasonal use and dispersed nature of travel.

In the past, hunters dug waterfowl pass-shooting depressions along bluffs in the Wahluke Unit, which could displace or uncover artifacts, leading to their possible theft; however, this activity is no longer allowed.

In general, visitor use would likely entail some degree of effect through illegal collection, vandalism, and crushing and scattering of cultural artifacts (Des Jean 2000; Hartley and Vawser 2004; British Columbia Ministry of Water 2004), with increased visitation implying an increase in effects (Ison et al. 1981). However, this potential damage exists regardless of a recreational hunting program; hunters are no more or less likely to create a problem than any other user group. With due diligence, educational materials (e.g., pamphlets and signs), and enforcement, impacts from vandalism and theft are anticipated to be negligible to minor.

Native Americans do use the Monument and Central Hanford for religious and cultural purposes. However, such use is typically in areas closed to hunting, occurs at times other than hunting season (e.g., root gathering), or is of such a nature as to not be impacted by recreational hunting activities. There would be negligible impacts to traditional use of the Monument by Native Americans from recreational hunting.

Hunting – Alternative B-1

As recreational hunting is believed to have negligible to minor impacts to cultural resources on the Monument, there would be negligible impacts by discontinuing it.

4.6.2.4.2 Fishing

Wake-based erosion from motorboat-based fishing activities may exacerbate existing shoreline erosion that results from subsurface offsite irrigation drainage and water level fluctuations in the Columbia River. Shoreline erosion and landslides are presently causing major adverse effects on White Bluffs deposits near Locke Island at river mile 366. However, adverse effects caused by motorboat-based fishing are anticipated to be negligible, especially compared to the effects from sloughing of the White Bluffs and frequent water level fluctuations along the shorelines.

Bank fishing activities primarily occur in the Ringold and Columbia River Units. Visitors pursuing bank fishing activities typically walk from a parking area to one or more desirable locations along the Columbia River, resulting in localized soil compaction and vegetation disturbance along these routes. With implementation of BMPs described in Section 4.0.1.2, effects are anticipated to be negligible.

4.6.2.4.3 Wildlife Observation and Photography

Effects on pre-contact cultural resources would be similar to those described for geological resources, with minor, long-term adverse effects anticipated under Alternative A and minor, long-term, beneficial effects anticipated under Alternatives B–F.

4.6.2.4.4 Hiking

Alternative A would result in minor, long-term negative effects on pre-contact cultural resources, primarily as a result of erosion where hiking occurs through areas in the Wahluke and Ringold Units. The effects may increase in severity over time as hiking activity increases in the Monument. Alternatives B–F would result in minor, long-term beneficial effects on pre-contact cultural resources by concentrating use on designated trail systems and reducing cross-country foot traffic. Because sensitive resources would be avoided under the action alternatives, negligible adverse effects are anticipated from trail development.

4.6.2.4.5 Equestrian Use

Effects on pre-contact cultural resources would be similar to those described for geological resources, with minor, long-term, adverse effects anticipated under Alternative A and minor, long-term, beneficial effects anticipated under Alternatives B–F.

4.6.2.4.6 Boat Launches

Vernita

Under all alternatives, curtailing cross-country vehicle travel and dispersed boat launching activities in the Vernita Bridge area would result in minor, long-term beneficial effects to pre-contact cultural resources.

Under Alternatives C, C-1, D and E, construction activities associated with boat launch development could have adverse effects. In accordance with BMPs described in Section 4.0.1.2, resource inventories would be conducted prior to boat launch development. If inventories indicate that pre-contact cultural resources cannot be avoided, data recovery efforts would be initiated. The potential dislocation of limited pre-contact cultural resources from their contextual site would be considered a moderate adverse effect.

White Bluffs

Under Alternatives A, B, C-1, D, E and F, continued visitor use in the launch area would have minor, long-term, adverse effects as described in Section 4.6.2.1.3. Alternative C would result in minor, long-term, beneficial effects to pre-contact cultural resources by limiting these disturbance factors. Closure of the launch under Alternative C would likely displace visitors to alternate developed launches at Ringold and Vernita, potentially resulting in increased effects at the alternate sites.

Under Alternative D, construction activities associated with boat launch improvements have the potential to adversely affect pre-contact cultural resources. In accordance with BMPs described in Section 4.0.1.2, resource inventories would be conducted prior to boat launch development. If inventories indicate that pre-contact cultural resources cannot be avoided, data recovery efforts would be initiated. The potential dislocation of limited pre-contact cultural resources from their contextual site would be considered a moderate adverse effect. In addition, improving the launch under Alternative D is expected to result in increased visitor use at this site. However, with implementation of BMPs described in Section 4.0.1.2, these additional effects would be negligible.

Ringold

Under Alternative A, continued use of the Ringold area as an unimproved launch is anticipated to have negligible effects. Under Alternatives B–F, an improved launch would result in increased visitor use at Ringold and (likely) decreased use at the Parking Lot 7 and White Bluffs Boat Launches. Construction activities associated with boat launch development have the potential to adversely affect pre-contact cultural resources. In accordance with BMPs described in Section 4.0.1.2, resource inventories would be conducted prior to boat launch development. If inventories indicate that pre-contact cultural resources cannot be avoided, data recovery efforts would be initiated. The potential dislocation of limited pre-contact cultural resources from their contextual site would be considered a moderate adverse effect.

South Shore

Under Alternative D, construction activities associated with boat launch and other site improvements (e.g., parking areas, toilets) have the potential to adversely affect pre-contact cultural resources. In accordance with BMPs described in Section 4.0.1.2, resource inventories would be conducted prior to boat launch development. If inventories indicate that pre-contact cultural resources cannot be avoided, data recovery efforts would be initiated. The potential dislocation of limited pre-contact cultural resources from their contextual site would be considered a moderate adverse effect. Moreover, Alternative D would result in increased vehicle traffic, boat launching, and other activities in areas that are currently receiving very little use. However, with implementation of BMPs and management controls described in Section 4.0.1.2, Alternative D would result in minor adverse effects to pre-contact cultural resources.

4.6.2.4.7 Camping

Vernita

Alternative A would continue minor adverse effects to pre-contact cultural resources through disturbance factors described in Section 4.6.2.1.3. Alternatives B, B-1, C, C-1 and F would have minor positive effects by limiting these disturbance factors. Under Alternatives D and E, construction activities associated with campground development have the potential to adversely affect pre-contact cultural resources. In accordance with BMPs described in Section 4.0.1.2, resource inventories would be conducted prior to boat launch development. If inventories indicate that pre-contact cultural resources cannot be avoided, data recovery efforts would be initiated. The potential dislocation of pre-contact cultural resources from their contextual site would be considered a moderate adverse effect. Under Alternatives D and E, the availability of camping opportunities in the Monument would likely lead to increased visitor use; however, with implementation of BMPs described in Section 4.0.1.2, adverse effects are expected to be minor.

Boat-In

Under Alternatives C, C-1, D and E, camping activities would result in minor, long-term, adverse effects to pre-contact cultural resources within a 1/4-mile radius of the campsites through factors described in Section 4.6.2.1.3. In addition, the availability of camping opportunities for non-motorized boaters is expected to result in increased non-motorized boat use on the Columbia River. However, with implementation of BMPs described in Section 4.0.1.2, Alternatives C, C-1, D and E would result in minor effects to pre-contact cultural resources on river shorelines along the Hanford Reach.

Saddle Mountain

Under Alternative D, effects would be similar to those described for the Vernita Bridge campground development under Alternatives D and E.

4.6.2.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Alternatives A and E would continue to have moderate, long-term, adverse effects to pre-contact cultural resources through disturbance factors described in Section 4.6.2.1.3. Alternatives B, B-1, C, C-1, D and F would result in long-term, minor beneficial effects by removing these disturbance factors.

Sand Dunes. Under Alternatives C, C-1, D and E, adverse impacts would result from public use. However, with implementation of BMPs described in Section 4.0.1.2, effects are anticipated to be negligible.

South Shore. Under Alternatives C, C-1, D and E, effects would be similar to those described above for sand dune access.

North Shore. Under Alternatives D and E, effects would be similar to those described above for sand dune access.

Ringold

Parking Areas. Negligible effects to pre-contact resources are anticipated under all alternatives.

Auto Tour. Under Alternative D, establishment of an auto tour route would result in adverse effects within the travel corridor, as described in Section 4.6.2.1.3. However, with implementation of BMPs and management controls described in Section 4.0.1.2, adverse effects would be negligible.

Saddle Mountain

Under Alternatives A, C-1, D and E, access to the summit would continue to have adverse effects through disturbance factors described in Section 4.6.2.1.3; however, with implementation of BMPs described in Section 4.0.1.2, further adverse effects would be negligible. Alternative B and B-1 would have a minor beneficial effect to pre-contact cultural resources by removing sources of disturbance. While Alternatives C and F are expected to result in reduced visitation to the summit, the effects would be similar to those described for Alternatives A, D and E.

Wahluke

West Access. Under Alternatives B–F, public access would result in adverse effects as described in Section 4.6.2.1.3. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects would be negligible.

Auto Tour. In Alternative D, establishment of an auto tour route would result in adverse effects within the travel corridor as described in Section 4.6.2.13. With implementation of BMPs described in Section 4.0.1.2 though, these adverse effects would be negligible.

4.6.2.4.9 Permit System

Under Alternative F, implementation of a permit system is anticipated to have negligible effects to pre-contact resources.

4.6.3 Effects Analysis—Post-Contact Resources

4.6.3.1 Effects Common to All Alternatives

Refer to Section 4.6.2.1 for a general discussion of common effects.

4.6.3.2 Effects of Biological Resource Management Actions

Section 4.0.3.1 presents a description of restoration and IPM techniques. Under all alternatives, restoration activities would be undertaken to restore degraded shrub-steppe habitats or disturbed areas to a natural range of native plant associations. Direct effects on post-contact resources would be minor under all alternatives, because most projects involving potential ground-disturbing activities would avoid cultural sites through Section 106 compliance reviews prior to project implementation. Project implementation would be monitored to mitigate adverse effects on undetected post-contact sites exposed during restoration activities. In some cases, shrub-steppe restoration activities would have moderate effects on post-contact resources, because previously disturbed sites (homestead areas, old fields, etc.) would be targeted to be restored back to native shrub-steppe habitats.

Riparian area restoration would be implemented in identified at-risk plant communities and aquatic areas. No active riparian restoration is proposed under Alternative A. Under Alternatives B–F, the restoration of riparian areas to proper functioning condition would be used primarily to restore degraded riparian habitats or disturbed areas to a natural range of native plant associations. Areas where historical post-contact sites exist within riparian zones (e.g. historic ferry crossings) would be avoided, and these features would be identified when sites to conduct riparian restoration are being determined.

4.6.3.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.6.3.3.1 Interpretive Site Development

Alternative A would have negligible effects on post-contact cultural resources. Informational signs have been placed along major entry points and travel routes in the Monument that have previously been disturbed.

Under Alternatives B–F, interpretive sites would be located away from any sensitive post-contact cultural resources to prevent disturbance by the visiting public. Interpretive sites adjacent to post-contact cultural resources (e.g., potentially the White Bluffs historic cabin, Foster Homestead, Hanford High School, White Bluffs Bank) would be designed to assure long-term protection of the cultural resource with negligible adverse effects.

4.6.3.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trails are planned; accordingly, no effects on post-contact cultural resources are anticipated.

Under Alternatives B–F, trailheads, parking areas, trail routes, and interpretive sign locations would be sited away from any sensitive post-contact cultural resources to prevent disturbance by the visiting public. Interpretive trails that would follow, or be sited adjacent to, post-contact cultural resources (e.g., White Bluffs Road) would be designed to have minor long-term effects.

4.6.3.4 Effects of Visitor Services Management Actions—Recreation

4.6.3.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

The effects of hunting activities would be similar to those described for pre-contact resources; anticipated effects would be minor.

Hunting – Alternative B-1

As the hunting program is believed to have negligible impacts to post-contact resources on the Monument, there would be negligible impacts from discontinuing it.

4.6.3.4.2 Fishing

The effects of fishing activities would be similar to those described for pre-contact resources; anticipated effects would be minor.

4.6.3.4.3 Wildlife Observation and Photography

The effects of wildlife observation and photography would be similar to those described for geological resources, with minor, long-term, adverse effects anticipated under Alternative A and minor, long-term, beneficial effects anticipated under Alternatives B–F.

4.6.3.4.4 Hiking

The effects of hiking would be similar to those described for pre-contact resources, with minor, long-term, adverse effects anticipated under Alternative A and minor, long-term, beneficial effects anticipated under Alternatives B–F.

4.6.3.4.5 Equestrian Use

The effects of equestrian use would be similar to those described for geological resources, with minor, long-term, adverse effects anticipated under Alternative A and minor, long-term, beneficial effects anticipated under Alternatives B–F.

4.6.3.4.6 Boat Launches

The effects of all actions related to boat launches would be similar to those described for pre-contact resources.

4.6.3.4.7 Camping

The effects of all actions related to camping would be similar to those described for pre-contact resources.

4.6.3.4.8 Modified Public Access

The effects of all actions related to public access would be similar to those described for pre-contact resources.

4.6.3.4.9 Permit System

Under Alternative F, implementation of a permit system is anticipated to have negligible effects on post-contact resources.

4.6.4 Effects Analysis—Cultural Traditions

4.6.4.1 Effects Common to All Alternatives

In general, effects would include those described at 4.6.2.1 for pre-contact resources. Mitigation may include oral history gathering, as well as reestablishment and enhancement of root-growing areas or similar food and medicinal resources.

4.6.4.1.2 Public Use

In addition to the effects described at 4.6.2.1.3, increased visitor use could affect traditional use and sacred areas through degradation of aesthetics, increased noise levels, and loss of solitude.

4.6.4.2 Effects of Biological Resource Management Actions

Under all alternatives, restoration activities would be undertaken to restore degraded shrub-steppe habitats or disturbed areas to a natural range of native plant associations. Direct effects on cultural traditions would be minor under all alternatives, because all projects involving potential ground-disturbing activities would avoid cultural sites through Section 106 compliance reviews prior to project implementation. Project implementation would be monitored to mitigate adverse effects on undetected sites exposed during restoration activities. Shrub-steppe restoration activities would generally have long-term beneficial effects on cultural traditions, because improvements in plant community stability and species diversity would increase the abundance of food and medicinal plant species. However, some ground-disturbing restoration activities (e.g., the removal of non-native species such as Russian olive and salt cedar) may affect soils, hiding and thermal cover, ecotones and nesting habitat for plant and animal species associated with traditional cultural practices. Project implementation would be monitored to mitigate adverse effects on undetected sites exposed during restoration activities. No foreseeable long-term adverse effects on cultural traditions are anticipated to result from implementation of restoration activities.

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions. Direct adverse effects on cultural traditions would be minor under all alternatives because all projects involving potential ground-disturbing activities would undergo Section 106 compliance reviews to avoid or minimize impact to sensitive resources. The return of portions of Rattlesnake Mountain to pre-Manhattan Project conditions would ultimately benefit resources associated with cultural traditions.

Direct effects on cultural traditions and plant resources may result from fire suppression activities (fireline construction) and erosion. These effects can be mitigated through BAER actions. With the use of trained personnel scouting and marking firelines ahead of equipment, the effects of the emergency use of equipment (e.g., disking equipment, bulldozers) on cultural resources can be reduced or avoided. The effects of wildland fire and fire suppression activities on cultural traditions would be minor.

4.6.4.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.6.4.3.2 Interpretive Sites

Alternative A would have negligible effects on cultural traditions. Informational signs have been placed along major entry points and travel routes in the Monument that have previously been disturbed.

Under Alternatives B–F, interpretive sites would be located away from sensitive cultural resources to prevent disturbance by the visiting public. With implementation of BMPs described in Section 4.0.1.2, effects are anticipated to be negligible.

4.6.4.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trails are planned; accordingly, no effects on post-contact cultural resources are anticipated.

Under Alternatives B–F, trailheads, parking areas, trail routes, and interpretive sign locations would be sited away from any sensitive cultural resources to prevent disturbance by the visiting public. Negligible adverse effects are anticipated.

4.6.4.4 Effects of Visitor Services Management Actions—Recreation

4.6.4.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

The effects of hunting activities would be similar to those described for pre-contact resources; anticipated effects would be minor.

Hunting – Alternative B-1

As the hunting program is believed to have negligible impacts to cultural traditions on the Monument, there would be negligible impacts from discontinuing it.

4.6.4.4.2 Fishing

The effects of fishing activities would be similar to those described for pre-contact resources; anticipated effects would be minor.

4.6.4.4.3 Wildlife Observation and Photography

The effects of wildlife observation and photography would be similar to those described for geological resources, with minor, long-term, adverse effects anticipated under Alternative A and minor, long-term, beneficial effects anticipated under Alternatives B–F.

4.6.4.4.4 Hiking

The effects of hiking would be similar to those described for pre-contact resources, with minor, long-term adverse effects anticipated under Alternative A and minor, long-term beneficial effects anticipated under Alternatives B–F.

4.6.4.4.5 Equestrian Use

The effects of equestrian use would be similar to those described for geological resources, with minor, long-term adverse effects anticipated under Alternative A and minor, long-term, beneficial effects anticipated under Alternatives B–F.

4.6.4.4.6 Boat Launches

The effects of all actions related to boat launches would be similar to those described for pre-contact resources.

4.6.4.4.7 Camping

The effects of proposed actions on cultural traditions would be similar to those described for pre-contact resources. In addition, increased visitor use resulting from the availability of camping opportunities under Alternatives D and E near the Vernita Bridge; under Alternatives C, C-1, D and E for boat-in camping in the river corridor; and under Alternative D in the Saddle Mountain Unit, would have minor, long-term, adverse effects on cultural traditions by decreasing opportunities for solitude.

4.6.4.4.8 Modified Public Access

The effects of all actions related to public access would be similar to those described for pre-contact resources.

4.6.4.4.9 Permit System

Under Alternative F, implementation of a permit system is anticipated to have negligible effects on cultural traditions.

4.7 Effects on Interpretation and Education

Visitors to the national parks, monuments, wildlife refuges, and wildlands of America expect exposure to high-quality interpretation and education facilities and activities. The long-standing tradition of enjoying our natural and cultural resources while gaining insights and enlightenment is a major drawing point of public lands. However, ecotourism carries the risk of damage to vulnerable environments (Kimmel 1999). There has been limited research into the application of accepted environmental education principles in the development of models of effective environmental interpretation (Orams 1994).

Grant Sharpe's *Interpreting the Environment* (1982), perhaps the most widely used text in the field of environmental interpretation, cited the following major objectives of environmental interpreters: 1)) to assist visitors in developing a keener awareness, appreciation and understanding of the areas they are visiting; 2) to accomplish management goals; and 3) to promote public understanding of an agency's goals and objectives.

Environmental interpretation has been defined and used in a variety of ways. Throughout its history, however, there has been a focus on changing people's behavior toward the environment. It has been argued—but not empirically demonstrated—that environmental interpretation can and should influence visitors' attitudes or behavior toward the use of natural resources. Such an influence presumably includes resources that are the immediate subjects of interpretation as well as those beyond the site (Hunt and Brown 1971; Knapp 1997; Mackintosh 1986; Mahaffey 1972; McAvoy and Dustin 1983; NPS 1991; Sharpe 1982; Tilden 1957).

Visitors come to experience the Monument's unique history, its sweeping vistas, and its spectacular natural resources. They seek the solitude of floating past the White Bluffs or a battle with a Columbia River Chinook salmon. Many wish to learn the history of the area—not simply the nuclear story, but of the lives of the Native Americans and the homesteaders that made a sustainable existence in this sometimes harsh land. To maintain these experiential benefits, dedicated efforts must be made toward protecting and often restoring the Monument's natural and cultural resources. Such efforts would benefit from high-quality, accessible and inspiring interpretation and education facilities, services and programs.

4.7.1 Assumptions

Since establishment of the Monument, there has been a steady increase in requests for interpretation and education programs and materials. In view of current outdoor recreation trends, a growing emphasis on environmental education in our schools and colleges, and the Monument's status as one of the nation's newest national monuments, demand for interpretation and education products will likely continue to rise.

Research has established that interpretation and education programs, facilities and materials can be pivotal in creating a sense of ownership in public lands and can help to instill conservation practices in students and the visiting public. Increasing numbers of schools are integrating hands-on, inquiry-oriented activities in their classrooms to offer students an opportunity to experience important concepts in science (Krapfel 1999). For example, stream and shrub-steppe monitoring and river studies afford excellent opportunities for students to investigate real-world problems associated with water quality and habitat restoration. Moreover, outdoor education programs such as these provide frequent opportunities to explore the *margins* of the classroom (Haley-Oliphant 1994; Palmberg and Kuru 2000).[160] These types of programs have had great success in their initial offerings at the Monument.

A step-down interpretation and education plan would be developed under all alternatives. The plan's extent will depend on management direction selected in the final CCP. It is assumed that

[160] *Margins* are places in curriculum where students and teachers explore concepts, ideas, and questions that give everyone the chance to take risks, to wonder, and to maintain curiosity and creativity.

developing a range of interpretation and education facilities, materials and services that are appropriate to the Monument's natural and cultural resources will result in beneficial long-term effects to resources and the visiting public.

4.7.2 Effects Analysis—Interpretation and Education

4.7.2.1 Effects Common to All Alternatives

4.7.2.1.1 Control of Invasive Non-native Species

The control of non-native invasive species would have no foreseeable adverse effects on interpretation and education activities. Moderate, long-term, beneficial effects would include increased opportunities to convey the adverse effects of non-native invasive species, the difficulty of control, and strategies to reduce the spread of invasive non-native species.

4.7.2.1.2 Restoration

The implementation of restoration measures may result in short-term adverse impacts to education and interpretation through the temporary closure of areas during restoration activities. Minor, indirect, beneficial effects would include increased educational opportunities in ecosystem restoration for volunteers, schools and other interest groups.

4.7.2.1.3 Interpretive Site Development

As with all developments and improvements on a minimally altered landscape, both beneficial and adverse effects are likely to result from interpretation and education site developments. Long-term localized effects could result from the installation of interpretive sites. The visiting public would generally experience beneficial effects through their heightened awareness and enjoyment of the Monument's natural and cultural resources. Presumably, improved recreational practices and activities by an enlightened public with a deeper understanding of conservation and stewardship ethics would ultimately have beneficial effects on the resources.

4.7.2.1.4 Public Use

Visitor facility improvements would provide additional interpretation and education opportunities through the placement of signs and informational materials at access points.

4.7.2.2 Effects of Biological Resource Management Actions

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions. Under all alternatives, upland habitat would be improved through the demolition and disposal actions associated with scheduled DOE remediation activities on top of Rattlesnake Mountain. Buildings identified for cleanup would be removed, and upland habitats would be restored. Restoration activities would remove all unnecessary structures, remove roads, recontour soils, and reestablish native vegetation. Ground-disturbing activities to remove building materials, asphalt, gravel and concrete foundations would have negligible direct effects on educational experiences. Interpretation and education opportunities related to restoration science, shrub-steppe habitat interpretation, wildlife observation, photography, botany, and the historical and cultural values of Rattlesnake Mountain would be expected to have beneficial effects.

Alternatives B, B-1, C, C-1 and F would entail the above mentioned cleanup efforts, with the additional removal of the observatory. The removal of the observatory would have minor adverse effects for educational institutions related to the study of astronomy. Restoration of Rattlesnake Mountain would have beneficial effects by providing additional interpretation and education opportunities related to the cultural and historical value of the mountain, restoration science, lithosol habitat interpretation, wildlife observation, photography, geology and botany.

Alternatives A, D and E would entail all DOE scheduled demolition and disposal cleanup efforts as above, except the observatory could remain in place to be used for remote operation for possible educational purposes. Retention of the observatory could have minor beneficial effects for educational institutions related to the study of astronomy.

Wildland fire and fire suppression activities could have minor to major effects on educational experiences on the Monument, depending on local weather conditions and the extent of individual fire events. Fire danger and/or wildland fire would cause short-term adverse effects on interpretation and education opportunities through temporary land closures during periods of high fire danger; area restrictions during ongoing fire operations; damage to educational infrastructure (e.g., kiosks, trails); effects on long-term study plots; vegetation removal; and suppression activities (e.g., bulldozer lines, hand lines, staging areas). Wildland fire would have beneficial effects by creating a setting for educational experiences involving post-fire research, fire effects monitoring, public information on fire and ecosystem relationships, and post-fire shrub-steppe recovery.

4.7.2.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.7.2.3.1 Interpretive Site Development

There are no interpretive site developments planned under Alternative A. This lack of developed sites would have a continued adverse effect on interpretation and education opportunities. Currently, the adverse effects include a resultant lack of general knowledge of the Monument and confusion over access points, Monument regulations, and available recreational opportunities. Threats to habitat, wildlife, and geological, paleontological and cultural resources result from a lack of available information on Monument regulations, habitat and wildlife sensitivity.

An increase in developed interpretive sites under Alternatives B–F would provide the visiting public with additional opportunities to learn about the Monument, its natural and cultural resources, and ongoing management activities to protect and enhance the environment. These added opportunities would aid the public in their knowledge of the FWS and its mission to protect and conserve wildlife and habitat, would raise awareness of Monument regulations, and would reduce instances of inappropriate activities, resulting in long-term beneficial effects to resources.

4.7.2.3.2 Interpretive Trail Systems

The impacts would be similar to those described above for Interpretive Sites.

4.7.2.4 Effects of Visitor Services Management Actions—Recreation

4.7.2.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Hunting activity under all alternatives would have minor adverse effects on interpretation and education opportunities through noise from weapon fire. However, the presence of hunting activity on the Monument can also provide opportunities for interpretation and education programs focusing on hunting history, its role in wildlife management, and changing societal views of hunting.

Hunting – Alternative B-1

As the hunting program is believed to have minor impacts on interpretation and education opportunities on the Monument, there would be negligible impacts from discontinuing it.

4.7.2.4.2 Fishing

The presence of fishing activity on the Monument can provide opportunities for interpretation and education programs focusing on fishing history and traditions.

4.7.2.4.3 Wildlife Observation and Photography

Alternatives B–F would result in moderate beneficial effects on interpretation and education opportunities by providing additional opportunities for learning about wildlife and other Monument resources.

4.7.2.4.4 Hiking

Designated hiking trails would increase interpretation and education opportunities along the trail and at key sites, such as trailheads and scenic vistas. Alternatives B, B-1 and F would result in minor beneficial effects, while Alternatives C, C-1, D and E would result in major beneficial effects by providing additional trails.

4.7.2.4.5 Equestrian Use

Designated equestrian trails would increase interpretation and education opportunities along the trail and at key sites, such as trailheads and scenic vistas. Alternatives B–F would result in moderate beneficial effects.

4.7.2.4.6 Boat Launches

Vernita

Alternatives B–F would result in minor beneficial effects by providing increased interpretation and education opportunities at this site.

White Bluffs

Alternatives A, B, B-1 and C-1 would have negligible effects on interpretation and education opportunities at the White Bluffs Boat Launch due to restrictions to access. Alternative C would have moderate adverse effects on those visitors wishing to visit this site by vehicle and moderate beneficial effects on visitors preferring a non-motorized setting. Alternative D would have minor beneficial effects on river-based interpretation and education opportunities by improving river access in this location. Alternatives E and F would have moderate adverse effects on interpretation and education opportunities for visitors using motorized boats due to restrictions on access and minor beneficial effects on interpretation and education opportunities for visitors using non-motorized boats.

Ringold

Alternatives B–F would result in minor beneficial effects on interpretation and education opportunities by increasing the ease of access to the river in this area and providing opportunities for visitors to learn about the Monument at the boat launch site.

South Shore

Alternative D would result in minor beneficial effects by providing increased opportunities for visitors to learn about the Monument at the boat launch site.

4.7.2.4.7 Camping

Vernita

Alternatives D and E would result in minor beneficial effects on interpretation and education opportunities in this area by providing increased opportunities to learn about the Monument at the developed campground.

Boat-In

Establishment of boat-in campsites under Alternatives C, C-1, D and E would result in moderate beneficial effects for non-motorized boaters pursuing interpretation and education opportunities on the Hanford Reach by providing access points for overnight use and increasing opportunities to learn about the Monument.

Saddle Mountain

Alternative D would result in moderate beneficial effects on visitors pursuing interpretation and education opportunities by providing increased opportunities to learn about the Monument at the new campground.

4.7.2.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Alternatives B, B-1, C, C-1, D and F would result in minor adverse effects on interpretation and education opportunities by reducing the available acreage open to the public. Alternative E would result in minor beneficial effects by providing opportunities for visitors to learn about the Monument at trailheads and other visitor improvement sites.

Sand Dunes. Alternatives C, C-1, D and E would provide access to the sand dunes, resulting in minor beneficial effects by providing additional interpretation and education opportunities for visitors to learn about the Monument.

South Shore. Alternatives C, C-1, D and E would provide access to the south shore, resulting in minor beneficial effects by providing additional interpretation and education opportunities for visitors to learn about the Monument.

North Shore. The effects under Alternatives D and E would be similar to those described for the South Shore.

Ringold Unit

Parking Lots. The effects on interpretation and education opportunities would be negligible.

Auto Tour. Alternative D would result in moderate beneficial effects by providing additional interpretation and education opportunities for visitors to learn about the Monument.

Saddle Mountain Unit

Under Alternatives A, C-1, D and E, effects on interpretation and education opportunities would be negligible. Alternatives B and B-1 would result in major adverse effects on interpretation and education opportunities by closing a destination area. Alternatives C and F would result in moderate adverse effects for visitors preferring motorized access and moderate beneficial effects for visitors preferring non-motorized access.

Wahluke Unit

West Access. Alternative B and B-1 would result in minor beneficial effects by providing additional interpretation and education opportunities. Alternatives C, C-1, D, E and F would result in moderate beneficial effects by providing additional interpretation and education opportunities, including access to the Saddle Mountain Lakes and wetlands.

Auto Tour. The effects under Alternative D would be similar to those described for the Ringold auto tour route.

4.7.2.4.9 Permit System

Under Alternative F, visitors would be required to obtain an access permit prior to entering the Monument. This requirement could decrease the convenience of visiting the Monument, resulting in minor adverse effects on visitors seeking interpretation and education opportunities. This could be offset, in part, by visitors having some form of contact with FWS staff or facilities, whereby Monument information could be conveyed.

4.8 Effects on Recreation and Public Use

Readily accessible by land and by water, the Monument provides many outdoor recreation opportunities. Most visitor facilities (e.g., roads, boat launches, and parking areas) are primitive. The Monument is open for day-use only, although this restriction has not been enforced in the Vernita Bridge boat launching area. This analysis examines effects on hunting, fishing, wildlife observation and photography, and other recreational activities (e.g., boating, equestrian use, hiking, and bicycling).

4.8.1 Assumptions

Facility improvements and increased access would result in increased visitation to the Monument. Byproducts of increased visitation could adversely affect visitor experiences to some degree through increased congestion, noise and litter, especially in popular public use areas. It is assumed that some visitors would be displaced from areas they may have traditionally used as a result of these factors, while others would adjust their visitation times and/or their expectations to accommodate the changes. It is assumed that with increased visitation, more people would learn about and appreciate the Monument.

An interpretation and education component would be integral to the Monument's visitor use program by providing information on the Monument's natural and cultural resources, recreational opportunities, rules and regulations.

The extent and depth to which interpretation and education facilities and programs are developed would vary under different alternatives. However, it is assumed that each action alternative would offer a variety of interpretive materials that would be complementary to the recreational facilities and activities available. Interpretation and education materials would emphasize the need for resource protection and attempt to foster a sense of ownership and stewardship of the Monument's natural and cultural values.

4.8.2 Effects Analysis—Hunting

Hunting is a recreational activity in its own right. Here, the analysis looks at both the impacts of hunting as a recreational activity, as well as its impact on other recreational activities. The Monument provides regionally significant opportunities for hunting waterfowl; upland birds, including quail, Hungarian (gray) partridge, pheasant, mourning dove, and chukar; and big game, including deer and elk. Hunting is only open during Washington State-designated hunting seasons. Non-toxic shot is required for all bird hunting activities, and big game hunting weapons are limited to archery, shotgun and muzzleloader.

4.8.2.1 Effects Common to All Alternatives

4.8.2.1.1 Invasive Non-native Species Control

Hunting activities would have no foreseeable adverse effects on the control of non-native invasive species under all alternatives. Conversely, beneficial long-term effects on hunting would be improved habitat conditions and increased wildlife distribution on the landscape. These effects would range from minor to major, depending on the timing and extent of successful weed treatments and the wildlife species that use these habitats. Non-native invasive species control would improve gamebird and animal populations by improving plant community biodiversity, health, structure and function. Occasionally, temporary area closures may take place during hunting season to conduct invasive non-native species control efforts. These temporary closures are for the safety of the hunting public and would have negligible effects on hunting overall.

4.8.2.1.2 Wildland Fire and Fire Suppression Activities

Hunting could have significant single-event impacts should a hunter-caused fire spread across the Monument. However, hunters are no more likely to cause a fire than any other user group, and the overall impacts during the duration of the CCP would be minor to moderate. In fact, given the time of year when hunting occurs, fire events would be less likely than from summer users of the Monument. On the other hand, fire events may have adverse short-term effects on hunting through vegetation removal, short-term habitat loss, wildlife disturbance and displacement, suppression effects (bulldozer lines, hand lines, staging areas), and post-fire expansion of non-native invasive species that degrade wildlife habitat. The level of effects on hunting cannot be estimated because the number and size of fires vary from year to year. Wildland fire would have moderate, long-term effects on hunting.

4.8.2.1.3 Public Use

Hunting – Alternatives A, B, C, C-1, D, E and F

Hunting opportunities would benefit from increased access and improved visitor facilities, such as parking areas, hunting blinds, and boat launches. However, visitor facility and access improvements would result in increased visitation to the Monument, with subsequent adverse effects on hunting through increased habitat degradation, wildlife disturbance, risk of wildland fire, and crowding. In addition, visitor facility improvements could necessitate the need for no-shooting safety zones.

As public use levels expand across time, unanticipated conflicts between user groups may occur, and there may be a need to implement strategies, such as time and space zoning, to eliminate or minimize conflicts and maintain quality wildlife-dependent recreational opportunities. However, in light of current hunter numbers, it is not anticipated that this would be needed within the foreseeable future.

Hunting activities and the presence and noise of weaponry in public use areas would have varying effects on the Monument's aesthetic environment; responses to hunting are highly subjective. As such, hunting could adversely affect visitors pursuing recreational activities such as boating, equestrian use, hiking and bicycling. Hunting activities—especially the sound of weapons—would result in seasonal, minor adverse effects on solitude within the Monument.

Non-hunters, especially, could experience adverse effects associated with hunting activities. The sight of orange safety garments typically worn by hunters would stand out on the landscape in some areas of the Monument. The sight of animals being killed and/or dead animals could be a major adverse effect for some visitors. Hunting-related litter, such as empty bullet casings,

would also contribute to adverse effects. Adverse effects would be minor to major for some visitors and negligible for others.

However, these adverse effects can be reduced, eliminated, or mitigated by providing information on year-round recreational opportunities and typical use patterns to visitors. Such information allows visitors to know what activities to expect at different times of the year so that they can better prepare for their visit. Seasonal closures of some areas to certain uses and other segregation of users would also eliminate, or at least lessen, potential adverse effects. Also, full and careful implementation of the hunting measures/regulations would lessen any impacts to non-hunters.

Public health and safety are of primary concern in the establishment and operations of any FWS program. None of the proposed hunts offer major conflicts with other hunts or activities. With the current use patterns, impacts to public health and safety from the hunting program would be negligible. However, if visitor use patterns change in the future, or visitor facility improvements such as trails and auto tour routes are established within hunting areas, there may be a need for implementing strategies, such as increased outreach and establishing no-shooting zones, to minimize impacts to public health and safety.

FWS-led management actions, such as non-native species control, fire suppression, or fire restoration efforts which involve use of aircraft and herbicide treatments, may occur during hunting seasons. When such efforts intersect with hunting activities and therefore could potentially impact human health and safety, the FWS may implement temporary area closures to minimize such impacts.

Hunting – Alternative B-1

Opportunities to participate in partnership programs with hunting interest groups to promote wildlife-dependant recreation and education could be missed. Likewise, direct opportunities to educate the public on the value of wildlife and national wildlife refuges would be foregone, as well as opportunities for more indirect environmental education.

Overall, benefits to other recreation opportunities, such as wildlife observation and photography, would likely occur from discontinuing hunting-related impacts (e.g., wildlife disturbance, noise, visual impacts). However, these gains would be minor.

As the recreational hunting program is believed to have negligible impacts to public health and safety on the Monument, there would be negligible impacts to public health and safety by discontinuing it.

4.8.2.1.4 Interpretation and Education

Hunting can have a positive impact on education and interpretation opportunities. Many state and federal programs use hunting to educate the public about the environment and responsible use of it.

Presently, only minimal interpretation and education materials address hunting. An uninformed public can account for many of the illegal and unauthorized hunting activities occurring in the Monument. It is anticipated that activities of this type would be reduced through the delivery of educational information and programs featuring hunting opportunities. Interpretation and education facilities and materials would have a moderate, long-term, beneficial effect on hunting.

4.8.2.2 Effects of Biological Resource Management Actions

Riparian area restoration would be implemented on identified at-risk plant communities and aquatic areas. No active riparian restoration is proposed under Alternative A, so hunting would have no effect.

Under Alternatives B–F, restoration treatments would entail the identification, prioritization and restoration of at-risk riparian areas to proper functioning condition. Adaptive management strategies and IPM techniques would be used to initiate treatment on sensitive and biologically diverse riparian plant communities. Given the time of year when most of these activities occur, hunting would have little, if any, effect. Conversely, direct effects from restoration on hunting include short-term wildlife disturbance/displacement and soil disturbance, which would have negligible effects on hunting opportunities. Indirect beneficial effects of riparian restoration efforts include soil and streambank stabilization, reduction in sedimentation, improved fish and wildlife habitat, and improved wildlife diversity, all of which would have moderate long-term beneficial effects on hunting opportunities.

4.8.2.3 Effects of Visitor Services Management Actions—Interpretation and Education

It is believed that hunting programs can enhance user appreciation for, and understanding of, wildlife, its habitats, and the environment, and they may promote a strong land ethic and sense of environmental awareness. By allowing hunting, the FWS realizes an opportunity to increase the public's awareness of the Monument, its resources, and the NWRS.

4.8.2.3.1 Interpretive Site Development

Under Alternative A, interpretive sites would not be established in the Monument. Adverse effects from hunting on the Monument would continue from lack of site-specific information.

The interpretive site developments planned under Alternatives B–F may involve hunting by mentioning opportunities, area closures, game species, and management actions. Hunting would allow the FWS to provide educational and interpretive programs to more people. Minor benefits to hunting would result from improving the ease of obtaining information about hunting opportunities.

4.8.2.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trails are planned; accordingly, no effects from hunting are anticipated.

Interpretive trails would be developed under Alternatives B–F. Hunting would have little impact on these systems as most hunting activity would occur well away from the trails, although they may be used as jump-off points for hunters. Depending on the location of these trails, and whether the trails and surrounding habitat would be open to hunters, there would be a moderate beneficial effect on hunting by providing increased access points and opportunities for hunters to easily traverse the landscape. However, there is the possibility of conflicts arising between hunters and other recreational users of the trails. Certain trails may be closed during hunting season or closed to hunting for visitor protection if such closure is warranted.

4.8.2.4 Effects of Visitor Services Management Actions—Recreation

4.8.2.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Continuation of compatible hunting programs on the Wahluke Unit would provide for one of the priority public uses identified by the Improvement Act. The public would have the opportunity to harvest a renewable resource in a traditional manner, which is culturally important to some components of the local community. This alternative would allow the public to enjoy hunting at no or little cost in a region where private land is the norm and where it is frequently leased for hunting, often costing $300-$2,000/year for hunting membership or access.

Hunting – Alternative B-1

If hunting was discontinued, the hunting public would not have the opportunity to harvest a renewable resource while participating in compatible wildlife-dependent recreation; nor would the FWS be meeting public use demand in the area. The FWS would also lose an important wildlife management tool if the hunting program were closed. Public relations would be severely, negatively impacted within the local hunting community.

4.8.2.4.2 Fishing

The effects from hunting are anticipated to be negligible.

4.8.2.4.3 Wildlife Observation and Photography

Wildlife disturbance resulting from hunting activities would have an adverse effect on wildlife observation and photography opportunities in hunt areas during hunting seasons. However, because of the seasonal nature of disturbance and the relatively large sanctuary areas in the Monument, such adverse effects are anticipated to be minor.

Hunting opportunities would be slightly reduced if a need is identified to establish no-hunting safety buffer zones around developed observation and photography sites. Because of the minimal acreage that would be involved in such buffer zones, effects are anticipated to be minor.

4.8.2.4.4 Hiking

Under Alternatives B–F, hunting would have minor, mostly aesthetic, impacts on hiking. Certain areas of the Monument may be closed to hiking for public safety. Hiking activities during hunting seasons could have minor adverse effects on hunting opportunities by flushing game animals.

4.8.2.4.5 Equestrian Use

Under Alternative A, effects from hunting are anticipated to be negligible. Under Alternatives B–F, equestrian travel routes would be established, and hunters could no longer hunt from horseback. Some visitors would perceive this positively, while some visitors preferring to hunt from horseback would be negatively impacted.

4.8.2.4.6 Boat Launches

Vernita

The effects from hunting are anticipated to be negligible due to the waterfowl hunting closure in the upper river and no shooting from boats for other wildlife.

White Bluffs

The effects from hunting are anticipated to be minor; any slight impacts would be associated with changes in access.

Ringold

Under Alternatives B–F, waterfowl hunters along the lower Hanford Reach could benefit from improved boat access.

South Shore

Under Alternative D, waterfowl hunters could benefit from additional boat access to the lower Hanford Reach.

4.8.2.4.7 Camping

Columbia River Unit

Vernita Bridge, South Shore. The effects on hunting are anticipated to be negligible.

South Shore. The effects on hunting are anticipated to be negligible.

North Shore. The effects on hunting are anticipated to be negligible.

Sand Dunes. The effects on hunting are anticipated to be negligible.

Ringold Unit

Parking Lots. The effects on hunting are anticipated to be negligible.

Auto Tour. Hunting opportunities would be slightly reduced if a need is identified to establish a no-hunting safety buffer zone around the auto tour route. Increased wildlife disturbance

resulting from visitor use of the auto tour route would result in minor adverse effects on hunting opportunities in this area.

Saddle Mountain Unit

No reasonably foreseeable effects from hunting would occur under Alternatives A, C-1 and D. Under Alternative B and B-1, 2,644 acres along the Saddle Mountain crest would be closed to public use, resulting in minor adverse effects on hunting opportunities. Under Alternatives C and F, 2,644 acres along the Saddle Mountain crest would be accessible by foot or horseback only, resulting minor beneficial effects for hunters preferring non-motorized hunting opportunities and minor adverse effects for hunters preferring vehicular access.

Wahluke Unit

West Access. Under Alternatives B–F, additional acreage would be opened to big and upland game hunting, resulting in moderate beneficial effects on hunting opportunities on the Monument.

Auto Tour. Because this area is currently closed to hunting and does not provide quality wildlife sanctuary habitat, there are no foreseeable effects on hunting.

4.8.2.4.9 Permit System

Under Alternative F, an access permit system would result in minor adverse effects by decreasing convenience in accessing the Monument.

4.8.3 Effects Analysis—Fishing

Fishing is the most popular activity in the Monument and occurs year-round on the Columbia River and the WB-10 Ponds. The Hanford Reach attracts anglers from around the Northwest, providing fishing opportunities for salmon, steelhead, sturgeon, whitefish and small-mouth bass. The Hanford Reach provides spawning habitat for approximately 80% of the remaining fall Chinook salmon runs on the main stem Columbia River, resulting in excellent fishing opportunities in the fall. Native American tribes have fished in the Hanford Reach for millennia. Columbia River fishing is regulated by the WDFW, while fishery resources are managed by multiple federal and state agencies.

4.8.3.1 Effects Common to All Alternatives

4.8.3.1.1 Control of Non-native Invasive Species

The treatment of non-native invasive species would have no foreseeable negative effects on fishing activities. Beneficial long-term effects on fishing would be anticipated to result from control of non-native invasive species. Benefits would be minor to major, depending on the extent of the infestation and the species involved, and would improve watershed health by enhancing plant community biodiversity, structure and function. Direct beneficial effects on fishing opportunities would result from improved upland health, reduced sedimentation, and improved hydrologic function.

4.8.3.1.2 Wildland Fire and Fire Suppression Activities

Fire events can have adverse short-term effects on fishing as a result of vegetation removal, suppression activities (e.g., bulldozer lines, hand lines, staging areas), changes in watershed response, nutrient transport (ash and silt), hydrologic function, and post-fire expansion of non-native invasive species that decrease upland health and increase sedimentation potential. The effects on fishing of wildland fire would be minor to moderate but of short duration and would depend on fire size, intensity and location.

4.8.3.1.3 Modified Public Access

Fishing opportunities would benefit from increased access and improved visitor facilities, such as parking areas, trails and boat launches. However, visitor facility and access improvements would result in increased visitation to the Monument, with subsequent adverse effects on fishing opportunities through increased habitat effects, congestion and noise.

4.8.3.2 Effects of Biological Resource Management Actions

No active riparian restoration is proposed under Alternative A.

Under Alternatives B–F, restoration treatments would entail the identification, prioritization and restoration of at-risk riparian areas to proper functioning condition. Adaptive management strategies and IPM techniques would be used to restore sensitive and biologically diverse riparian plant communities. Direct effects would include short-term soil disturbance, which would have negligible effects on fishing opportunities. Indirect beneficial effects of riparian

restoration efforts include soil stabilization, streambank stabilization, reduction in sedimentation, improved fish habitat, and improved species diversity, all of which would have long-term beneficial effects on fishing opportunities.

4.8.3.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.8.3.3.1 Interpretive Site Development

Under Alternative A, interpretive sites would not be established in the Monument; consequently, effects on fishing opportunities would be negligible.

The interpretive site developments planned under Alternatives B–F may involve fishing by mentioning opportunities, access points, available species, fishing methods (both modern and historical), and management actions. Minor adverse effects on fishing may include an increase in fishing pressure, increased congestion on the river and the river shore, increased use of boat ramp facilities, and more trash and litter at fishing access points. Messages in interpretive exhibits will attempt to mitigate these effects through education and the creation of a sense of ownership and stewardship of Monument resources.

4.8.3.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trails are planned; accordingly, no effects on fishing opportunities are anticipated.

The development of interpretive trails is not likely to include fishing activities as a component of the interpretive experience. Although trails may be sited along waterways, they are not anticipated to be associated with fishing facilities or activities. They may, however, provide travel corridors to fishing access points. Negligible effects are anticipated.

4.8.3.4 Effects of Visitor Services Management Actions—Recreation

4.8.3.4.1 Hunting

The effects on fishing are anticipated to be negligible.

4.8.3.4.2 Fishing

It is anticipated that fishing opportunities would be enhanced through the completion of a step-down Fishing Plan developed in coordination with agencies that have jurisdictional authority over the Columbia River, as well as through subsequent implementation of management actions aimed at addressing facility and access needs, safety and public outreach and education.

4.8.3.4.3 Wildlife Observation and Photography

The effects on fishing are anticipated to be negligible.

4.8.3.4.4 Hiking

The effects on fishing are anticipated to be negligible.

4.8.3.4.5 Equestrian Use

The effects on fishing are anticipated to be negligible.

4.8.3.4.6 Boat Launches

Vernita

Under Alternatives A, B, B-1 and F, primitive conditions at the Vernita launch area would serve as a deterrent to some anglers, who would continue to seek river access elsewhere, such as the White Bluffs Boat Launch, the WDFW Ringold Fish Hatchery, or the developed launches in the Tri-Cities area. Alternatives C, C-1, D and E would result in moderate beneficial effects on motorized boat fishing opportunities by providing an improved boat launch and would result in moderate adverse effects for anglers preferring primitive settings. A developed boat launch under Alternatives C, C-1, D and E is expected to increase visitor use in this area, resulting in minor adverse effects on fishing experiences caused by increased noise and congestion on the river, although obviously, access would be improved.

White Bluffs

Alternatives A, B, B-1 and C-1 are anticipated to have negligible effects on fishing opportunities. Alternative C would have an adverse effect on fishing opportunities by closing the boat launch. Alternatives E and F would result in moderate adverse effects on motorboat-

based anglers seeking access in this area. Anglers would be displaced to alternate launch sites at Vernita, Ringold, or Tri-Cities area launches. Alternative D would have moderate beneficial effects for motorboat-based anglers preferring developed settings and would have moderate adverse effects on those preferring primitive settings. A developed boat launch under Alternative D is expected to increase visitor use in this area, resulting in minor adverse effects on fishing experiences caused by increased noise and congestion on the river, although obviously, access would be improved.

Ringold

Under Alternative A, the primitive conditions at the Ringold launch area would serve as a deterrent to some anglers, who would continue to seek river access elsewhere, such as the White Bluffs Boat Launch or the developed launches in the Tri-Cities area. Alternatives B–F would result in moderate beneficial effects on anglers preferring developed boat launches and moderate adverse effects on anglers preferring primitive launches. A developed launch at Ringold is anticipated to increase visitor use in this area, resulting in minor adverse effects on fishing experiences caused by increased noise and congestion on the river, although obviously, access would be improved.

South Shore

Alternative D would result in moderate beneficial effects on anglers by providing additional river access and boat launch sites. However, Alternative D would also result in moderate adverse effects on fishing experiences caused by increased noise and congestion on the river, although obviously, access would be improved.

4.8.3.4.7 Camping

Vernita

Alternative A is anticipated to have negligible effects on fishing opportunities. Alternatives B, B-1, C, C-1 and F would result in moderate adverse effects on anglers wishing to camp in the Vernita Bridge area, likely displacing them to alternate sites outside the Monument, such as the community of Desert Aire or Benton County's Horn Rapids Park. Alternatives D and E would result in moderate beneficial effects by reducing travel time to fishing areas for campground-based motorboat anglers.

Boat-In

Alternatives C, C-1, D and E would result in moderate benefits for anglers fishing from non-motorized boats by providing camping opportunities on the Hanford Reach.

Saddle Mountain

Alternatives A, B, B-1, C, C-1, E and F would require anglers to continue to seek overnight accommodations outside the Monument. Alternative D would result in moderate beneficial effects on access for anglers by removing the need to travel off site for overnight accommodations.

4.8.3.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Alternatives A and E would have negligible effects on fishing opportunities. Alternatives B, B-1, C, C-1, D and F would result in minor adverse effects on fishing opportunities by reducing available shorelines open to the public for these activities.

Sand Dunes. The effects from this action are anticipated to be negligible.

South Shore. Alternatives C, D and E would result in moderate beneficial effects by increasing opportunities for fishing on the south shore.

North Shore. Alternatives C-1, D and E would provide access to the north shore, resulting in minor beneficial effects by increasing opportunities for fishing on the north shore.

Ringold Unit

Parking Lots. Alternatives B–E would have negligible effects on fishing opportunities. Alternative F would result in minor adverse effects on fishing opportunities by closing Parking Lot 7 and the existing primitive boat launch and by increasing the difficulty of access to bank shore fishing around Parking Lot 7.

Auto Tour. The effects on fishing are anticipated to be negligible.

Saddle Mountain Unit

The effects on fishing are anticipated to be negligible.

Wahluke Unit

West Access. The effects on fishing are anticipated to be negligible.

Auto Tour. The effects on fishing are anticipated to be negligible.

4.8.3.4.9 Permit System

Under Alternative F, an access permit system would result in minor adverse effects by decreasing convenience in accessing the Monument.

4.8.4 Effects Analysis—Wildlife Observation & Photography

The Monument offers excellent opportunities for wildlife observation and photography, including numerous plants and animals, the Columbia River, basalt ridgelines, cliffs, bluffs, sand dunes, and expansive landscapes. Currently, there are no special facilities (e.g., observation decks, trails, photography blinds) to support these activities.

4.8.4.1 Effects Common to All Alternatives

Interpretive planning will incorporate the best available designs to reduce adverse effects to the lowest level possible while providing visitors with a high-quality wildlife viewing experience. Design components may include viewing blinds, unobtrusive trail designs, and the identification and enforcement of seasonal closures of key areas to protect critical habitats.

Wildlife observation and photography opportunities would benefit from increased access and improved visitor facilities, such as parking areas, photography blinds, and boat launches. However, visitor facility and access improvements would also result in increased visitation to the Monument, with subsequent adverse effects associated with crowding, noise, risk of wildland fire, and wildlife disturbance.

4.8.4.2 Effects of Biological Resource Management Actions

Invasive non-native plant species pose a significant threat to native biodiversity, wildlife habitat, habitat connectivity, and wildlife observation. Under Alternative A, the use of IPM techniques (chemical, biological, cultural, and mechanical) would have minor effects on wildlife observation opportunities. Weeds would be treated annually along major transportation corridors to prevent their spread into adjacent upland plant communities. Spot spraying, hand pulling, and the release of biological control agents would be conducted on an annual basis on high-priority weed populations in off-road situations. Minor direct effects on wildlife observation include short-term wildlife disturbance, short-term wildlife habitat modification, and soil disturbance (with mechanical treatments). The early treatment of small weed populations and site restoration with native species will have indirect, long-term, beneficial effects on native habitats by protecting associated plant communities and wildlife habitat from further

degradation. The control of non-native species would have an overall beneficial effect on wildlife habitat and wildlife observation opportunities.

Under Alternatives B–F, 11,000-18,000 acres would be mapped and treated to control noxious weeds. Weed populations would be prioritized and treated annually on the basis of threat analysis and the target population's potential for offsite movement and infestation of adjacent lands. Minor direct effects on wildlife observation would include short-term wildlife disturbance, short-term habitat modification, and localized soil disturbance. Minor indirect effects would include the reduction or elimination of invasive species in native plant communities leading to improvement of resource conditions, wildlife habitat, wildlife observation opportunities, plant community stability, and habitat connectivity.

Under Alternative A, restoration activities on uplands would range from 0 to 10,000 acres annually and focus primarily on lands disturbed by wildfire events, maintenance-related project work, Hanford Site mitigation, and noxious weed control efforts. Minor direct effects on wildlife observation would include short-term disturbance (temporarily displacing wildlife from the project area) and potential effects on ground-dwelling wildlife by soil disturbance, crushing of burrows or dens, and compaction during drill seeding and harrowing operations. Moderate indirect effects would include improvement of wildlife observation opportunities through native plant reestablishment and the improvement of biodiversity, site health, and plant community structure and function.

Under Alternatives B–F, annual restoration activities on uplands would be conducted on 2,000-6,000 acres per year for fifteen years. Restoration methods would be used primarily to restore degraded shrub-steppe habitats or disturbed areas to a natural range of native plant communities. These activities would directly and indirectly improve the condition of native vegetation and wildlife habitat. Wildlife observation opportunities would, in turn, improve throughout the Monument as shrub-steppe habitats are restored. Minor direct effects on wildlife observation would include short-term disturbance (temporarily displacing wildlife from the project area), as well as potential effects on viewable wildlife through soil disturbance or compaction during drill seeding and harrowing operations. Indirect effects include native plant reestablishment and the improvement of biodiversity, site health, and plant community structure and function; these effects would in turn greatly improve wildlife observation opportunities.

Under Alternatives B, B-1, C, C-1 and D, riparian restoration treatments would entail the identification, prioritization and restoration of at-risk areas to proper functioning condition. Adaptive management strategies and IPM techniques would be used in treating sensitive and biologically diverse riparian plant communities. Some restoration activities (e.g., the removal of non-native species such as Russian olive and salt cedar) may disturb soils, hiding and thermal cover, ecotones and nesting habitat, resulting in minor effects on wildlife observation opportunities. Direct effects would include short-term wildlife disturbance/displacement and soil disturbance. Indirect beneficial effects of riparian restoration efforts include soil

stabilization, streambank stabilization, reduction in sedimentation, improved fish and wildlife habitat, improved wildlife diversity, and improved wildlife viewing opportunities.

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions. Buildings identified for cleanup currently serve as barriers to wildlife movement or artificial habitat for undesirable species such as rats and starlings. Buildings also serve as unnatural perch areas for raptors, increasing predation of rodent populations, while guy wires are known to cause mortality of birds and bats through accidental strikes. Removing the structures would have long-term beneficial effects on wildlife and wildlife observation opportunities. Under all alternatives, upland habitat would be improved through the demolition and disposal actions associated with scheduled DOE remediation activities on top of Rattlesnake Mountain. Short-term displacement and disturbance of wildlife would result from human activity during demolition work.

Fire is the chief threat to the health of shrub-steppe habitats in the Monument. Fire directly effects wildlife observation, both beneficially and adversely, through habitat destruction or modification. Many species depend on shrubs for breeding, rearing and foraging habitat. When plant community components are reduced or eliminated, these species must relocate to other suitable habitat; Wyoming big sagebrush and many other shrub species in the Monument do not resprout following fire. Shrub-steppe obligate species (wildlife species that require certain components of shrub/bunchgrass/forb plant associations for their survival) are thus directly affected by wildland fires. Loss of habitat also has a direct effect on species' reproduction capability, diversity and richness. Decreases in plant community structure and function lead to concomitant reductions in the diversity of wildlife species using these habitats and thus reductions in wildlife viewing opportunities.

Direct effects on wildlife habitat from wildland fire can range from minor to major and include loss of thermal and hiding cover; loss of structure and function for nesting, roosting and rearing; effects on food supplies (plants, animals and insects); and effects on wildlife distribution (potential crowding), foraging and migration patterns. Elimination of vegetative cover also exposes many species of wildlife to excessive predation, and can cause short-term suppression of prey populations. Many species abandon historic use areas (e.g., sage-grouse leks, burrows, dens) and seek out new habitat following fire. Indirect effects include the movement of wildlife into agricultural fields or onto adjacent lands with intact shrub-steppe habitat (e.g., Yakima Training Center), the loss of species diversity, decreased reproduction rates, and increased mortality. Consequently, fire is a major threat to wildlife habitat and thus to wildlife viewing opportunities in the Monument.

Wildland fire can also have beneficial effects on wildlife observation. These effects include habitat improvement, nutrient recycling, improved forage (forbs, insects, grasses), and increased edge effect. However, these benefits are short-term in nature and when combined with invasive species establishment in disturbed areas, such as burned sites, it is unlikely that these benefits would be significant in the Monument.

4.8.4.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.8.4.3.1 Interpretive Site Development

Under Alternative A, interpretive sites would not be established in the Monument, so there would be no effects to wildlife observation opportunities.

Under Alternatives B–F, developing interpretive sites would enhance wildlife observation opportunities by providing information regarding the location of high-quality viewing sites, the times of day and seasons that are best for viewing, and what species can be observed across the seasons. Interpretive sites would be located at centers of visitor activity accessible to observation locations, but far enough removed from them to minimize adverse effects on wildlife. Interpretive sites established at selected wildlife viewing and photography locations would be designed to mitigate adverse effects on wildlife species, populations and habitats through unobtrusive design parameters.

4.8.4.3.2 Interpretive Trail Systems

Under Alternative A, interpretive sites would not be established in the Monument, so there would be no effects to wildlife observation and photography opportunities.

Under Alternatives B–F, an expanded interpretive trail system would provide the visiting public with increased opportunities for viewing and photographing the Monument's wildlife species in their native habitat. Many high-quality opportunities are presently accessible only by primitive, unsigned trails. Development of interpretive trails would provide viewing and photography opportunities to a range of visitors who would otherwise be unable to hike overland or would be reluctant to do so due to the lack of signs. Coupling interpretive trails with established viewing blinds and stations along the route would have long-term beneficial effects on viewing and photography opportunities while minimizing adverse effects on the Monument's wildlife.

4.8.4.4 Effects of Visitor Services Management Actions—Recreation

4.8.4.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Wildlife disturbance resulting from hunting activities would have an adverse effect on wildlife observation and photography opportunities during hunting seasons. Because of the seasonal nature of disturbance and the relatively large sanctuary areas in the Monument, adverse effects are anticipated to be minor.

Hunting – Alternative B-1

Discontinuing the hunting program on the Monument would have a beneficial effect on wildlife observation and photography opportunities during hunting seasons but this effect will be minor because of the seasonal nature of disturbance and the relatively large sanctuary areas in the Monument.

4.8.4.4.2 Fishing

Riverine wildlife disturbance resulting from fishing activities would have an adverse effect on wildlife observation and photography opportunities during fishing seasons. However, with implementation of BMPs, such as establishing area closures around sensitive habitats as needed, and because of the considerable escape area available for riverine species along forty-six miles of Columbia River within the Monument, adverse effects are anticipated to be minor. If boat traffic increases significantly, riverine wildlife disturbance may increase as well, with greater adverse impacts to observation and photography opportunities.

4.8.4.4.3 Wildlife Observation and Photography

Alternatives B, B-1 and F would result in minor beneficial effects on wildlife observation and photography by providing additional opportunities. Alternatives C, C-1, D and E would result in moderate beneficial effects by providing even more opportunities.

4.8.4.4.4 Hiking

Alternative A is expected to have negligible effects on wildlife observation and photography opportunities. Alternatives B, B-1 and F would result in moderate beneficial effects by

providing new trail-based opportunities. Alternatives C, C-1, D and E would result in major beneficial effects by providing a greater extent of trail-based opportunities, including trails in the previously closed Rattlesnake Unit.

4.8.4.4.5 Equestrian Use

Alternative A would result in negligible effects on wildlife observation and photography opportunities. Alternatives B–F would result in moderate beneficial effects on equestrian-based visitors seeking to pursue wildlife observation and photography opportunities on designated trail systems.

4.8.4.4.6 Boat Launches

Vernita

Alternatives A, B, B-1 and F are anticipated to have negligible effects on wildlife observation and photography opportunities. Alternatives C, C-1, D and E would result in minor beneficial effects on motorboat-based visitors by improving boat access at this site. However, improved boat access for wildlife observation and photography opportunities could be offset by increasing use, congestion and noise in the area.

White Bluffs

Alternatives A, B and C-1 would have negligible effects on wildlife observation and photography opportunities. Alternative C would result in moderate, site-specific, adverse effects for visitors preferring motorized access and moderate, site-specific, beneficial effects for visitors preferring non-motorized settings. Alternative D would result in moderate beneficial effects on motorboat-based wildlife observation and photography opportunities by improving river access in this location. However, improved boat access for wildlife observation and photography opportunities could be offset by increasing use, congestion and noise in the area. Alternatives E and F would result in moderate adverse effects on motorboat-based wildlife observation and photography opportunities and moderate beneficial effects on wildlife observation and photography opportunities using non-motorized boats.

Ringold

Under Alternative A, the primitive conditions at the Ringold launch area would serve as a deterrent to some visitors seeking wildlife observation and photography opportunities; they would continue to seek river access elsewhere, such as the White Bluffs Boat Launch or the developed launches in the Tri-Cities. Alternatives B–F would result in moderate beneficial

effects on river-related wildlife observation and photography opportunities by increasing the ease of access to the river in this area. However, improved boat access would also have minor adverse effects on wildlife observation and photography opportunities by increasing use, congestion and noise in the area.

South Shore

Under Alternatives A, B, B-1, C, C-1, E and F, visitors seeking wildlife observation and photography opportunities by boat would continue to use launch sites on the north shore or use launches in the Tri-Cities to access the Monument. Alternative D would result in moderate beneficial effects on visitors seeking boat-based wildlife observation and photography opportunities by providing access on the south shore. However, improved boat access for wildlife observation and photography opportunities could be offset by increasing use, congestion and noise in the area.

4.8.4.4.7 Camping

Vernita

Alternative A is anticipated to have negligible effects on wildlife observation and photography opportunities. Alternatives B, B-1, C, C-1 and F would result in moderate adverse effects on visitors wishing to camp in the Vernita Bridge area, likely displacing them to alternate sites outside the Monument (e.g., the community of Desert Aire, Benton County's Horn Rapids Park). Alternatives D and E would result in moderate beneficial effects by reducing travel time to various locations in the Monument for campground-based visitors. Campground activities, increased visitation, and associated wildlife disturbance in the Vernita Bridge vicinity would have minor adverse effects on wildlife observation and photography opportunities.

Boat-In

Under Alternatives C, C-1, D and E, establishment of boat-in campsites would result in major beneficial effects for non-motorized boaters by providing extended viewing and photography opportunities along the Hanford Reach.

Saddle Mountain

Alternative D would result in moderate beneficial effects on wildlife observation and photography opportunities by reducing travel time to various locations in the Monument for campground-based visitors.

4.8.4.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Alternatives A and E would have negligible effects on wildlife observation and photography opportunities. Alternatives B, B-1, C, C-1, D and F would result in minor adverse effects on wildlife observation and photography opportunities by reducing available acreage open to the public for these activities.

Sand Dunes. Alternatives C, C-1, D and E would result in major beneficial effects on wildlife observation and photography opportunities by providing access to this previously closed area.

South Shore. Alternatives C, C-1, D and E would have minor beneficial effects on wildlife observation and photography opportunities by providing access to this previously closed area.

North Shore. Alternatives D and E would have minor beneficial effects on wildlife observation and photography opportunities by providing access to new portions of this area.

Ringold Unit

Parking Lots. The effects on wildlife observation and photography opportunities are anticipated to be negligible.

Auto Tour. Alternative D would result in moderate, site-specific, beneficial effects on wildlife observation and photography opportunities for visitors preferring motorized access and minor adverse effects on visitors preferring non-motorized settings.

Saddle Mountain Unit

Under Alternatives A, C-1 and D, the effects on wildlife observation and photography opportunities would be negligible. Alternatives B and B-1 would result in major adverse effects on wildlife observation and photography opportunities by closing a destination area for these activities. Alternatives C and F would result in moderate adverse effects on visitors preferring motorized access for wildlife observation and photography and moderate beneficial effects on visitors preferring non-motorized access. Alternative E would have minor adverse effects on wildlife observation and photography opportunities by increasing restrictions on activities.

Wahluke Unit

West Access. Alternatives B and B-1 would result in minor beneficial effects on wildlife observation and photography by providing additional opportunities. Alternatives C, C-1, D, E and F would result in major beneficial effects on wildlife observation and photography by

providing additional opportunities, including access to riparian species associated with the Saddle Mountain irrigation return lakes.

Auto Tour. Alternative D would result in moderate beneficial effects on wildlife observation and photography by providing new opportunities to pursue these activities in a previously closed area.

4.8.4.4.9 Permit System

Under Alternative F, visitors would be required to obtain an access permit prior to entering the Monument. This requirement would decrease the convenience of visiting the Monument, resulting in minor adverse effects on visitors seeking wildlife observation and photography opportunities.

4.8.5 Effects Analysis—Other Recreational Activities

In addition to hunting, fishing and wildlife observation/photography, the Monument provides opportunities for non-motorized and motorized boating, equestrian use, hiking and bicycling. There are no special-surface use regulations in place for boating on the Hanford Reach. Presently, there are no restrictions on cross-country hiking or equestrian use. Bicycles, however, are restricted to designated roads.

4.8.5.1 Effects Common to All Alternatives

4.8.5.1.1 Control of Non-native Invasive Species

No foreseeable effects on other recreational activities are anticipated through implementation of IPM actions.

4.8.5.1.2 Restoration Activities

No foreseeable effects on other recreational activities are anticipated through implementation of DOE's Rattlesnake Mountain restoration actions.

Riparian restoration treatments may affect some recreational activities, such as hiking or boating activities. Seasonal or intermittent area closures would be used to protect restoration activities

as needed in sensitive or fragile resource areas. Minor effects on other recreational activities would be expected under all alternatives.

4.8.5.1.3 Wildland Fire and Fire Suppression Activities

Other recreational activities in some portions of the Monument may be affected by fire precaution levels, ongoing wildland fire, fire suppression operations, fire effects, or fire restoration actions. These effects could include temporary suspension of all use by the general public, modified use through road or area closures, area closures due to high or extreme fire danger, and emergency evacuations due to threats to public safety. Effects on other recreational activities would be similar under all alternatives and would be governed solely by the extent of fire danger or ongoing fire operations on the Monument at the time. It is anticipated that effects on other recreational activities would be minor to moderate and periodic or short-term.

4.8.5.1.4 Modified Public Access

Visitors would benefit from increased access and improved visitor facilities, such as parking areas, trails and boat launches. However, visitor facility and access improvements would increase visitation to the Monument, resulting in adverse effects by increasing user conflicts, crowding, noise, litter and the risk of wildland fire.

4.8.5.2 Effects of Biological Resource Management Actions

Shrub-steppe restoration is a high priority for the protection of Monument Proclamation resources under all alternatives. Minor effects on recreational activities would be expected under all alternatives. Seasonal or intermittent area closures of restoration treatment areas would affect some recreational activities, such as hiking, horseback riding, or other activities, that could potentially interfere with restoration efforts.

4.8.5.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.8.5.3.1 Interpretive Site Development

Under Alternative A, interpretive sites would not be established in the Monument. Under Alternatives B–F, interpretive site development would have long-term beneficial effects on other

recreational opportunities by informing the public of the availability of such opportunities and how they can be enjoyed safely while protecting Monument resources. Messages would include information on safe boating practices, staying on trails designated as hiking and/or horseback riding, and bicycling only on established roadways. The threat of invasive species spread would be stressed, and any special closures or stock feed requirements would be addressed and explained. These messages would have a moderate, long-term, beneficial effect on visitors' experiences and protection of Monument resources.

4.8.5.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trails are planned. Under Alternatives B–F, the development of interpretive trail systems would have a moderate long-term beneficial effect on hiking in the Monument. Many trail users are reluctant to traverse unknown trails or open country; directional and interpretive signs would make these trail systems user friendly. Such a trail system would open Monument resources to a much wider range of visitors who desire to experience the Monument on foot while learning about its unique resources. Because interpretive trails would not likely be open to horses, no effects are anticipated related to equestrian use.

4.8.5.4 Effects of Visitor Services Management Actions—Recreation

4.8.5.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Hunting activities and the presence and noise of guns would adversely affect some visitors pursuing recreational activities, such as boating, equestrian use, hiking and bicycling. Because of the seasonal nature of this disturbance, adverse effects are anticipated to be minor.

Hunting – Alternative B-1

Discontinuing the hunting program on the monument would have a beneficial effect for some visitors pursuing recreational activities, but this effect would be minor because of the seasonal nature of the disturbance.

4.8.5.4.2 Fishing

Fishing activities and associated congestion and noise during popular sportfishing seasons would have minor adverse effects on boaters and potentially other recreationists within sight and sound of the river.

4.8.5.4.3 Wildlife Observation and Photography

Alternatives B–F would have minor beneficial effects on visitors pursuing other recreational activities who would use wildlife observation and photography sites opportunistically.

4.8.5.4.4 Hiking

Alternative A would have negligible effects on hiking opportunities. Alternatives B, B-1 and F would result in moderate beneficial effects on hiking opportunities in the Monument. Alternatives C, C-1, D and E would result in major beneficial effects by providing a greater extent of trail-based opportunities, including trails in the previously closed Rattlesnake Unit.

4.8.5.4.5 Equestrian Use

Alternative A would result in negligible effects on equestrian opportunities. Alternatives B–F would result in moderate beneficial effects on equestrian users by providing designated trail systems. For some non-equestrian users, equestrian use would have an adverse effect by increasing erosion effects of horse travel and by introducing horse excrement, odor, flies and trail encounters with horses to the visitor experience (Newsome et al. 2004).

4.8.5.4.6 Boat Launches

Vernita

Alternatives A, B, B-1 and F are anticipated to have negligible effects on other recreational activities. Alternatives C, C-1, D and E would result in minor beneficial effects to motorboat-based visitors by improving boat access at this site. However, improved boat access would have minor adverse effects on other recreational activities by increasing use, congestion and noise in the area.

White Bluffs

Under Alternatives A, B, B-1 and C-1, effects on other recreational activities would be negligible. Alternative C would result in major adverse effects on boaters preferring to launch at White Bluffs. Closing the launch and access road would have moderate beneficial effects on other recreationists using the river in this area by reducing sights and sounds of other visitors and vehicles. Land-based visitors seeking non-motorized recreational opportunities, such as hikers and equestrians, would also benefit from the closure of the access road. Under Alternative D, improving the White Bluffs Boat Launch would result in moderate beneficial effects on boaters by increasing the ease of river access. Alternatives E and F would result in moderate beneficial effects on non-motorized boaters and moderate adverse effects on motorized boaters as described for Alternative C.

Ringold

Under Alternative A, the primitive conditions at the Ringold launch area would serve as a deterrent to some visitors, who would continue to seek river access elsewhere, such as the White Bluffs Boat Launch or the developed launches in the Tri-Cities. Alternatives B–F would result in moderate beneficial effects by increasing the ease of access to the river in this area. However, improved boat access would have minor adverse effects on other recreational activities by increasing use, congestion and noise in the area.

South Shore

Alternative D would result in moderate beneficial effects on boating opportunities by providing one to two additional boat launches on the south shore. However, improved boat access would have minor adverse effects on other recreational activities by increasing use, congestion and noise in the area.

4.8.5.4.7 Camping

Vernita

Alternative A is anticipated to have negligible effects on other recreational activities. Alternatives B, B-1, C, C-1 and F would result in moderate adverse effects on visitors wishing to camp in the Vernita Bridge area, likely displacing them to alternate sites outside the Monument (e.g., the community of Desert Aire, Benton County's Horn Rapids Park). Alternatives D and E would result in moderate beneficial effects by reducing travel time to various locations in the Monument for campground-based visitors. Campground activities, increased visitation, and associated noise and congestion would have minor adverse effects on other recreational activities in the Vernita Bridge vicinity.

Boat-In

Under Alternatives A, B, B-1 and F, non-motorized boaters seeking to float the entire Hanford Reach would have no options for overnight stays in the Monument. Most non-motorized boaters would continue to divide the trip into two segments, leaving the river in mid-journey, traveling off-site for overnight accommodations, and completing an additional vehicle shuttle for the remaining segment. Establishment of boat-in campsites under Alternatives C, C-1, D and E would have major beneficial effects for non-motorized boaters seeking to float the entire Hanford Reach by providing access points for overnight use and removing the need to divide the trip into two separate trips.

Saddle Mountain

Under Alternatives A, B, B-1, C, C-1, E and F, visitors seeking camping opportunities would be required to leave the Monument, with some options available at sites near the Monument. Alternative D would result in major beneficial effects on visitors seeking to stay more than one day at the Monument by providing for overnight use.

4.8.5.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Alternatives A and E would result in negligible effects on other recreational activities. Alternatives B, B-1, C, C-1, D and F would result in minor adverse effects by reducing the acreage open to public use in this area.

Sand Dunes. Alternatives C, C-1, D and E would result in moderate beneficial effects on non-motorized recreation opportunities through increased access.

South Shore. Alternatives C, C-1, D and E would provide access to the south shore, resulting in moderate beneficial effects on other recreational activities through increased access.

North Shore. Alternatives D and E would provide additional access to the north shore, resulting in moderate beneficial effects on other recreational activities through increased access.

Ringold Unit

Parking Lots. Alternatives B, B-1, C, C-1, D and E would result in negligible effects on other recreational activities. Alternative F would result in minor adverse effects on other recreational activities by increasing the difficulty of access to areas surrounding Parking Lot 7.

Auto Tour. Alternative D would result in moderate beneficial effects on motorized recreational opportunities by increasing vehicle access and providing for through travel between the Ringold and Wahluke Units. Expanded vehicle access in the Ringold Unit would have minor adverse effects on non-motorized recreational activities.

Saddle Mountain Unit

Alternatives A, C-1 and D would result in negligible effects on other recreational activities in the Saddle Mountain summit area. Alternatives B and B-1 would result in moderate adverse effects on other recreational activities by reducing the amount of land open to public access. Alternatives C and F would result in moderate beneficial effects on non-motorized recreational activities by increasing the amount of land available for them and moderate adverse effects on motorized recreational activities by decreasing the acreage available for them. Alternative E would result in minor adverse effects by increasing the restrictions on allowable activities.

Wahluke Unit

West Access. Alternatives B and B-1 would result in minor beneficial effects on recreational activities, such as hiking and horseback riding, by providing public access. Alternatives C, C-1, D, E and F would result in moderate beneficial effects on recreational activities, such as hiking and horseback riding, by providing access to the Saddle Mountain Lakes.

Auto Tour. Alternative D would result in moderate beneficial effects on recreational activities, such as driving for pleasure and sightseeing, by increasing road mileage open to public access.

4.8.5.4.9 Permit System

Under Alternative F, visitors would be required to obtain an access permit prior to entering the Monument. This requirement would decrease the convenience of visiting the Monument, resulting in minor adverse effects on visitors seeking other recreational opportunities.

4.9 Effects on Aesthetics and Solitude

The Monument offers some of the most dramatic landscapes in the Mid-Columbia Basin, characterized by basaltic mountains and ridgelines, rolling uplands, shifting sand dunes, White Bluffs flood deposits, and the Columbia River. Visible human modifications include historic homestead trees; Cold War defense and weapons production facilities; and modern power lines, communication towers, irrigation canals, and wasteways. Even with today's human influences, the Monument's landscapes offer a look into the past, before dam construction and the

impounding of the Columbia River. The semi-pristine viewscape is enhanced by the immense feeling of solitude one feels when visiting the Monument. Such aesthetics and opportunities for solitude in a natural environment exist at few other places in the region. It is important that management actions strive to retain both the aesthetic value and the sense of solitude engendered by the open space and remoteness of the Monument.

4.9.1 Assumptions

All facility design would consider the viewscape and use color and topographic contours to hide facilities from long-range view and minimize effects on aesthetics to the greatest extent possible.

4.9.2 Effects Analysis—Aesthetics

4.9.2.1 Effects Common to All Alternatives

4.9.2.1.1 Wildland Fire and Fire Suppression Activities

Fire events lead to an increased likelihood for moderate short and long-term adverse effects on aesthetics through vegetation removal, suppression activities (bulldozer lines, hand lines, staging areas), and post-fire expansion of non-native invasive species. Natural fires (i.e., under natural fire regimes) can have moderate long-term beneficial effects on aesthetics. Fire can promote the establishment of diverse native plant communities, provide a mosaic plant community appearance, and help reduce the presence of non-native invasive species.

4.9.2.1.2 Public Use

Opening new areas to public access and improving visitor facilities would result in increased visitation. Larger numbers of visitors can adversely affect aesthetics through littering, vandalism, increased risk of wildfire, and spread of non-native invasive species. In addition, visitor facilities and signage can potentially degrade aesthetics by clashing with the landscape.

4.9.2.2 Effects of Biological Resource Management Actions

Minor, long-term, beneficial effects would result from IPM activities. A more diverse and visually pleasing natural landscape would develop through the control of non-native invasive

plants. This effect would be most noticeable during the wildflower bloom in the spring through the reduction of non-native invasive species and the improvement of shrub-steppe habitat health and biodiversity.

Under Alternative A, rehabilitation activities would range from 0 to 10,000 acres annually and focus primarily on lands disturbed by wildfire events, maintenance-related project work, Hanford Site mitigation, and control of non-native invasive plants species. Under Alternatives B–F, annual restoration activities would be conducted on 2,000-6,000 acres over 15 years. Restoration methods would be used primarily to restore degraded shrub-steppe habitats or disturbed areas to a natural range of native plant communities. Treatments could involve the use of prescribed fire to reduce the extent of non-native invasive species and minor ground disturbance associated with drill seeding and planting of native grasses, forbs and shrubs. Minor, short-term, adverse effects on aesthetics could result from these treatments, particularly the use of fire. The restoration of native grasses, forbs, and shrubs in areas now dominated by annual species such as cheatgrass and tumble weed would have moderate, long-term, beneficial effects on aesthetics.

Restoration activities on the summit of Rattlesnake Mountain would attempt to return portions of the site to pre-Manhattan Project conditions. The removal of buildings, towers and other infrastructure and subsequent restoration would have major beneficial effects on aesthetics in the Rattlesnake Mountain crest area. Under Alternatives A, D and E, the observatory structure could remain in place, with continuing moderate adverse effects to the immediate area on the crest of Rattlesnake Mountain, while the proposed removal of the observatory under Alternatives B, B-1, C, C-1 and F would have moderate beneficial effects.

Riparian restoration activities (removing non-native species, ground-disturbance, and planting and seeding) could have minor, localized, short-term, adverse effects on aesthetics. The reestablishment of native trees, shrubs, grasses, and forbs in riparian and wetland areas would have moderate, long-term, beneficial effects on the aesthetics of the Monument.

4.9.2.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.9.2.3.1 Interpretive Site Development

Under Alternative A, interpretive sites would not be established in the Monument. Under Alternatives B–F, facilities and signage associated with interpretive sites would be designed to blend with the environment (e.g., framing, support, colors); however, they would still have some amount of adverse effect. Alternatives B, B-1 and F, with limited site development, would have minor to negligible, long-term, adverse effects on the aesthetic environment. Alternative D, with

the greatest number of developed sites, would have a minor, long-term, adverse effect. Under Alternatives C, C-1 and E, facilities would be concentrated along the perimeters of the Monument and centers of activity, reducing the number of facilities in the interior. This approach to maintaining the native viewscape would have minor to negligible, long-term, adverse effects on the aesthetic environment.

4.9.2.3.2 Interpretive Trail Systems

Under Alternative A, no interpretive trails are planned. Under Alternatives B–F, from two to six interpretive trails are planned. Potential adverse effects would increase with the number of trails developed; conversely, the opportunity for visitors to experience the Monument's aesthetic environment would also increase. Facilities and signage associated with interpretive trails would be designed to blend with the environment to reduce overall minor adverse effects.

4.9.2.4 Effects of Visitor Services Management Actions—Recreation

4.9.2.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Under all alternatives, hunting would have varying effects on the Monument's aesthetic environment; responses to hunting are highly subjective. Some visitors, especially non-hunters, could experience adverse effects associated with hunting activities. The sight of orange safety garments typically worn by hunters would stand out on the landscape in some areas of the Monument. The sight of animals being killed and/or dead animals could be a major adverse effect for some visitors. Hunting-related litter, such as empty bullet casings, would also contribute to adverse effects. Adverse effects would be minor to major for some visitors and negligible for others.

Hunting – Alternative B-1

Discontinuing the hunting program would have a minor to major beneficial effect for some visitors but would be negligible for others. Some visitors find hunting activities visually stimulating (e.g., the sight of the hunters going out into the field with their dogs). These individuals would experience a minor negative impact from the discontinuation of the hunting program.

4.9.2.4.2 Fishing

Under all alternatives, fishing activities would have varying effects on the aesthetic environment; responses are highly subjective. Fishing-related litter, such as discarded fishing line and fish entrails, would be an adverse effect on aesthetics for some visitors. Adverse effects would be minor to major for some visitors and negligible for others.

4.9.2.4.3 Wildlife Observation and Photography

Alternatives B–F would provide varying amounts of new viewing opportunities, including the construction of new facilities. However, with implementation of BMPs described in Section 4.0.1.2, the effects would have negligible to minor effects on the aesthetic environment.

4.9.2.4.4 Hiking

Under Alternative A, there would be no change to existing viewing opportunities. Under Alternatives B–F, new viewing opportunities would be available to visitors because of the creation of designated trails. Potential adverse effects would increase with the number of trails developed; however, facilities and signage associated with interpretive trails would be designed with to blend with the environment.

4.9.2.4.5 Equestrian Use

Under Alternative A, equestrian use would have negligible effects on the aesthetic environment. Under Alternatives B–F, designated trails and roadways would likely result in increased use of the Monument by equestrians, leading to an increased number of viewing opportunities. Horse excrement and flies on trails could constitute an adverse effect on aesthetics for some users. Adverse effects would be minor to major for some visitors and negligible for others.

4.9.2.4.6 Boat Launches

Vernita

Alternative A would have negligible effects on the aesthetic environment of the Vernita Bridge area. Under Alternatives B–F, limited changes to the area would have minor, long-term, beneficial effects on the aesthetic environment by modifying the current use patterns (and resulting damage) that occur in the Vernita Bridge area. Construction of a developed boat

launch under Alternatives C, C-1, D and E would have minor, short-term, localized effects on aesthetics as a result of construction-related traffic, noise and dust.

White Bluffs

Alternatives A, B, B-1, C-1, E and F would have negligible effects on the aesthetic environment of the White Bluffs Boat Launch area. Alternative C would result in fewer viewers, but would still allow public access. Under Alternative C, visitors viewing this site from the Columbia River and other vantages would no longer see vehicles in this area; this would be a minor, long-term, beneficial effect. Alternative D would result in limited changes to the area. Any construction activities would have minor, short-term, localized, adverse effects on aesthetics as a result of construction-related traffic, noise and dust.

Ringold

Alternative A would have negligible effects on the aesthetic environment of the Ringold Fish Hatchery area and on viewing opportunities. Alternatives B–F would result in limited changes to the area and would have minor, long-term, beneficial effects on the aesthetic environment by improving the existing condition of the launch area. Construction activities would have minor, short-term, localized, adverse effects on aesthetics as a result of construction-related traffic, noise and dust.

South Shore

Alternatives A, B, B-1, C, C-1, E and F would have negligible effects on the aesthetic environment. Under Alternative D, a boat launch on the south shore would have minor, long-term, adverse effects on the surrounding aesthetic environment. Construction activities would have minor short-term, localized, adverse effects on aesthetics as a result of construction-related traffic, noise and dust.

4.9.2.4.7 Camping

Vernita

Alternative A would have negligible effects on the aesthetic environment of the Vernita Bridge area and on viewing opportunities. Alternatives B–F would result in limited changes to the area and would have minor, long-term, beneficial effects on aesthetics by changing the current use patterns (and resulting damage) in the Vernita Bridge area. Alternatives D and E would also provide a developed campground; construction activities would have minor, short-term, localized, adverse effects on aesthetics as a result of construction-related traffic, noise and dust.

Boat-In

Alternatives A, B, B-1 and F would have negligible effects on aesthetics. With implementation of BMPs described in Section 4.0.1.2, Alternatives C, C-1, D and E would also have negligible effects on the aesthetic environment of the Hanford Reach.

Saddle Mountain

Alternatives A, B, B-1, C, C-1, E and F would have negligible effects on the aesthetic environment of the Saddle Mountain Unit. The campground associated with Alternative D would have a moderate, long-term, adverse effect on the aesthetic environment near it. Construction activities would have minor, short-term, localized, adverse effects on aesthetics as a result of construction-related traffic, noise and dust.

4.9.2.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Alternative A would have negligible effects on the existing aesthetic environment of the area. Alternatives B, B-1, C, C-1, D and F would result in minor, long-term, beneficial effects on the aesthetic environment by removing existing activities such as off-road vehicle use, littering, dumping and vandalism. This action would likely displace recreational users to the north side of the river; this modified use pattern could increase site damage and have long-term adverse effects on the aesthetic environment there. Alternative E would result in minor, long-term, beneficial effects by establishing designated roads and trails for visitor use.

Sand Dunes. Alternatives A, B, B-1 and F would have negligible effects on the existing aesthetic environment of the portion of the Columbia River Unit near the sand dunes. Alternatives C, C-1, D and E would provide access to the dunes and more viewing opportunities for the public. However, alternatives C, C-1, D and E would have minor, long-term, adverse effects on the aesthetic environment through vegetation disturbance, introduction of non-native invasive plant species, and increased risk of human-caused wildfire.

South Shore. Alternatives A, B, B-1 and F would have negligible effects on the aesthetic environment of the south shore and on viewing opportunities. Under Alternatives C, C-1, D and E, increased visitation would result in minor, long-term, adverse effects on the aesthetic environment, including vegetation disturbance, introduction of non-native invasive plant species, and increased risk of human-caused wildfire. Alternatives C, C-1, D and E would also provide more viewing opportunities for the public along the south shore.

North Shore. Alternatives A, B, B-1, C, C-1 and F would have negligible effects on the aesthetic environment of the north shore and on viewing opportunities. Increased visitation under Alternatives D and E would have minor, long-term, adverse effects on aesthetics through vegetation disturbance, introduction of non-native invasive plant species, and increased risk of human-caused wildfire. Alternatives D and E would also provide more viewing opportunities for the public along the north shore.

Ringold Unit

Parking Lots. Alternative A would have negligible effects on the existing aesthetic environment in the vicinity of the existing parking lots. Under Alternatives B–F, closing and rehabilitating parking lots would have minor, long-term, beneficial effects on aesthetics.

Auto Tour. Alternatives A, B, B-1, C, C-1, E and F would result in negligible effects on the aesthetic environment of the Ringold Unit. An auto tour route under Alternative D would have minor, long-term, adverse effects on aesthetics; however, additional viewing opportunities and information regarding the natural and cultural history of the Ringold Unit and the Monument in general would increase visitors' appreciation of the aesthetic environment. Road improvement activities would have minor, short-term, adverse effects on aesthetics near the areas that would be upgraded as a result of traffic, noise and dust related to construction.

Saddle Mountain Unit

Alternative A would have negligible long-term effects on the existing aesthetic environment and would not result in changes to existing viewing opportunities. Alternatives B and B-1 would have minor, long-term, beneficial effects on aesthetics by allowing areas near the summit to recover from prolonged littering, trampling and vandalism; however, because the entire Saddle Mountain Road would be closed to the public, the public would no longer be able to view this portion of the unit. Under Alternatives C and F, increasing the difficulty of access would have minor beneficial effects on aesthetics by reducing adverse effects (e.g., litter, trampling, vandalism) in the summit area. Alternative C-1 has minor effect on impact, as access could be closed seasonally as needed**.** Under Alternatives D and E, increased visitor use over time could have minor, long-term, adverse effects on aesthetics as a result of increased litter, damage to vegetation from trampling, the introduction of non-native invasive species, and the increased risk of human-caused wildfire.

Wahluke Unit

West Access. Alternative A would have negligible effects on the aesthetic environment. Alternatives B–F would provide new access points, open additional areas to visit, and offer new viewing opportunities for the public. Construction of the new access points would have minor, short-term, localized, adverse effects on aesthetics resulting from construction-related traffic, noise and dust. However, with implementation of BMPs described in Section 4.0.1.2, new

access points in these areas would likely have negligible to minor long-term effects on the aesthetic environment. Increased visitation in the area would have minor, long-term, adverse effects on the aesthetic environment as a result of increased litter, damage to vegetation from trampling, the introduction of non-native invasive species, and the increased risk of human-caused wildfire.

Auto Tour. Alternatives A, B, B-1, C, C-1, E and F would have negligible effects on the aesthetic environment. Under Alternative D, effects would be similar to those described for the Ringold Unit auto tour above.

4.9.2.4.9 Permit System

Under Alternative F, an access permit system would result in negligible adverse effects on aesthetics.

4.9.3 Effects Analysis—Solitude

4.9.3.1 Effects Common to All Alternatives

Adverse effects on solitude would result from increased visitor use on the lands and waters of the Monument. Under all alternatives, these effects would be ameliorated by informing visitors about typical use patterns in the Monument, such as the seasons and locations that tend to receive high visitation and those that receive low visitation. Visitors seeking solitude could use such information in trip planning to increase the likelihood of experiencing solitude. Additionally, outside of hunting seasons, visitors would be encouraged to use natural-colored equipment and clothing to minimize their visibility to others.

4.9.3.2 Effects of Biological Resource Management Actions

Minor adverse effects on solitude can be expected through the implementation of IPM techniques and restoration activities. Effects would be localized and would vary seasonally and annually with scheduled work activities to control non-native invasive species and restore shrub-steppe habitats. Direct effects are anticipated to include increased noise, dust, vehicle traffic, and visibility reduction for visitors near specific project areas.

4.9.3.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.9.3.3.1 Interpretive Site Development

As interpretive sites are developed, it is hoped that the number of visitors who use them will increase. This increase would have a minor, long-term, adverse effect on solitude but would be very localized. Because minimal interpretive sites are planned for the interior of the Monument, most use of such facilities would occur along transportation routes already established. Interpretive site development will mitigate the adverse effects of visitors using the backcountry by increasing their awareness and appreciation of Monument resources, and the concentration of site development in previously established use areas will help to maintain the sense of solitude in the shrub-steppe environment.

4.9.3.3.2 Interpretive Trail Systems

Under Alternatives B–F, from two to six interpretive trails are planned. The loss of solitude would increase with the number of trails developed. All trails would be sited to minimize visual effects and to avoid congestion. The interpretive trails would likely range from 0.5 to 1.5 miles in length and would be sited near notable Monument resources, some of which already receive considerable visitation.

4.9.3.4 Effects of Visitor Services Management Actions—Recreation

4.9.3.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Under all alternatives, hunting activities—especially the sound of weapons—result in seasonal, minor adverse effects on solitude in the Monument. Under Alternatives B–F, development and implementation of a step-down Hunting Plan is anticipated to result in negligible effects on solitude opportunities in the Monument.

Hunting – Alternative B-1

As the hunting program is believed to have negligible impacts to solitude on the Monument, there would be negligible impacts from discontinuing it.

4.9.3.4.2 Fishing

Under all alternatives, fishing activities result in seasonal, moderate adverse effects on solitude opportunities within range of the Hanford Reach through increased visitation during sportfishing seasons. Under Alternatives B–F, development and implementation of a step-down Fishing Plan is anticipated to result in negligible effects on solitude in the Monument.

4.9.3.4.3 Wildlife Observation and Photography

Alternatives B–F would result in increased use of the Monument for wildlife observation and photography, resulting in minor, long-term, adverse effects on solitude.

4.9.3.4.4 Hiking

Alternative A would not affect existing solitude opportunities. Alternatives B–F would result in increased use of the Monument for hiking, resulting in minor adverse effects on solitude for hikers.

4.9.3.4.5 Equestrian Use

Alternative A would result in negligible effects on solitude opportunities. Alternatives B–F would result in increased equestrian use of the Monument, resulting in minor adverse effects on solitude opportunities.

4.9.3.4.6 Boat Launches

Vernita

Under Alternative A, opportunities for solitude in the Vernita Bridge area would continue to be minimal during sportfishing seasons and northern pikeminnow Washington State reward seasons. Alternatives B, B-1 and F would result in negligible effects on solitude opportunities. Under Alternatives C and C-1, a developed boat launch would draw increased visitor use, resulting in moderate adverse effects on solitude opportunities at this site and within the river corridor. A developed boat launch under Alternatives D and E would result in moderate adverse effects on solitude due to increased visitor numbers and increased lengths of stay for the average visitor.

White Bluffs

Under Alternatives A, B, B-1 and C-1, solitude opportunities at the White Bluffs Boat Launch would continue to vary seasonally, with minimal opportunities during sportfishing seasons. Alternative C would result in moderate beneficial effects on solitude opportunities in this area by increasing the difficulty of access and decreasing the number of visitors, as well as by removing the sight and sound of vehicles. Alternative D would result in moderate adverse effects on solitude opportunities by increasing visitor use related to boating. Alternatives E and F would result in negligible effects on solitude opportunities in this area.

Ringold

Alternative A would have no foreseeable effect on solitude. Under Alternatives B–F, a developed boat launch in this area is anticipated to have minor adverse effects on solitude in the river corridor by improving the ease and convenience of launching boats here.

South Shore

Solitude opportunities would not be affected under Alternatives A, B, B-1, C, C-1, E and F. Alternative D would result in minor adverse effects on solitude opportunities on the river due to increased visitor use that would result from increasing the ease and convenience of boat access from the south end of the Monument.

4.9.3.4.7 Camping

Vernita

Under Alternative A, opportunities for solitude in the Vernita Bridge area would continue to be minimal during sportfishing seasons and northern pikeminnow reward seasons. Alternatives B, B-1, C, C-1 and F would result in negligible effects on solitude opportunities. A developed campground under Alternatives D and E is anticipated to result in minor adverse effects on solitude opportunities in the Monument due to increased visitor numbers and increased lengths of stay for the average visitor.

Boat-In

Alternatives A, B, B-1 and F would have no foreseeable effect on solitude opportunities. Alternatives C, C-1, D and E would result in minor adverse effects on solitude on the river due to increased visitation by non-motorized boaters. Alternatives C, C-1, D and E would also result in moderate beneficial effects on solitude opportunities for non-motorized boaters by providing previously unavailable opportunities to camp along the river corridor.

Saddle Mountain

Alternatives A, B, B-1, C, E and F would have no foreseeable effects on solitude. Alternatives C-1 and D would result in minor adverse effects on solitude due to increased visitor numbers and increased lengths of stay for the average visitor.

4.9.3.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Alternatives A and E would have negligible effects on solitude opportunities. Alternatives B, B-1, C, C-1, D and F would result in minor adverse effects on solitude opportunities by reducing the lands available for public access.

Sand Dunes. Under Alternatives A, B, B-1 and F, boaters on the river in the sand dunes area would not encounter the sights or sounds of visitors on the uplands. Under these alternatives, there would be negligible effects on solitude opportunities. Alternatives C, C-1, D and E would result in minor adverse effects on solitude opportunities for boaters in the sand dunes area, and minor beneficial effects on solitude opportunities by opening an additional area of the Monument to public access, thus absorbing visitation pressure from existing public use areas and providing access to a remote area.

South Shore. Under Alternatives A, B, B-1, C-1 and F, boaters on the river would not encounter the sights or sounds of visitors on the south shore. Under these alternatives, solitude opportunities would not be affected. Alternatives C, D and E would result in minor adverse effects on solitude opportunities for boaters on the river near the south shore access points and minor beneficial effects on solitude opportunities by opening additional access points in the Monument.

North Shore. Under Alternatives B and B-1, boaters on the river would not encounter the sights or sounds of visitors on the north shore in this area. Under these alternatives, solitude opportunities would not be affected. Alternatives A, C, C-1, D, E and F would result in minor adverse effects on solitude opportunities for boaters on the river near the north shore access points. Alternative D would result in minor beneficial effects on solitude opportunities by opening additional access points in the Monument.

Ringold Unit

Parking Lots. Alternative A would result in negligible effects on solitude. Alternatives B and B-1, C, C-1, D and E would result in negligible effects on solitude, because rarely used parking areas would be closed. Alternative F would result in moderate beneficial effects on solitude

opportunities in the vicinity of Parking Lot 7 by increasing the difficulty of accessing lands in the immediate vicinity. Alternative F would also in effect eliminate the use of the primitive boat launch at parking Lot 7, thus reducing vehicle traffic along the Ringold road.

Auto Tour. Alternatives A, B, B-1, C, C-1, E and F would result in negligible effects on solitude opportunities in the Ringold Unit. Under Alternative D, an auto tour route connecting the Ringold Unit with the Wahluke Unit would draw visitor use, as well as increase the convenience of travel between the Ringold and Wahluke Units. Moderate, long-term, adverse effects on solitude opportunities in the auto tour route area are anticipated.

Saddle Mountain Unit

With increased visitor use, Alternatives A, C-1, D and E would result in minor to moderate, long-term, adverse effects on solitude opportunities in the Saddle Mountain summit area. Alternatives B and B-1 would result in minor adverse effects on solitude opportunities in this area by decreasing the number of acres available for public use. Alternatives C and F would result in moderate beneficial effects on solitude opportunities in the area by increasing the difficulty of access and decreasing visitor use in this area.

Wahluke Unit

West Access. Under Alternative A, boaters would not encounter the sights or sounds of visitors on the uplands on the north side of the river between the Vernita Bridge and the White Bluffs Boat Launch. Under this alternative, existing opportunities for solitude for boaters in this area would be maintained. Alternatives B–F would result in minor adverse effects on solitude opportunities for boaters using the river between the Vernita Bridge and the White Bluffs Boat Launch, with lesser effects resulting from Alternative B and B-1 and greater effects resulting from Alternatives C, C-1, D, E and F. Alternatives B–F would also have minor beneficial effects on solitude opportunities for upland visitors by opening additional lands to public access, thus absorbing visitation pressure from existing public use areas.

Auto Tour. Alternatives A, B, B-1, C, C-1, E and F would have negligible effects on solitude. Under Alternative D, an auto tour route would attract visitor use throughout the year; however, opportunities for solitude would still be available outside popular use periods. Alternative D would result in minor beneficial effects on solitude opportunities by opening an additional area to public access, thus absorbing visitation pressure from existing public use areas.

4.9.3.4.9 Permit System

Under Alternative F, an access permit system would result in negligible adverse effects on solitude.

4.10 Effects on Special Area Designations

The Monument contains several areas that have been recognized for their special resource values by various designations—an Important Bird Area, a Research Natural Area, National Register Historic Districts, Washington Heritage Sites, eligible Traditional Cultural Properties, and a river corridor found eligible and suitable for designation as a national wild and scenic river.

4.10.1 Assumptions

Individual step-down management plans will be designed to retain the resource values of all special area designations. In addition, certain designations may require specific plans.

4.10.2 Effects Analysis—Special Area Designations

4.10.2.1 Effects Common to All Alternatives

4.10.2.1.1 Management Actions

No foreseeable effects on special area designations are anticipated through the implementation of IPM plan actions, shrub-steppe and riparian restoration activities, restoration activities on ridgetops or lithosol soils, or fire management activities.

Inventories prescribed under this CCP would benefit special area designations by increasing knowledge and understanding of specific resources, locations and special conservation needs. Management actions to restore habitat and control non-native invasive species would improve resource conditions and thus benefit special area designations. Improved visitor facilities and increased public access would adversely affect special area designations by increasing the risk of wildlife disturbance, wildfire, vandalism, theft and accidental or purposeful disturbance of research projects.

4.10.2.1.2 Interpretation and Education

Interpretation and educational materials will include information on special area designations, their purpose, and any special regulations that apply, with the goal of enhancing public understanding and support for their protection. Research activities and research results will be

featured in interpretive messages to further educate visitors on the importance of special designation areas.

The interpretation and education program would have long-term, beneficial effects by serving to educate visitors about the natural and cultural significance and sensitivity of such areas, as well as help direct public use patterns to minimize potential adverse effects.

4.10.2.2 Effects of Biological Resource Management Actions

No proposed resource management actions will affect special area designations.

4.10.2.3 Effects of Visitor Services Management Actions—Interpretation and Education

4.10.2.3.1 Interpretive Site Development

Any interpretive sites established on or adjacent to special designation areas will have the same effects as those described in the corresponding geological/paleontological, upland, aquatic and cultural resource sections.

4.10.2.3.2 Interpretive Trail Systems

Any interpretive trails established on or adjacent to special designation areas will have the same effects as those described in the corresponding geological/paleontological, upland, aquatic and cultural resource sections.

4.10.2.4 Effects of Visitor Services Management Actions—Recreation

4.10.2.4.1 Hunting

Hunting – Alternatives A, B, C, C-1, D, E and F

Under Alternatives B–F, hunting activities could occur in several special designation areas—IBA, National Register sites, eligible TCPs, and an eligible national wild and scenic river

corridor. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects are anticipated to be minor.

Hunting – Alternative B-1

As the hunting program is believed to have negligible impacts to special area designations on the Monument, there would be negligible impacts from discontinuing it.

4.10.2.4.2 Fishing

The effects would be similar to those described above for hunting.

4.10.2.4.3 Wildlife Observation and Photography

Under Alternatives B–F, any development in the river corridor, such as access points, trails and visitor facilities, would have to be in compliance with the intent and provisions of the Wild and Scenic Rivers Act. Depending on the location of developed sites, increased human activity in the river corridor and concomitant disturbance could adversely affect breeding, foraging, migration and wintering habitat values of an IBA. Also depending on the location of developed sites, increased public use carries a risk of adverse effects on the resource values of several National Register sites (Archaeological Districts). However, with implementation of BMPs described in Section 4.0.1.2, adverse effects on these special designation areas would be minor.

4.10.2.4.4 Hiking

Under Alternatives B–F, any development in the river corridor, such as access points, trails and visitor facilities, would have to be in compliance with the intent and provisions of the Wild and Scenic Rivers Act. Depending on the location of developed sites, increased human activity in the river corridor and concomitant disturbance could adversely affect breeding, foraging, migration and wintering habitat values of an IBA. Also depending on the location of developed sites, increased public use carries a risk of adverse effects on the resource values of several National Register sites (Archaeological Districts). Under Alternatives C, C-1, D and E, providing public access in the RNA would result in increased risk of accidental or purposeful disturbance of research projects. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects on these special designation areas would be minor.

4.10.2.4.5 Equestrian Use

The effects would be similar to those described above for hiking activities.

4.10.2.4.6 Boat Launches

For all management actions related to boat launch development, any development in the river corridor, such as access points, trails, and visitor facilities, would have to be in compliance with the intent and provisions of the Wild and Scenic Rivers Act. No foreseeable effect on wild and scenic river eligibility is anticipated. Depending on the location of developed sites, increased human activity in the river corridor and concomitant disturbance could adversely affect breeding, foraging, migration and wintering habitat values of an IBA. Also depending on the location of developed sites, increased public use carries a risk of adverse effects on the resource values of several National Register sites (Archaeological Districts). However, with implementation of BMPs described in Section 4.0.1.2, adverse effects on these special designation areas would be minor.

4.10.2.4.7 Camping

Vernita

Under Alternatives D and E, campground development would have to be in compliance with the intent and provisions of the Wild and Scenic Rivers Act. No foreseeable effect on wild and scenic river eligibility is anticipated. Increased visitor use in the river corridor and concomitant disturbance could have minor adverse effects on breeding, foraging, migration and wintering habitat values of an IBA and carries a risk of adverse effects on the resource values of several National Register sites (Archaeological Districts). However, with implementation of BMPs described in Section 4.0.1.2, adverse effects on these special designation areas would be minor.

Boat-In

Any development in the river corridor, such as access points, trails, and visitor facilities, would have to be in compliance with the intent and provisions of the Wild and Scenic Rivers Act. No foreseeable effect on wild and scenic river eligibility is anticipated. Under Alternatives C, C-1, D and E, increased human activity in the river corridor and concomitant disturbance could have minor adverse effects on breeding, foraging, migration and wintering habitat values of an IBA and carries a risk of adverse effects on the resource values of several National Register sites (Archaeological Districts). However, with implementation of BMPs described in Section 4.0.1.2, adverse effects on these special designation areas would be minor.

Saddle Mountain

Because there are no special area designations in this unit, there are no foreseeable effects.

4.10.2.4.8 Modified Public Access

Columbia River Unit

Vernita Bridge, South Shore. Under Alternatives A and E, any developments associated with public access would have to be in compliance with the intent and provisions of the Wild and Scenic Rivers Act. No foreseeable effect on wild and scenic river eligibility is anticipated. Under Alternatives A and E, human activity in this area and concomitant disturbance could adversely effect breeding, foraging, migration and wintering habitat values of an IBA. Under Alternatives A and E, public access in this area carries a risk of adverse effects on the resource values of a National Register (Archaeological District) site. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects on these special designation areas would be minor.

Sand Dunes. Any development associated with this action, such as access points, trails and visitor facilities, would have to be in compliance with the intent and provisions of the Wild and Scenic Rivers Act. No foreseeable effect on wild and scenic river eligibility is anticipated.

South Shore. Under Alternatives C and C-1, D and E, any development associated with this action, such as access points, trails and visitor facilities, would have to be in compliance with the intent and provisions of the Wild and Scenic Rivers Act. No foreseeable effect on wild and scenic river eligibility is anticipated. Increased human activity on the south shore and concomitant disturbance could adversely effect breeding, foraging, migration and wintering habitat values of an IBA. In addition, public access in this area carries a risk of adverse effects on the resource values of a National Register (Archaeological District) site. However, with implementation of BMPs described in Section 4.0.1.2, adverse effects on these special designation areas would be minor.

North Shore. The effects under Alternatives D and E would be similar to those described above for the south shore.

Ringold Unit

Parking Lots. Because there are no special area designations in this unit, there are no foreseeable effects.

Auto Tour. Because there are no special area designations in this unit, there are no foreseeable effects.

Saddle Mountain Unit

Because there are no special area designations in this unit, there are no foreseeable effects.

Wahluke Unit

West Access. Under Alternatives B, B-1, C, C-1, D and E, providing public access in this area would result in increased risk of disturbance of the resource values of a National Register (Archaeological District) site. With implementation of BMPs described in Section 4.0.1.2, adverse effects on this special designation area would be minor.

Auto Tour. Because there are no special area designations in this unit, there are no foreseeable effects.

4.10.2.4.9 Permit System

Under Alternative F, an access permit system would not result in foreseeable effects on special area designations.

4.11 Effects on Islands

The Columbia River Corridor Unit includes nineteen islands upstream of Richland, Washington. Six islands are in the McNary National Wildlife Refuge (McNary Islands) and thirteen are in the Hanford Reach National Monument (Hanford Islands). These islands are natural features of the Columbia River system; they were not constructed through dredging or development activities. The islands are considered highly significant due to their cultural and natural resources (Sections 3.14 and 3.21.5).[161]

Islands provide nesting and foraging habitat and escape cover for many species of birds and mammals. Shoreline riparian communities are seasonally important for a variety of species. Willows trap food for waterfowl and birds that use shoreline habitat (e.g., Forster's terns), as

[161] As noted earlier, since the release of the draft CCP/EIS, the McNary National Wildlife Refuge, along with six other national wildlife refuges (Cold Springs, Columbia, Conboy Lake, McKay Creek, Toppenish, Umatilla), has been combined with the Monument into the Mid-Columbia River National Wildlife Refuge Complex. As such, all the islands discussed in this CCP are under one jurisdiction and management team.

well as providing nesting habitat for passerines. Terrestrial and aquatic insects are abundant in emergent grasses and provide food for fish, waterfowl and shorebirds.

Islands in the Hanford Reach are considered important breeding areas for waterfowl and other migratory waterbirds; these islands support breeding of several groups of species, including shorebirds, colonial waterbirds, geese and ducks. Wildlife (e.g., mule deer) seek out the islands as calving/birthing habitat to avoid predators.

The islands were historically used by Native Americans and contain regionally and nationally significant cultural resources. Recorded archaeological sites demonstrate extensive use by Native American tribes, with the majority of site inventories representative of a wide range of Native American site types—pit house villages, campsites, fishing stations, root gathering and resource processing camps, caches, hunting blinds, rock cairns, talus pits, hearth features, sacred locations, cemeteries, quarries, and lithic tool production sites. The vicinity of the islands also serves as an important habitat for salmon spawning and rearing; salmon is a culturally significant resource to area Native American tribes.

Historically, all McNary Islands have been closed to the public above the mean high water mark, except for islands 14-18 during the Washington State waterfowl season. Hunters could access and hunt from those McNary Islands located upstream from the city limits of Richland, Washington, from October to January of each year. All other islands in the Hanford Reach have been closed to the public since 1943.

4.11.1 Assumptions

Present-day effects on islands result directly and indirectly from disturbances attributed to Columbia River flow fluctuations, erosion, and the removal of vegetation; from the construction and maintenance of facilities (e.g., research, Hanford warning systems, power transmission); from trespass activities; and through wildlife disturbance. Daily fluctuations in water levels affects island plant communities, shoreline integrity, and aquatic habitats. These fluctuations change the composition of vegetative associations by causing surface disturbance and non-native invasive species invasion; increase erosion along shorelines; and increase sediment deposition into riparian plant communities, leading to habitat degradation. However, addressing impacts to islands from the flow regime is outside the scope of this CCP.

4.11.2 Effects Analysis—Islands

Little activities are planned for the islands, so few effects are anticipated under this CCP.

4.11.2.1 Effects Common to All Alternatives

4.11.2.1.1 Interpretation and Education

The Hanford Islands are unique in their natural and cultural resources and their connection with regional history. Interpretation and educational efforts will focus on informing visitors of the sensitivity of island resources and the regulations in place to protect those resources. There are no impacts to islands anticipated through interpretation and education actions.

4.11.2.1.2 Recreational Activities

Under all alternatives, a year-round closure of all islands would be maintained. Waterfowl hunting activities, which have historically occurred above and below the mean high water mark of the McNary Islands, would not be allowed above that line.[162] Impacts to waterfowl hunting opportunities would be minor to negligible, as most waterfowl hunting activity occurs on the shorelines below the mean high water mark.

4.11.2.2 Effects of Biological Resource Management Actions

Restoration on the islands would include both upland and riparian restoration. Under Alternatives B, B-1, C, C-1 and F, restoration efforts could take place on islands. Under alternatives A, D and E, restoration, including any activities on the islands, would be conducted in response to disturbance events. Minor to moderate direct effects of restoration activities would include changing plant community structure and function from mid-seral to early seral successional processes; wildlife disturbance; soil disturbance; increased sedimentation during peak flow periods; and short-term effects on aesthetics. Moderate indirect effects would include habitat improvement for colonial nesting species, shorebirds and waterfowl; decreasing the presence or abundance of non-native invasive species; and increasing populations of native species, including rare and endangered plants.

[162] Below the mean (or ordinary) high water mark, the state of Washington has jurisdiction. Waterfowl hunting and associated activities (e.g., decoy placement) around the upper-most five McNary Islands would still be allowed, subject to state regulations.

4.11.2.3 Effects of Visitor Service Management Actions—Interpretation and Education

4.11.2.3.1 Interpretive Site Development

No interpretive sites are planned for development on islands under any alternative. The islands' natural and cultural history stories will be addressed through interpretive themes in exhibits located on mainland shores. No adverse effects on island resources are thus anticipated. Moderate long-term beneficial effects are expected to result from increased visitor understanding of island resources and support for their protection.

4.11.2.3.2 Interpretive Trail Systems

Because interpretive trails are not planned for the islands, there will be no effects on island resources.

4.11.2.4 Effects of Visitor Service Management Actions—Recreation

Because no proposed visitor services management actions would involve the islands, there are no foreseeable effects. Effects on riverine wildlife and plants are addressed in Section 4.3.

4.12 Population Management of Elk

Under Alternative C, controlled elk hunting on the Rattlesnake Unit of the Monument would be conducted to assist the WDFW in achieving its Rattlesnake Hills Elk Herd objectives as identified in existing plans (WDFW 2002).[163] Elk hunting activities on the Rattlesnake Unit would be managed based on factors such as herd size and movements, monitoring data, and ongoing DOE and FWS activities on the Rattlesnake Unit (e.g., research, monitoring, education).

[163] The DOE has determined that hunting in the Rattlesnake Unit is not consistent with its current mission. As the mission of the DOE changes, or as the current ownership situation changes, hunting may be desirable and possible for elk population management. As noted, this possibility is addressed under Alternative C.

4.12.1 Assumptions

Under Alternative C, controlled elk hunting could take place on the Rattlesnake Unit from September through March, as necessary, to meet WDFW herd harvest objectives; hunting would occur only when there are more than 350 elk in the Rattlesnake Hills Elk Herd. Modern firearms would be used to maximize harvest rates.[164] There would be approximately 42,000 acres (52% of the Rattlesnake Unit) available for elk population control through hunting. Based upon elk movement patterns and the time of year that hunting would occur, it is anticipated that less than 25% of the 42,000 acres would have reoccurring hunting. Initially, up to ten hunters would be used during specific ten-day periods to minimize alteration of typical elk distribution and behavior patterns. These periods would be implemented only when there is a high likelihood of harvesting elk. For these reasons and those listed below, it is anticipated that there would be no or very little population control hunting on the Rattlesnake Unit in either the early or late parts of the Washington State hunting season. More effort would likely be expended during the winter months (December–February) to maximize elk harvest. The FWS would consult with the WDFW in using an adaptive management approach to adjust the number of hunters and the number and length of hunting periods, considering: the numbers and locations of elk; harvest rates; movement patterns and behavior of elk in response to hunting; the ongoing management activities by the FWS, DOE and their agents on the Rattlesnake Unit; and weather.

Stipulations for this hunt are in the Compatibility Determination for Hunting in Appendix I.

4.12.2 Effects on Geological and Paleontological Resources

Hunters pursuing elk on the Rattlesnake Unit would walk cross-country or follow game trails. Such activity is anticipated to have negligible effects on soil erosion and associated impacts to geological and paleontologic resources because of the limited number of hunters and the size of the area involved.

4.12.3 Effects on Shrub-Steppe and Other Upland Resources

4.12.3.1 Effects on Wildlife and Habitat

Hunting activity would result in individual elk mortality. In addition, hunting activity, such as stalking and firearm discharge, would result in wildlife disturbance of other species using the

[164] Using center-fire rifles here would be different than any other location on the Monument open to hunting. Elsewhere, only archery, shotguns and muzzleloaders are allowed.

area (e.g., mule deer, coyote, and various bird species). There would also be adverse effects on wildlife habitat through vegetation trampling, soil compaction, introduction of invasive plant species, and increased risk of wildfire. However, because of the limited hunting seasons, the dispersed nature of disturbance, and the availability of adjacent escape areas, minor adverse effects on individual animals and their habitat, and negligible effects on wildlife populations, are anticipated.

4.12.3.2 Effects on Microbiotic Crust

Hunting activities on the Rattlesnake Unit would cause some localized disturbance of microbiotic crust from foot traffic and elk retrieval actions. However, because of the limited number of hunters and dispersed nature of travel by hunters, impacts are anticipated to be minor.

4.12.3.3 Effects on Sensitive Plant Communities

Hunting activities would affect sensitive plant communities, primarily through the introduction and spread of invasive species and through human-caused wildfire events. The spread of non-native invasive species in remote areas of the Monument is of particular concern, because populations may become established within sensitive plant communities before they are detected and treated. In addition, such species can increase the fuel loads and flammability of sensitive plant communities, thus increasing the severity of wildfire events. However, with hunting stipulations and implementation of BMPs described in Section 4.0.1.2, adverse effects on sensitive plant communities are anticipated to be minor.

4.12.3.4 Effects on Threatened, Endangered, and Sensitive Species

Adverse effects of visitor-related activities on TE&S species would result primarily from loss or modification of habitat, including changes in vegetation community structure and composition, soil compaction, and establishment of invasive species. There is also possible disturbance and modification of diurnal and seasonal wildlife behavioral patterns caused by the visible and audible presence of hunters. In addition, severe impacts could result from human-caused wildfire. Hunting activities could also result in the take of TE&S species through illegal poaching, although because of the controlled nature of the hunt, poaching incidents would be highly unlikely. With the hunting stipulations and implementation of BMPs described in Section 4.0.1.2, adverse effects to TE&S species are anticipated to be minor (see also Sections 4.2.5 and 4.3.4 for additional analysis of the impacts of hunting on TE&S species).

4.12.4 Effects on Riverine, Other Aquatic/Wetland Resources

4.12.4.1 Effects on Wildlife and Habitat

The proposed hunting area surrounds several springs and short sections of surface streams. Hunting activities could cause disturbance to migrating bird species using riparian areas, although disturbance is anticipated to have minor adverse impacts due to the limited number of hunters and dispersed nature of hunting activities. Impacts could still occur through invasive species spread and wildfire as discussed above; however, with hunting stipulations, adverse effects are anticipated to be minor.

4.12.4.2 Effects on Sensitive Plant Communities

The effects would be similar to those described at 4.12.3.3 above.

4.12.4.3 Effects on Threatened, Endangered, and Sensitive Species

The effects would be similar to those described at 4.12.3.4 above.

4.12.5 Effects on Invasive Species

Hunting activities may contribute to the spread of non-native invasive plant species which could be transported in on vehicles, hunting equipment, clothing and footwear. However, the introduction and spread of invasive plants would be minimized through the use of existing roads and parking areas for vehicles, and all hunters and their assistants would be required to annually attend an orientation session, where they would be briefed regarding measures to minimize the introduction and spread of invasive plants.

4.12.6 Effects on Habitat Connectivity

With the limited number of hunters and because are no facilities are associated with proposed hunting activities, impacts to connectivity are anticipated to be negligible.

4.12.7 Effects on Cultural Resources

4.12.7.1 Effects on Pre-Contact Cultural Resources

Hunting activities could result in soil compaction, vegetation disturbance, and increased erosion, all of which could expose pre-contact resources if any are present in the hunting areas; these impacts are anticipated to be minor due to the limited number of hunters and the dispersed nature of the hunting activity. Providing access to this area may result in some degree of impact through illegal collection. Impacts are anticipated to be minor, however, due to the hunting stipulations and controlled nature of the hunt. In addition, an orientation training session covering sensitive resources and associated rules would be required for all hunters.

4.12.7.2 Effects on Post-Contact Cultural Resources

The anticipated impacts to post-contact cultural resources would be similar to those described above under Pre-contact Resources.

4.12.7.3 Effects on Cultural Traditions

Hunting activity can result in soil compaction; potential disturbance of traditional food, medicinal and utilitarian plants; increased erosion; and potential exposure of pre-contact resources. Exposure leaves resources susceptible to degradation from the elements of weather, as well as disturbance associated with animal activity and human foot traffic, vandalism and theft. In addition, increased visitor use can affect traditional use and sacred areas through degradation of aesthetics, increased noise levels, and loss of solitude. However, with the limited number of hunters and hunting stipulations, adverse impacts are anticipated to be minor.

4.12.8 Effects on Interpretation and Education

Permitted information and education trips occur infrequently within the Rattlesnake Unit, most often in the spring (March–May, depending on weather) to view wildflowers. Because little or no elk hunting is expected during this time, impacts are anticipated to be negligible.

4.12.9 Effects on Recreation and Public Use

4.12.9.1 Effects on Hunting

Under Alternative C, hunting opportunities would be expanded for a limited number of hunters taking part in the elk population control effort, with minor beneficial impacts to overall hunting opportunities on the Monument.

4.12.9.2 Effects on Wildlife Observation and Photography

Controlled hunting activities will reduce the elk herd and potentially disrupt or alter elk movement patterns which typically provide observation and photography opportunities from highway pullouts along State Route 240. Also, Alternative C provides for observation and photography opportunities from hiking trails within the Rattlesnake Unit. Depending upon elk response to disturbance, animals could move farther away from highway pullouts and/or the trail system. Due to the short-term nature of disturbance, impacts are anticipated to be minor, though.

4.12.9.3 Effects on Other Recreational Activities

Under Alternative C, hiking trails would be established within the Rattlesnake Unit. Depending upon the location of the elk herd and hunting activities in relationship to the established trails, short term trail closures may take place, with minor adverse impacts to hiking opportunities.

4.12.10 Effects on Aesthetics and Solitude

Under Alternative C, while localized gunshots might be heard during the hours when elk hunting is ongoing, adverse effects on the aesthetic environment and solitude opportunities are anticipated to be negligible, especially as the area is generally closed to public access.

4.12.11 Effects on Special Area Designations

Under Alternative C, hunting activities would have impacts on natural and cultural resources as described in the above sections. However, based upon hunting stipulations and the controlled nature of the hunt, impacts to the values underlying the RNA, IBA and NERP designations are anticipated to be negligible.

4.12.12 Effects on Infrastructure

Under Alternative C, operation of the controlled hunt would require the installation of additional emergency evacuation sirens for use in case of a Hanford Site emergency event. This installation would have minor long-term impacts to natural or cultural resources.

4.12.13 Effects on Transportation

Under Alternative C, disturbance from hunting activities could push elk towards public roads adjacent to the Rattlesnake Unit, possibly leading to elk-car interactions. If this occurs all hunting activities would be suspended until this issue can be resolved.

4.12.14 Effects on Economics

Rocky Mountain elk have both beneficial and adverse effects on the local economy. Many complaints have been received by the WDFW about elk damage to agricultural crops adjacent to the Rattlesnake Unit. Elk can damaged orchards, crops, tree farms, and residential landscaping through herbivory, trampling, shredding and rubbing. Other adverse effects include elk-vehicle collisions and damage to fences, allowing domestic livestock to escape. Positive economic effects can result from elk viewing and photography; however, these effects are believed to be minor at this time as viewing opportunities occur only seasonally and are limited to a vehicle pullout along State Route 240. Under Alternative C, hunters would spend money locally on lodging, food, fuel, equipment and ammunition. However, due to the low numbers of hunters needed for population control, and the likelihood that many of these hunters would be local, economic effects are anticipated to be minor.

4.13 Effects on Social, Economic, and Infrastructure Resources

4.13.1 Effects Analysis—Infrastructure

The following infrastructure currently exists in and is related to the Monument.

- State highways.
- County roads.
- Boat launches.
- Parking areas.
- Highway rest stop.
- Transmission lines.
- Electric power substations.
- Communication towers.
- Irrigation return canals.
- Pumphouses.
- Emergency sirens.

Infrastructure in and related to the Monument is operated and maintained by a variety of federal, state, and local government agencies and private interests. (Infrastructure specifically related to transportation is discussed in Section 4.13.2.)

4.13.1.1 Effects Common to All Alternatives

Increased visitation is anticipated to occur under all alternatives; the greatest increase would occur under Alternative D, followed in decreasing order by Alternatives E, C-1, C, F, B, B-1 and A. Visitation increases will place new demands on infrastructure that would be directly used by the public, such as state highways, the Horn Rapids County Park, the Vernita Rest Area, and the Monument's transportation system. Increased visitation would also place higher demands on local emergency services. Given the undeveloped nature of the Monument, these impacts are anticipated to be moderate.

4.13.1.2 Effects of Biological Resource Management Actions

No foreseeable effects on infrastructure are anticipated through implementation of biological resource actions. The FWS would partner with facility operators to conduct non-native invasive species control across all areas of infrastructure across the Monument, as these areas are likely corridors for weed establishment and spread. Under Alternative C, a potential elk population control hunt could require the installation of additional emergency evacuation sirens for use in case of an emergency event.

4.13.1.3 Effects of Visitor Services Management Actions—Recreation

4.13.1.3.1 Hiking

Under Alternatives C, C-1, D and E, providing hiking trails in the River Corridor and Rattlesnake Units could require the installation of additional emergency evacuation sirens for use in case of an emergency event.

4.13.1.3.2 Boat Launches

Ringold

Under Alternatives B–F, improvement of the Ringold area and resulting increased visitor use of this area would result in an increased risk of adverse effects on utility facilities.

4.13.1.3.3 Modified Public Access

Columbia River Unit

Sand Dunes. Alternatives C, C-1, D and E would provide trail access to the sand dunes, resulting in an increased risk of vandalism to Energy Northwest's pumphouse and to transmission line facilities in the area. Opening this area to public use would require the installation of additional emergency evacuation sirens for use in case of an emergency event.

Rattlesnake Unit

Under Alternatives C, C-1, D and E, opening this area to public use could require the installation of additional emergency evacuation sirens for use in case of an emergency event.

Ringold Unit

Under Alternatives B–F, the FWS would work with partners to provide a developed boat launch adjacent to the Monument boundary in the WDFW's Ringold Fish Hatchery area. Improvement of the Ringold launch and resulting increased visitor use of this area would lead to an increased risk of adverse effects on utility facilities. Impacts have been addresses throughout this EIS.

4.13.2 Effects Analysis—Transportation

The environmental consequences related to transportation include potential impacts on traffic volume, LOS, parking, access, safety, circulation and non-motorized travel. This section considers the potential effects of each of the proposed alternatives and recommends mitigation to address effects that are potentially significant.

4.13.2.1 Effects Common to All Alternatives

Increased access and improved visitor facilities would likely attract increased visitor use under all alternatives. Increased visitor use would result in increased traffic volumes and increased maintenance requirements for public roads and parking areas. Upgrades to any transportation facilities would be designed to WSDOT specifications in coordination with the appropriate agencies.

4.13.2.2 Methodology

4.13.2.2.1 Baseline Traffic Volumes

Traffic volumes were projected to 2025 to be consistent with the timelines of typical long-range transportation planning efforts in the state of Washington. This timeline is conservative because it extends beyond the life of the project alternatives.

Table 4.2. Baseline Traffic Projections.

Highway	Location	Existing Average Daily Traffic[1]	Projected 2025 Volume[2]	Maximum ADT To Maintain LOS C[3]
State Route 24	West of SR 240	2,900	6,900	12,000
State Route 24	North of SR 240	3,500	8,300	10,000
State Route 24	At Vernita Bridge	3,400	8,100	12,000
State Route 24	East of SR 243	830	2,000	11,000
State Route 240	North of SR 225	3,200	7,600	12,000
State Route 240	North of I-82	18,000	42,700	62,000

[1] Source: WSDOT 2003.
[2] Based on average annual traffic growth rate of 4% per year.
[3] Based on Highway Capacity Manual (TRB 2000) highway LOS procedures.

Before assessing the impacts of the alternatives on traffic conditions, the baseline average daily traffic (ADT) volumes were estimated for the planning year 2025. These projected ADT volumes reflect the traffic growth expected to occur based on typical growth in the region. Typical traffic growth on state highways in the project area was calculated using WSDOT data collected between 1996 and 2002 (WSDOT 1997, 2004), resulting in an average annual growth rate of approximately 4%. This growth rate was applied to existing traffic volumes at key locations in the study area to estimate baseline ADT volumes in 2025. Projected traffic volumes on major highways throughout the area are well below maximum ADT volumes that would maintain LOS C or better. (See below for a detailed description of LOS.) Table 4.2 summarizes the projected 2025 baseline ADT volumes.

4.13.2.2.2 Trip Estimates for Alternatives

Traffic volumes were estimated for each alternative based on the range of visitor projections summarized in Table 4.3. These projections are conservative estimates. Annual vehicle volumes for each alternative were developed by dividing the total number of projected annual visitors by an average of 2.3 persons per vehicle, as summarized in Table 4.3.

Table 4.3. Annual Visitor Estimates Used for Traffic Projections and Annual Vehicle Estimates.

Alternative	Visitor Projection (Average Per Year)	Traffic Generation (Average Vehicles/Year)
A	63,000	24,400
B	85,000	37,000
C	110,000	47,800
D	135,000	58,700
E	125,500	54,600
F	85,000	37,000

The projected annual vehicle volume was further broken down into projected monthly volumes by applying the observed monthly traffic volumes collected by the WSDOT on State Route 240 just south of State Route 24 (Table 4.4). As shown in the table, the highest level of traffic occurs during October.

The WSDOT has also collected data at this location that can be used to calculate the percentages of weekly traffic that occur on a typical weekday and a typical weekend day. Based on daily traffic variations, 13.1% of weekly traffic occurs on a typical weekday (Monday–Thursday), and 15.9% of weekly traffic occurs on a typical weekend day (Friday–Sunday).

Table 4.4. Monthly Traffic Percentages in Study Area.

Month	Percentage of Annual Traffic
January	6.2%
February	6.3%
March	7.6%
April	7.8%
May	8.3%
June	8.8%
July	9.6%
August	10.2%
September	10.0%
October	10.4%
November	8.0%
December	6.8%

Peak daily traffic was estimated for each alternative by applying the monthly and weekly percentage breakdowns to the projected annual totals (Table 4.5). As shown in the table, the maximum number of vehicles projected under this range of visitor assumptions is 219 vehicles per weekend day (under Alternative D). To assess the adequacy of the highways in the study area, the projected maximum vehicle volume of 219 was doubled, to account for round trips, resulting in a projected total of 440 trips per peak weekend day potentially related to Monument traffic.

Table 4.5. Annual Vehicle Estimates by Alternative.

Alternative	Annual	Peak Month[1]	Peak Week[2]	Peak Weekday[3]	Peak Weekend Day[4]
Existing	27,400	2,850	643	84	102
A	37,000	3,848	869	114	138
B	37,000	3,848	869	114	138
C	47,800	4,971	1,123	147	178
D	58,700	6,105	1,379	181	219
E	54,600	5,678	1,282	168	204
F	37,000	3,848	869	114	138

[1] Existing traffic data indicates that October is the peak month, with 10.4% of total annual traffic. Peak monthly volume = Annual volume x 10.4%.
[2] Peak week volume = Peak month volume / 31 days per month x 7 days per week.
[3] Peak weekday volume = Peak week volume x 13.1%.
[4] Peak weekend volume = Peak week volume x 15.9%.

Using this method, an increase of 10,000 annual visitors projected beyond the 135,000 maximum already projected would translate into an additional sixteen vehicles, or thirty-two trips, per day.

4.13.2.2.3 Trip Distribution

The derived trips were distributed on the basis of data obtained from a market analysis completed for the planned Visitor Center (EcoNorthwest 2003), which included population estimates within 120 miles of the Tri-Cities, as well as farther away in Washington and Oregon (Table 4.6). These estimates indicate that most visitors to the Monument will arrive from population areas within 120 miles of the site. Trips were assigned to various access points based on the proportional share of population closest to that access point within a 120-mile radius, as shown in the table. The "Rest of Washington" percentage was based on the same rationale, with 6% dispersed to the north approach to reflect I-90 access.

Table 4.6. Traffic Volume Distribution.

Area	Population Percentage[1]	West Approach SR 24	North Approach SR 243	East Approach SR 24	South Approach SR 240
Benton County	18%				18%
Franklin County	6%			3%	3%
Yakima County	27%	27%			
Rest of Washington	21%	5%	6%	1%	9%
Oregon	28%				28%
Totals	100%	33%	6%	4%	60%

[1] Population within 120 miles of the Tri-Cities (further dispersed between Benton, Franklin and Yakima Counties) and in Washington and Oregon (EcoNorthwest 2003).

4.13.2.2.4 Roadway LOS Assessment

LOS designations are qualitative measures of congestion that describe operational conditions within a traffic stream; they take into consideration factors such as volume, speed, travel time, and delay. Level of service is represented by letter grades A–F, which represent progressively worsening traffic and congestion conditions. (See Section 3.18.2.4 for descriptions of the LOS grades.) To determine LOS conditions that might result from Monument management, the 440 project-generated trips identified above were added to the projected baseline volumes at each of the study locations. Table 4.7 summarizes the maximum daily volumes that were projected for 2025 under the highest traffic alternative. To be conservative, the projected trips were not distributed between State Route 24 and 240 according to the percentages summarized in Table 4.6. Instead, all trips were conservatively assumed to travel the length of the highways within the study area, so the maximum projection of 440 vehicle trips was added to each of the projected daily baseline totals.

As shown in Table 4.7, under this maximum volume assessment, the total projected traffic volumes are well below what would be allowed to maintain LOS C on these highways. Therefore, under all alternatives, projected traffic volumes are not expected to have a significant effect on roadway operations in the study area.

Table 4.7. LOS Assessment Under Alternative D (Highest Projected Traffic Volume).

Highway	Location	Projected 2025 Baseline Volume[1]	Maximum Projected Peak Daily Volume[2]	Total Projected 2025 Volume Alternative D	Maximum ADT to Maintain LOS C[3]
State Route 24	West of SR 240	6,900	440	6,340	12,000
State Route 24	North of SR 240	8,300	440	8,740	10,000
State Route 24	At Vernita Bridge	8,100	440	8,540	12,000
State Route 24	East of SR 243	2,000	440	2,440	11,000
State Route 240	North of SR 225	7,600	440	8,040	12,000
State Route 240	North of I-82	42,700	440	43,140	62,000

[1] See Table 4.2.
[2] Based on the conservative assumption that 100% of projected traffic under Alternative D.
[3] Based on Highway Capacity Manual (TRB 2000) highway LOS procedures.

4.13.2.2.5 Parking

The parking demand projected under each alternative is summarized in Table 4.8. This projection conservatively assumes that all projected peak weekend day vehicles will park at the same time. As shown in the table, the total number of parking spaces incorporated into each alternative is adequate to accommodate this conservative estimate of parking demand. The parking supply summarized in Section 3.18.2 indicates an existing supply of approximately 100 parking spaces in the Monument. This should be adequate to serve existing parking needs, but this will likely need to be increased under the higher levels of use defined under the project alternatives.

Table 4.8. Maximum Daily Parking Estimates.

Alternative	Maximum Parking Demand
Existing Conditions	102
A	138
B	138
C	178
D	219
E	204
F	138

4.13.2.2.6 Access, Safety and Circulation

Access Control of State Highways

As discussed in Section 3.18.2, the highways in the Monument's vicinity are classified as limited-access highways and specifically fall under the definition of partial access-control facilities. No new intersecting access roadways are being proposed as part of this project, but upgrades of existing access points/intersections are being proposed under each alternative.

Under the maximum use of Alternative D, only two or three upgrades of access points are proposed across the length of the highways in the vicinity of the Monument, and these would be spaced more than one mile apart. The FWS will need to obtain approval from the WSDOT (North Central Region, north of the Columbia River; and South Central Region, south of the Columbia River) for proposed upgrades to existing access roadways and work very closely with the WSDOT to identify the appropriate design characteristics, consistent with WSDOT design standards, at these locations.

Easements for State Highways and Intersecting Roads

The WSDOT has easements from the DOE for all state highways crossing the Monument and the rest of the Hanford Site. These easements were granted by the DOE and are subject to revocation if necessary, although this is very unlikely considering the revised mission of the DOE on the Hanford Site. All other roads in the Monument are either DOE roads or allowed through agreements and/or easements by the DOE to a third party for an express purpose (e.g., irrigation canal maintenance, utility corridors, research access).

Safety

Historical accident data presented in Section 3.18.2 indicate that the rate of accidents in the project area is lower than the statewide average. Increased traffic volumes and increased recreational traffic (which tends to travel more slowly), mixed with the commute and freight traffic that currently predominates in the area (and which tends to travel more quickly), have the potential to result in more accidents in the area. Upgraded access points into the Monument will need to include features such as acceleration/deceleration lanes, consistent with WSDOT design standards, that allow recreational traffic to more safely enter and exit the main traffic stream. The FWS will need to work closely with the WSDOT to determine the appropriate design characteristics at intersections.

Internal Circulation

The maximum daily traffic volumes projected under each alternative can be easily accommodated by a basic two-lane roadway. A minimum design standard for two-lane

roadways (i.e., eighteen-foot width with six-foot shoulders on one or both sides) will need to be incorporated into Monument step-down plans.

4.13.2.2.7 Roadway Maintenance

Increased traffic due to higher recreational use in the Monument would be expected to increase maintenance needs in the area. For example, increased use also increases the potential for increased roadside litter and abandoned vehicles. However, the increases in traffic attributable to the Monument would be a small portion of the overall traffic on the road system, and therefore the impacts would be minor.

4.13.2.2.8 Non-Motorized Travel

Non-motorized travel in the Monument is expected to increase under all alternatives; recreational activity in the area is expected to generate pedestrian, bicycle and equestrian traffic in areas of the Monument that are open to the public. To accommodate non-motorized traffic, access roadways will need to be designed within the Monument to include either shoulders on one or both sides or parallel trails. Providing roadway shoulders or trails, where appropriate, would separate non-motorized traffic from vehicular traffic, allowing pedestrian, bicycle and equestrian traffic to be safely accommodated. Because non-motorized considerations will be incorporated into facility design under the selected alternative, this would be a minor effect.

4.13.2.3 Effects and Mitigation

It would be expected that Alternative D would have the greatest effect on the transportation system and Alternative A would have the least. However, any amount of increased recreational use is expected to have some level of effect. Accordingly, the following effects and mitigation discussion applies to all alternatives.

4.13.2.3.1 Traffic Volume and Level of Service

Total traffic volume in the study area is expected to increase under any of the alternatives. However, analysis presented in the previous section shows that the maximum daily traffic volumes projected in addition to the baseline levels determined for 2025 will not cause level of service on the highways to exceed LOS C. Therefore, this effect is negligible.

4.13.2.3.2 Parking

Total parking demand in the Monument is expected to increase as a result of implementing any alternative. More parking spaces will eventually need to be provided to accommodate increased parking needs for the selected alternative. This is a minor effect.

4.13.2.3.3 Highway Access and Safety

Recreational traffic in the Monument will likely increase, necessitating changes at the proposed Monument access points.

Once a final alternative is selected, the FWS will work with the WSDOT (North Central Region, north of the Columbia River; and South Central Region, south of the Columbia River) to identify any necessary roadway upgrades needed to facilitate increased visitation. The FWS will work very closely with the WSDOT to identify appropriate roadway design characteristics, consistent with WSDOT design standards. In addition to meeting the requirements of limited-access highway (minor arterial with partially controlled access), the design will include safety considerations to address Monument-generated traffic entering and exiting the highway traffic stream. With implementation of these activities, this would be a minor effect.

4.13.3 Effects Analysis—Economics

Environmental consequences related to economics comprise the direct, indirect and induced economic effects that changes in employment and recreation use are expected to incur under the project alternatives.

4.13.3.1 Effects Common to All Alternatives

Increased visitor use would result in a projected increase of funds circulating throughout the local economy. These expenditures would be in the form of additional jobs and typical visitor expenses such as lodging, food and drink, and transportation. The greatest increase of visitor use would be expected to occur under Alternative D, followed in decreasing order by Alternatives E, C-1, C, F, B, B-1 and A.

4.13.3.2 Methodology

4.13.3.2.1 Economic Analysis Study Area

The Monument is located in Adams, Benton, Franklin and Grant Counties. A perimeter of sixty miles surrounding the Monument encompasses portions of Kittitas, Walla Walla, and Yakima Counties. These seven counties are considered to comprise the affected economic region and were accordingly included in the economic impact analysis.

4.13.3.2.2 Activity Levels for Alternatives

The alternatives, described in detail in Chapter 2, vary primarily in the level of public use that would be allowed and encouraged in the Monument. The differing levels of use among the alternatives are expected to be a result of the number of acres open to public use and Monument expenditures on facilities, infrastructure, staffing and information dissemination. For purposes of economic analysis, the different alternatives must be translated into specific projections of staffing, project expenditures, and expected numbers of visitors. The projections developed for this analysis are described in the following sections.

4.13.3.2.3 Economic Impact Analysis

Economic impact analysis is an assessment of the change in overall economic activity as a result of some change in one or more economic activities (Minnesota IMPLAN Group 2004). For the Monument, analysis involves determining the overall change in economic activity in the seven-county study area expected to result from changes in economic activities associated with the Monument (i.e., implementation of the different alternatives).

Description of Input-Output Model

An input-output model was developed for this study utilizing IMPLAN (Impact Analysis for Planning) software. Input-output models measure the direct and indirect economic relationships within a regional economy in terms of additional industry output, jobs and income. An input-output model also measures the economy by compiling and tracking the transactions of businesses and industries in more than 500 sectors. It is considered a secondary system in that it does not employ survey-based data. Instead, IMPLAN is based on national average relationships between industries to which regional relationships are added.

The IMPLAN model developed was used to estimate the effects on the local economy of spending by recreational visitors to the Monument and of the employment, capital expenditures,

and operating expenditures of the Monument. The potential regional economic impacts of these expenditures were evaluated for each alternative, as well as for existing conditions. The change of economic activity from existing conditions is considered the economic impact.

4.13.3.2.4 Inputs to Economic Analysis

The following sections describe the data that were developed for the project alternatives; this is the input into the economic model.

Refuge Staffing and Expenditures. Table 4.9 summarizes the Monument staffing needs that have been projected for each alternative. Table 4.10 summarizes the approximate annual non-salary expenditures that are projected with implementation of each alternative.

Table 4.9. Projected Annual Staffing Expenditures by Alternative.

Alternative	Number of Employees (2020)[1]
Alternative A	26
Alternative B	45
Alternative C	45
Alternative D	45
Alternative E	45
Alternative F	45
1 - Under Alternative A, fourteen employees are covered by base funding, and the salaries of other employees are covered by other sources. Under Alternatives B–F, all salaries are covered by base funding.	

Table 4.10. Projected Non-salary Expenditures by Alternative.

Alternative	Average Annual Expenditure (2020)[1]
Alternative A	$17,240
Alternative B	$661,106
Alternative C	$662,625
Alternative D	$653,685
Alternative E	$662,625
Alternative F	$654,854
1 - Expenditures from base funding.	

Usage Forecasts for Alternatives. The number of annual visitors to each potential recreation type is summarized in Table 4.11. The projections are based on existing visitor counts and visitation of other national wildlife refuges with similar uses.

For purposes of economic analysis, visitor counts are measured according to recreational visitor-days, which is defined as an eight-hour day (Caudill et al. 2003). Thus, a person participating in an activity for four hours would be counted as spending one-half of a visitor-day. This prevents over-estimation of spending attributable to the Monument that would result if brief visits were counted the same as extended stays.

In a given day, a visitor may engage in more than one recreational activity. To count that person once under each activity would result in an over-estimation of the total number of visitors and, in turn, an over-estimation of spending attributed to those visitors. Thus, for purposes of economic analysis, visitors are counted once according to their primary activity.

Table 4.11. Projected Annual Monument Visitation by Alternative.

Primary Activity	Annual Visitor Days by Alternative						
	Existing	Alt A	Alt B, B-1	Alt C, C-1	Alt D	Alt E	Alt F
Big game hunting	200	180	180	200	204	200	180
Upland game hunting	400	360	360	360	360	360	360
Waterfowl hunting	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Fishing	20,000	23,000	23,000	24,000	25,000	24,500	23,000
Wildlife observation	500	600	650	700	750	725	625
Wildlife photography	70	74	77	84	91	87	75
Education/Interpretation	250	250	275	2,750	5,250	3,750	260
Hiking	330	1,980	4,290	6,930	8,250	7,500	3,500
Non-motorized boating	670	2,680	4,690	7,370	8,710	8,000	3,600
Motorized boating	2,000	2,400	2,460	2,500	2,800	2,600	2,430
Commercial river trips	1,880	2,162	2,162	2,256	2,350	2,300	2,162
Primitive camping	2,700	3,105	0	3,450	3,450	3,450	0
Equestrian use	330	380	363	406	406	406	340
Developed camping	0	0	0	0	33,350	23,000	0
Driving for pleasure	330	3,630	6,930	10,230	13,530	11,000	5,500
Totals	30,660	41,801	46,437	62,236	105,501	88,878	43,032

Resident and Non-Resident Visitors. The estimated visitors summarized in Table 4.11 were further categorized as resident or non-resident. Residents are defined as visitors who live within thirty miles of the Monument, and non-residents are visitors who live beyond the thirty-mile radius. Making the distinction between resident and non-resident visitors is important in economic analysis because each group has different spending characteristics. Non-residents typically spend more than residents, as is shown in the following section.

Table 4.12. Projected Annual Monument Visitation by Alternative.

Primary Activity	Resident	Non-Resident	Source
Big game hunting	25%	75%	1
Upland game hunting	75%	25%	1
Waterfowl hunting	50%	50%	1
Fishing	70%	30%	1
Wildlife observation	65%	35%	1
Wildlife photography	65%	35%	1
Education/Interpretation	90%	10%	2
Hiking	90%	10%	1
Non-motorized boating	65%	35%	2
Motorized boating	65%	35%	2
Commercial river trips	35%	65%	3
Primitive camping	75%	25%	2
Equestrian use	90%	10%	2
Developed camping	50%	50%	2
Driving for pleasure	35%	65%	3

1 - Based on observed percentages for same activity at the Umatilla National Wildlife Refuge (Caudill et al. 2003).
2 - Based on observed percentages for similar type of non-consumptive activity at the Umatilla National Wildlife Refuge (Caudill et al. 2003).
3 - Based on assumption that a greater number of non-resident visitors than resident visitors would participate in tourist-oriented activities.

Table 4.12 summarizes the estimated percentages of residents versus non-residents. Most values are based on data that were recorded for similar activities at the Umatilla National Wildlife Refuge, located in Morrow County, Oregon, and Benton and Franklin Counties, Washington (Caudill et al. 2003). Caudill did not provide data that could be used to estimate percentages for "Driving for Pleasure" or "Commercial River Trip" activities. In both cases, the assumption was

made that, because these tend to be more tourist-oriented activities, a greater number of non-resident visitors than resident visitors would participate.

Average Annual Visitor Expenditures. Table 4.13 summarizes the estimated average daily expenditures for the primary recreational activities as defined by the Monument alternatives. Expenditures were developed for both resident and non-resident recreational visitor-days. Expenditure information was developed according to the following four categories.

Lodging. Overnight lodging at hotels and motels.

Food and drink. Purchases from grocery stores as well as restaurants.

Transportation. Gas and oil purchase, automobile maintenance and repair, and air transportation.

Other. All other miscellaneous purchases associated with recreational use, such as clothing, sporting goods, and photographic services.

The primary source of spending information used for this analysis was obtained from *Banking on Nature 2002* (Caudill et al. 2003), which is based on compiled data from the FWS National Survey of Fishing, Hunting and Wildlife-Associated Recreation and the FWS Refuge Management Information System (RMIS). These data were further refined with information from refuge staff, regional tourism agencies, and other recreation providers (Caudill 2003). Data from these sources were combined to develop profiles of refuge spending in local communities.

The other primary source of expenditure data that was used for this analysis is *Spending Profiles of National Forest Visitors, 2002 Update* (Stynes and White 2004). This report presents national forest visitor spending profiles developed from the National Visitor Use Monitoring Project surveys collected between 2000 and 2002. This report provided more explicit information on some non-consumptive activities, such as hiking and driving for pleasure, that were not covered in the *Banking on Nature* report.

Values obtained from these two sources were based on 2001 dollars and adjusted using the Consumer Price Index (CPI). The CPI is a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services; it can be used as a means of adjusting dollar values. Based on the CPI, the 2001 values were adjusted to reflect 2005 dollars by applying a multiplier of 1.08 (U.S. Department of Labor 2005).

The average expenditures per person per resident and non-resident visitor day were applied to the visitor projections summarized in Table 4.11, resulting in estimates of average annual expenditures in each of the four categories—lodging, food/drink, transportation and other.

Table 4.13. Average Expenditure per Person per Visitor-Day (2001 $).

Primary Activity	Lodging		Food/Drink		Transportation		Other		Source
	R	NR	R	NR	R	NR	R	NR	
Big Game Hunting	$1.78	$3.05	$16.00	$18.99	$14.14	$37.36	$4.23	$29.04	1
Small Game Hunting	$3.52	$6.85	$9.19	$18.99	$10.25	$46.44	$2.84	$5.17	1
Waterfowl Hunting	$0.45	$9.80	$7.80	$38.56	$6.74	$91.71	$13.35	$14.06	1
Fishing	$3.47	$8.21	$8.68	$17.51	$8.11	$29.50	$9.09	$7.39	1
Wildlife Observation	$5.17	$35.10	$7.45	$27.25	$6.59	$41.91	$1.52	$3.81	2
Wildlife Photography	$5.17	$35.10	$7.45	$27.25	$6.59	$41.91	$1.52	$3.81	2
Interpretation	$0.45	$3.05	$3.26	$6.50	$3.38	$5.63	$0.85	$1.34	4
Hiking	$0.45	$3.05	$3.26	$6.50	$3.38	$5.63	$0.85	$1.34	3
Non-Motorized Boating	$5.17	$35.10	$7.45	$27.25	$6.59	$41.91	$1.52	$3.81	2
Motorized Boating	$5.17	$35.10	$7.45	$27.25	$6.59	$41.91	$1.52	$3.81	2
Commercial River Trips	$5.17	$35.10	$7.45	$27.25	$6.59	$41.91	$1.52	$3.81	2
Primitive Camping	$0.00	$0.00	$4.63	$18.53	$3.12	$18.73	$4.29	$10.72	5
Equestrian Use	$0.45	$3.05	$3.26	$6.50	$3.38	$5.63	$0.85	$1.34	4
Developed Camping	$0.00	$0.00	$10.24	$40.95	$5.03	$30.20	$4.37	$10.94	5
Driving For Pleasure	$0.45	$3.05	$3.26	$6.50	$3.38	$5.63	$0.85	$1.34	3

1 - Obtained directly from Caudill et al. (2003) for the specified activity for the region of the United States that includes Washington, Oregon, Idaho, Nevada and California.
2 - Obtained directly from Caudill et al. (2003) for non-consumptive activities for the region of the United States that includes Washington, Oregon, Idaho, Nevada and California.
3 - Obtained from Stynes and White (2003) for the specified activity. Expenditure data was provided as the average per party per visitor-day and was divided by 2.3 to estimate the average per person per visitor-day.
4 - Estimated based on data from Stynes and White (2004) and based on activities with participants that are expected to have a similar expenditure profile.
5 - Estimated based on camping data from Stynes and Sun (2003) and non-consumptive use data from Caudill (2003).

Allocation of Expenditure Data to IMPLAN Sectors. Table 4.14 summarizes the direct economic expenditures of two hunting alternatives, the current situation and Alternative B-1, No Hunting. This was derived by taking the percentage of hunters who are resident for each activity, determining how many visitor days can be attributed to resident hunters, and multiplying that by the total visitor day expenditure for the particular activity.

Table 4.15 presents the allocations to IMPLAN sectors of the annual expenditure data. These allocations are based on typical allocations per activity/sector for national wildlife refuges, as presented by Caudill et al. (2003).

Table 4.14. Comparison of Projected Annual Hunting Expenditures for Alternatives A and B-1.

Primary Activity	Total Expenditure by Alternative					
	Hunting Alt A			Hunting Alt B[1]		
Upland game hunting	$7,740.00	$7,745.00	$15,485.00	$0.00	$0.00	$0.00
Waterfowl hunting	$14,170.00	$77,065.00	$91,235.00	$4,718.61	$25,662.65	$30,381.26
Totals	$23,717.50	$98,076.00	$121,793.50	$4,718.61	$25,662.65	$30,381.26

[1] Some waterfowl hunting would still occur on the river and/or below the ordinary high water mark, which are not within the jurisdiction of the FWS. It was assumed that 1/3 of the waterfowl hunting is on the WB-10 Ponds, 1/3 on the Monument other than the WB-10 Ponds, and 1/3 on the river (1,000 total visitor days).

Table 4.15. Allocation of Annual Visitor Expenditures to IMPLAN Sectors/Activities.

Category	Sector	Activity	Resident	Non-Resident
Lodging	479	Hotels	100%	100%
Food/Drink	481	Restaurant meals	35%	65%
	405	Groceries	65%	35%
Transportation	407	Gas/oil	90%	85%
	483	Car repairs	10%	10%
	391	Airline	0%	5%
Other	409	Sporting goods	40%	40%
	405	Tobacco	1%	1%
	405	Alcohol	1%	1%
	408	Shoes	8%	8%
	408	Clothing, women	8%	8%
	408	Clothing, men	8%	8%
	411	Personal/misc.	8%	8%
	411	Toiletries	8%	8%
	422	Telephone	6%	6%
	398	Postage	6%	6%
	448	Film	6%	6%

Summary of Inputs to IMPLAN Model

Tables 4.16 and 4.17 summarize the visitor and Monument expenditures and employment information that were estimated according to the procedures described above. These values were the input into the IMPLAN input-output model.

Table 4.16. Summary of Estimated Annual Visitor Expenditures by Sector (2005 $).

Description	Alternatives								
	Existing	A	B	B-1	C	C-1	D	E	F
Air transportation	$18,313	$22,811	$24,447	$22,339	$28,841	$28,841	$56,706	$47,288	$23,251
Postal service	$14,033	$16,544	$16,138	$15,218	$18,903	$18,903	$35,511	$30,011	$15,815
Food and beverage stores	$192,769	$244,398	$259,837	$249,185	$319,741	$319,741	$710,306	$578,815	$246,594
Gasoline stations	$452,552	$565,296	$605,694	$564,479	$723,377	$723,377	$1,299,995	$1,100,380	$576,662
Clothing and accessories	$56,133	$66,177	$64,554	$60,873	$75,612	$75,612	$142,044	$120,042	$63,258
Sporting goods	$93,557	$110,294	$107,588	$101,453	$126,022	$126,022	$236,738	$200,071	$105,430
Miscellaneous store retailers	$37,422	$44,118	$43,036	$40,582	$50,408	$50,408	$94,696	$80,028	$42,172
Telecommunications	$14,033	$16,544	$16,138	$15,218	$18,903	$18,903	$35,511	$30,011	$15,815
Photographic services	$14,033	$16,544	$16,138	$15,218	$18,903	$18,903	$35,511	$30,011	$15,815
Hotels and motels	$215,850	$288,934	$333,415	$327,614	$398,495	$398,495	$444,723	$417,731	$310,500
Food services/ drinking places	$202,603	$259,820	$279,050	$265,108	$343,126	$343,126	$885,034	$705,298	$263,394
Automotive repair	$52,318	$65,345	$70,016	$65,202	$83,580	$83,580	$150,745	$127,519	$66,657
Totals	$1,363,616	$1,716,825	$1,836,051	$1,742,489	$2,205,911	$2,205,911	$4,127,520	$3,467,205	$1,745,363

Table 4.17. Summary of Estimated Monument Annual Staffing and Expenditures.

Description	Alternatives								
	Current	A	B		C		D	E	F
Federal staffing	26	26	45		45		45	45	45
Federal expenditures	$17,240	$17,240	$661,106		$662,625		$653,685	$662,625	$654,854
Totals	$1,363,616	$1,716,825	$1,836,051		$2,205,911		$4,127,520	$3,467,205	$1,745,363

4.13.3.3 Economic Effects Analysis

Regional economic analysis considered the direct, indirect and induced economic effects of the expenditures within the region that are expected to result from recreational use of the Monument.

Direct effects are changes in the industry to which a final demand change was made (e.g., increased Monument staffing has a direct effect of increased federal non-military employment).

Indirect effects are changes in inter-industry purchases as they respond to the new demands of the directly affected industries (e.g., increased Monument staffing has an indirect effect of higher demand for food and housing spending).

Induced effects typically reflect changes in spending from households as income increases or decreases as a result of the changes in production.

Table 4.18 summarizes the direct, indirect and induced economic impacts of increased visitor and Monument spending that are expected to result from each of the proposed alternatives, based on the input-output model developed for this project. Table 4.19 summarizes the direct, indirect and induced employment effects estimated for each alternative.

The tables show that the proposed uses under Alternative A would be expected to have economic and employment effects very similar to existing conditions. Alternatives B, C and D are expected to produce respectively increasing economic and employment benefits. This is in line with the increased recreational activity levels that are expected under each of these alternatives, with the highest economic benefit resulting from Alternative D. Alternative E is expected to result in economic benefits between those of Alternatives C, C-1 and D, while Alternative F has economic benefits approximating those of Alternative B.

Table 4.18. Summary of Annual Economic Effects Under Projected 2020 Conditions (2005 $).

Description	Alternatives								
	Current	A	B	B-1	C	C-1	D	E	F
Direct	$3,715,762	$4,064,431	$6,546,730	$6,453,631	$6,914,249	$6,914,249	$8,823,062	$8,173,070	$6,451,439
Indirect	$330,133	$414,122	$440,450	$416,766	$529,849	$529,849	$1,041,432	$867,110	$419,296
Induced	$2,711,092	$2,908,930	$4,926,345	$4,874,622	$5,134,549	$5,134,549	$6,185,377	$5,828,257	$4,870,382
Totals	$6,756,987	$7,387,483	$11,913,525	$11,745,018	$12,578,647	$12,578,647	$16,049,871	$14,868,437	$11,741,117

Table 4.19. Summary of Economic Effects Under Projected 2020 Conditions (Jobs).

Description	Alternatives								
	Current	A	B	B-1	C	C-1	D	E	F
Direct	51	58	85	83	92	92	131	118	83
Indirect	4	5	5	5	6	6	13	11	5
Induced	36	39	66	66	69	69	83	78	65
Totals	91	102	156	153	167	167	227	207	153

4.14 Cumulative, Long-Term, and Irreversible Effects

Council on Environmental Quality (CEQ) regulations, which implement the provisions of the NEPA, define several different types of effects that should be evaluated in an EIS, including direct, indirect and cumulative effects. Direct effects are addressed in the resource-specific sections of this chapter (Sections 4.1 through 4.12). This section addresses indirect and cumulative effects. It should be noted that the comprehensive nature by which direct and indirect effects associated with implementing the various alternatives has been conducted largely comprises a cumulative effects analysis. The analyses in this section primarily focus on effects associated with reasonably foreseeable future events and/or actions regardless of what entity undertakes that action.

The CEQ (40 CFR § 1508.7) (CEQ 1997) provides the following definition of indirect effects.

> *[Impacts that are] caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems including ecosystems.*

The CEQ (40 CFR § 1508.7) (CEQ 1997) provides the following definition of cumulative effects.

> *The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.*

Irreversible commitments of resources occurs when an action so alters the resource that it cannot be restored or returned to its original or pre-disturbance condition.

4.14.1 Indirect and Cumulative Effects

4.14.1.1 Potential Adverse Indirect and Cumulative Effects

4.14.1.1.1 Increased Public Use

Three projects that are currently in planning and/or study phases, if completed, are expected to result in individual and cumulative impacts to public use levels on the Monument.

Hanford Reach National Monument Heritage and Visitor Center

The Visitor Center is a non-FWS facility being constructed through the City of Richland Public Facilities District. Located along the Columbia River downstream from the Monument, this project has been designed and partially funded and is currently undergoing environmental review. The Visitor Center is intended to serve as the primary contact station for visitors seeking information, education and interpretation opportunities related to the Monument and would also promote heritage tourism for the Tri-Cities and surrounding region. The Visitor Center is expected to attract from 85,000 to 135,000 visitors per year.

B Reactor

The NPS was directed by Public Law 108-340 to study sites across the nation related to the Manhattan Project and America's development and construction of the atomic bomb. The B Reactor and Chemical Separations Building (T-Plant) sites at Hanford are being studied to determine whether they meet suitability and feasibility requirements for addition to the National Park System. If they meet the criteria, the NPS will recommend the best manner to preserve them, such as designating a National Historic Site or Historical Park. The B Reactor is located within the Hanford Site adjacent to the Monument near the Vernita Bridge and could become available for public visitation in the future. Access, via either the highway or the Columbia River, would be on the Monument, as would much of the off-site interpretive facilities. Besides additional visitation to the Monument, this project would likely result in increased congestion in the Vernita Bridge vicinity.

Ice Age Floods Trail

Legislation to designate the Ice Age Floods National Geologic Trail has passed both the U.S. House of Representatives and Senate, although the two bills are different and still need to be rectified. If established, the Ice Age Floods National Geologic Trail would be administered by the NPS, and as the Monument falls within the central pathway of the floods, it contains many associated features that would attract floods-related visitation.

The by-products of developing the Visitor Center, designation of B-Reactor as a National Historic Site, and/or the establishment of the Ice Age Floods National Geologic Trail would be increased public use in and around the Monument. This would be additive to the increase in visitation that would likely result from implementing any of the action alternatives, all of which would provide some level of improved visitor facilities on the Monument. Increased public use could lead to increased degradation of natural and cultural resources through spread of invasive species, fire, vandalism, theft and wildlife disturbance, as well as other impacts associated with visitor use described in previous sections. In addition, start-up of private commercial enterprises, such as guided tours and outfitting services, may result from increased demand for visitor services on the Monument. Such services would further contribute to increased public use and amplification of impacts.

Increased visitation and traffic through the Monument would increase the need for maintenance of roads and visitor facilities in addition to the standard maintenance and IPM programs already being implemented in the Monument. Additional public use would likely require both onsite and adjacent land managers to increase use of chemical controls for invasive species. Additional chemical use for maintaining facilities and roads would have an additive effect with nearby agricultural chemical use. These maintenance activities could potentially result in bioaccumulation of toxins in fish and wildlife species and Native American food plants.

4.14.1.1.2 DOE Hanford Site Remediation Activities

Past and current development activities—agricultural, industrial and residential—have contributed to the loss of natural and cultural resources in the Columbia Basin region, elevating the importance of resources preserved within the Monument. Ongoing DOE remediation activities—such as the decommissioning of production reactors, development of new waste facilities or expansion of existing facilities, and excavation of basalt, sand, gravel and silt/loam for use as fill and capping materials—would result in impacts to geologic, cultural, wildlife, habitat and aesthetic resources that are located adjacent to the Monument. The further loss or decline of such resources within the Columbia Basin would amplify the significance of impacts from Monument actions proposed in this plan.

4.14.1.1.3 White Bluffs Landslides

Continuing landslides within the White Bluffs formation are resulting in the loss of cultural, paleontologic and geologic resources and salmon spawning habitat, as well as having adverse impacts to aesthetic resources. These impacts will likely continue into the foreseeable future, and would be additive to impacts from Monument actions proposed in this plan.

4.14.1.1.4 Hunting

Migratory Birds

Migratory game birds are those bird species so designated in conventions between the United States and several foreign nations for the protection and management of these birds. Under the Migratory Bird Treaty Act (16 U.S.C. 703-712), the Secretary of the Interior is authorized to determine when "hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any . . . bird, or any part, nest, or egg" of migratory game birds can take place and to adopt regulations for this purpose. These regulations are: 1) written after giving due regard to "the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds;" and 2) updated annually (16 U.S.C. 704(a)). This responsibility has been delegated to the FWS as the lead federal agency for managing and conserving migratory birds in the United States.

Acknowledging regional differences in hunting conditions, the FWS has administratively divided the nation into four flyways for the primary purpose of managing migratory game birds. Each flyway (Atlantic, Mississippi, Central and Pacific) has a Flyway Council, a formal organization generally composed of one member from each state and province in that flyway. The Monument is within the Pacific Flyway and allows hunting for ducks, geese, coots, snipe and mourning doves.

The FWS annually prescribes frameworks, or outer limits, for dates and times when hunting of migratory birds may occur and the number of birds that may be taken and possessed. These frameworks are necessary to: 1) allow state selections of seasons and limits for recreation and sustenance; 2) aid federal, state and tribal governments in the management of migratory game birds; and 3) permit harvests at levels compatible with population status and habitat conditions. Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the Secretary of the Interior, the FWS annually promulgates regulations (50 CFR Part 20) establishing the frameworks from which states may select season dates, bag limits, shooting hours, and other options for each migratory bird hunting season. The frameworks are essentially permissive in that hunting of migratory birds would not be allowed without them. Thus, in effect, federal annual regulations both allow and limit the hunting of migratory birds.

The process for adopting migratory game bird hunting regulations, located in 50 CFR Part 20, is constrained by three primary factors. Legal and administrative considerations dictate how long the rulemaking process will last. Most importantly, however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation. The process of adopting migratory game bird hunting regulations includes two separate regulations-development schedules, based on "early" and "late" hunting season regulations. Early hunting seasons pertain to all migratory game bird species in Alaska, Hawaii, Puerto Rico, and the Virgin Islands; migratory game birds other than waterfowl (e.g., dove, woodcock); and special early waterfowl seasons, such as teal or resident Canada geese. Early hunting

seasons generally begin prior to October 1. Late hunting seasons generally start on or after October 1 and include most waterfowl seasons not already established. There are basically no differences in the processes for establishing either early or late hunting seasons. For each cycle, FWS biologists and others gather, analyze and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to Flyway Councils and other interested parties.

Because the FWS is required to take the abundance of migratory birds and other factors into consideration, it undertakes a number of surveys throughout the year in conjunction with the Canadian Wildlife Service, state and provincial wildlife-management agencies, and others. To determine the appropriate frameworks for each species, the FWS considers factors such as population size and trend, geographical distribution, annual breeding effort, the condition of breeding and wintering habitat, the number of hunters, and the anticipated harvest. After frameworks are established for season lengths, bag limits, and areas for migratory game bird hunting, migratory game bird management becomes a cooperative effort of federal and state governments. After FWS establishment of final frameworks for hunting seasons, the states may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative in their selections than the federal frameworks but never more liberal. Season dates and bag limits for national wildlife refuges open to hunting, including the Monument, are never longer or larger than the state regulations.

NEPA considerations by the FWS for hunted migratory game bird species are addressed by the programmatic document, *Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88-14)*, filed with the EPA on June 9, 1988. A Notice of Availability was published in the *Federal Register* on June 16, 1988 (53 FR 22582), and a ROD was signed on August 18, 1988 (53 FR 31341). Current year NEPA considerations for waterfowl hunting frameworks are covered under a separate Environmental Assessment, *Duck Hunting Regulations for 2006-07*, and an August 24, 2006, Finding of No Significant Impact (FONSI). Further, in a notice published in the September 8, 2005, *Federal Register* (70 FR 53376), the FWS announced its intent to develop a new supplemental environmental impact statement for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006, as announced in a March 9, 2006, *Federal Register* notice (71 FR 12216).[165]

With regard to the effects of the Monument's current harvest of migratory birds, the impacts of continuing the recreational hunting program (Alternative A) would be negligible. There are an estimated 1,000 visitor days devoted to migratory bird hunting. This translates into 1,500 individual visits. Of this, the greatest majority of hunting is for ducks, with an estimated 95% of visits devoted to duck hunting (1,425 visits). As hunting conditions for ducks are less than ideal on the Monument, with many hunts having no harvest, the estimated daily harvest is approximately 1-3/4 ducks per hunt, (2,494 ducks total per year). Approximately 2% of hunting visits are devoted to geese (30 visits), with

[165] More information may be obtained from: Chief, Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Department of the Interior, MS MBSP-4107-ARLSQ, 1849 C Street, NW, Washington, DC 20240.

a success ratio of 0.5 geese per visit due to the poor success rate of pass-shooting more than 1/4-mile removed from the river (15 geese total). Mourning dove hunting success is also extremely variable on the Monument, with a success ratio of approximately 2.0 doves per visit, again with approximately 2% of visits aimed at mourning dove hunting (60 doves total per year). Snipe hunting is virtually non-existent on the Monument, with less than 1% of visits devoted to snipe hunting and under poor conditions; at a 0.3 success rate per visit, that would be approximately 10 snipe taken per year. The total annual take of migratory birds on the Monument would be 2,579 birds. Considering the national trends in hunting participation, these numbers are not likely to increase and may, in fact, decrease.

The state of Washington's five-year average (2001-2005) harvest of ducks, geese and doves was 394,821, 48,140 and 73,108 birds, respectively (516,069 total). This includes harvest on other national wildlife refuges, other public lands and waters, and private lands. Annual snipe harvest rates vary considerably throughout the state and have ranged from 879 to 164,595 birds taken statewide within the past ten years. In comparison with statewide harvests, the harvest of migratory birds on the Monument is minimal and represents <1% of the statewide harvest. The Monument's role in the cumulative impact of migratory bird harvest, even solely on a statewide basis, is insignificant.

Likewise, the indirect effects of harvesting migratory birds on the Monument is negligible, as there are no known significant correlations between the population sizes of these species and other Monument resources. Some birds are taken by coyotes, bald eagles and other raptors; however, the slight fluctuations in population sizes from hunting would have no effect on predatory species. Further, the areas frequented by eagles (the upper Hanford Reach and Saddle Mountain Lakes) are waterfowl sanctuaries closed to hunting. Eagles foraging for waterfowl in these areas would not be impacted by hunting due to the spatial separation from hunting areas. This, added to the hunting regulations described earlier (e.g., non-toxic shot requirement), would protect eagles.

Discontinuing recreational hunting under Alternative B would, likewise, have no significant cumulative physical effects, although the social impacts could be significant.

Resident Wildlife

Resident wildlife refers not just to those species hunted, but also the other, non-hunted species on the Monument. It is possible that non-hunted species could be directly or indirectly impacted by hunting programs, which is addressed below.

Deer and Elk

The WDFW establishes annual seasons and bag limits for all (hunted) deer species within the state. They do this through subdivisions within the state; distinct populations are broken into Population Management Units (PMUs), and hunting regulations are set through further subdivisions (GMUs). The Monument (Wahluke Unit) is within PMU 31 and GMUs 278 and 379. The deer herd is primarily comprised of mule deer, but a few white-tailed deer are present.

Since 2000, the deer harvest in PMU 31 has averaged 273 animals, which was <1% of the total statewide harvest of 40,000 animals. On the Monument, an estimated ten deer are harvested annually, which is 4% of the PMU 31 total. Population surveys have not been conducted in PMU 31, but harvest and post-hunt composition data have been used to evaluate population status and trend (WDFW 2006). Based on the best available data, the population appears stable and harvest rates on the Monument have not had significant cumulative impacts on the PMU 31 deer herd. There are no known indirect effects associated with the harvest of deer on the Monument (Alternative A), although it is possible that ending hunting could lead to an overpopulation of deer with the related habitat damage; this, in turn, could impact other wildlife. So, while maintaining hunting as a population control measure is an important management tool, the effectiveness on the Monument's deer population is not known.

As there is virtually no harvest of elk on the Wahluke Unit,[166] there are no significant cumulative or indirect effects associated with a hunting season. If elk do become a viable hunting option on the Wahluke Unit, the impacts of hunting may need to be revisited. However, as the Rattlesnake Hills Elk Herd population is currently considered by the WDFW and many area residents to be at a socially unacceptable level (i.e., too great a population), additional hunting pressure would likely have a positive impact in reaching Washington State management goals.[167]

Upland Game Birds

The WDFW establishes annual seasons and bag limits for all small game. On the Monument, only pheasants, chukar and quail are open to hunting. All three species are introduced, and the WDFW manages populations specifically to maximize recreational opportunities. Upland bird hunters accounted for an estimated 400 visitor days (600 individual hunting visits) on the Monument during 2004. Although no population estimates are available for upland game birds, hunting likely has no negative cumulative impacts. Upland game birds characteristically have short life spans and high reproductive output. Populations fluctuate annually and are most influenced by climatic and habitat conditions. There are no known indirect effects associated with hunting or not hunting (either alternative) these species on the Monument.

Non-hunted Wildlife on the Monument

Non-hunted wildlife includes all species or groupings of species not specifically addressed in this section (migratory birds, deer, small game). The cumulative (and long-term) effects of disturbance to non-hunted wildlife are negligible. Hunting seasons do not coincide with the breeding season, when excessive disturbance could cause reduced reproductive success. In addition, many species (i.e., small mammals, bats, reptiles) are inactive during winter, are nocturnal, or have migrated out of the area,

[166] Monument staff are unaware of any elk being harvested on the Wahluke Unit.

[167] It must be noted that a great many residents do not share this view and believe the herd population levels are fine.

and hunter interactions are unlikely. Although some wildlife may be accidentally and/or illegally shot, such incidents are believed to be rare and isolated; the cumulative effects of such take would be negligible.

Disturbance to daily wintering activities (e.g., feeding and resting) for some non-hunted wildlife species is possible, but significant negative cumulative effects would be unlikely. The area open to hunting consists of 58,000 acres, and access is primarily by foot traffic only; Monument regulations restrict vehicle use to designated open roads and parking areas. Hence, there are many areas that provide refuge for both hunted and non-hunted wildlife. In addition, hunters represent only 5% of the 30,000 annual visitor use days on the Monument, and they visit the Monument when other uses are few. So, while there would be localized disturbance to individual animals on a short-term basis, the long-term, cumulative effects would be negligible or minimal.

There are no known significant indirect effects associated with either alternative.

Non-hunted Wildlife and Land Conservation

The cumulative effect of closing the Monument and other national wildlife refuges to hunting may result in a decline in one form of financial support for wildlife conservation. Hunters have provided, through the purchase of hunting licenses and migratory bird conservation stamps and taxes levied on purchases of hunting equipment, a consistent and significant stream of revenue to purchase lands for wildlife and other conservation purposes. This same source of revenue has restored upland and wetland habitats on millions of acres of public and private lands across the country (FWS 2000). Of course, this is one manner in which to ensure huntable populations of wildlife, but the habitat projects also directly, significantly benefit migratory songbirds and other wildlife. Closing national wildlife refuges to hunting may result in a decline in duck stamp and hunting license sales, leading to a decline in funds for conservation. The cumulative effect on closing national wildlife refuges to hunting may be reduced conservation of wildlife habitats if the above revenues are not replaced by another source, although the exact extent of this effect is unknowable as the extent that hunters will move to substitute lands versus "giving up" hunting is unknown.

Endangered Species

Pygmy rabbits, Washington ground squirrels, greater sage grouse, and White Bluffs bladder-pod are the endangered, threatened and candidate species that could potentially be found on the Wahluke Unit of the Monument. A Section 7 evaluation was conducted in association with this assessment for hunting on the Monument. It was determined that the proposed action would have no effect on T&E species and would not likely jeopardize any candidate species. This includes cumulative and indirect effects as hunting seasons and the seasons of use/growth/reproduction of these species have little

overlap. In addition, hunting would not be in significant direct competition for life cycle needs of any of these species.[168]

4.14.1.2 Potential Beneficial Indirect and Cumulative Effects

In addition to potential adverse indirect and cumulative effects, all alternatives could result in beneficial indirect and cumulative effects on the local economy. An increase in visitation to the Monument would have a beneficial effect on the local economy. This beneficial effect would also affect the economy in an additive manner when combined with other economic impacts in the region, such as increased industry and tourism not associated with the Monument.

4.14.2 Potential Irretrievable and Irreversible Commitments

Establishing concentrated areas of public use, including the potential construction of trail systems, parking lots, and facilities, may result in irreversible and irretrievable effects on resources, such as a reduction in biological and cultural resources in the vicinity of the public use areas. The magnitude of such reductions would depend on the alternative being implemented. The protection/restoration emphasis of Alternatives B, B-1 and F would limit the likelihood of potential irretrievable and irreversible effects on biological and cultural resources. Alternatives C and C-1, which focuses on concentrating public use areas and facilities in common areas, would localize any potential irretrievable and irreversible effects; these effects would be mitigated by focusing development of public use facilities in areas with no or few natural or cultural resources. Alternatives D and E would provide more opportunities for public use and would increase the potential for irretrievable and irreversible effects on biological and cultural resources, although these effects could be somewhat reduced by concentrating public use in sites with few natural or cultural resources of significance.

Specifically, implementation of the following reasonable foreseeable actions may result in the irretrievable and irreversible commitments described below.

[168] Bald eagles were recently removed from the list of endangered species; however, they remain a species of concern. Bald eagles do occasionally eat waterfowl on the Monument. However, the very slight fluctuations in waterfowl populations associated with hunting are insignificant to the bald eagles' diet on the Monument. Further, the areas frequented by eagles (the upper Hanford Reach and Saddle Mountain Lakes) are waterfowl sanctuaries closed to hunting.

4.14.2.1 Establishing Two Campgrounds (Alternatives D and E)

The proposed Saddle Mountain campground would encompass approximately two acres under Alternative D. The proposed Vernita Bridge and Ringold area campgrounds would encompass approximately six acres under Alternatives D and E.

4.14.2.2 Improving Three Boat Launches (Alternatives C, C-1, D, E)

Approximately two acres would be dedicated to the Vernita Bridge boat launch under Alternatives C, C-1, D and E. A boat launch proposed on the south shore would require approximately one acre under Alternative D. The White Bluffs Boat Launch would increase in size by one acre under Alternative D.

4.14.2.3 Developing Parking Lots (Alternatives B–F)

4.14.2.3.1 Alternatives B and B-1

The total number of parking lots would not change from existing conditions—two new lots would be created, but two old lots would be restored to native habitat. In addition, a one-acre scenic overlook with parking would be added.

4.14.2.3.2 Alternatives C and C-1

Compared to existing conditions, the total number of parking lots would increase by two (0.5 acre each)—four new lots would be created, but two old lots would be restored to native habitat. In addition, a one-acre scenic overlook with parking would be added.

4.14.2.3.3 Alternative D

Compared to existing conditions, the total number of parking lots would increase by four (0.5 acre each)—six new lots would be created, but two old lots would be restored to native habitat. In addition, a one-acre scenic overlook with parking would be added.

4.14.2.3.4 Alternative E

Compared to existing conditions, the total number of parking lots would increase by two (0.5 acre each)—four new lots would be created, but two old lots would be restored to native habitat. In addition, a one-acre scenic overlook with parking would be added.

4.14.2.3.5 Alternative F

The total number of parking lots would not change from existing conditions—two new lots would be created, but two old lots would be restored to native habitat. In addition, a one-acre scenic overlook with parking would be added.

4.14.2.4 Creating an Auto Tour Route (Alternative D)

Rerouting the closed section of the Ringold Road to accommodate an auto tour route would redirect approximately three miles of the existing two-lane road away from the face of the bluffs over the top of the bluffs. The effects associated with these commitments could potentially include the loss of riparian and upland habitat; destruction of microbiotic crust; adverse effects on aesthetics; increased vandalism, littering, fire and looting; disturbance of wildlife (including nesting birds); spread of invasive species; and decreased opportunities for solitude. These effects are discussed in greater detail throughout this chapter.

4.14.3 Relationship Between Short-Term Uses of the Human Environment and Enhancement of Long-Term Productivity

Long-term productivity in the Monument will likely be focused on upland, riparian and wetland habitats. Short-term uses that enhance long-term productivity within the Monument are primarily related to habitat restoration and fire management.

The following habitat restoration activities would be undertaken under all alternatives.

- Discing in preparation of seeding.
- Recontouring the landscape.
- Removing vegetation—usually invasive species—through prescribed fire or chemical or physical means (e.g., mowing, discing, chopping).

The short-term effects of these activities would include temporary effects on aesthetics, connectivity and localized wildlife use of the site.

Fire and its control—both firefighting and prevention—have major effects on the landscape. In the event of a fire, fire lines may be disced across the Monument. Under all alternatives, disced firebreaks would be maintained along state highways (averaging thirty-two feet wide and forty-one miles long) and administrative roads (sixteen feet wide and fifty-nine miles long). Prescribed fire would be used under all alternatives to reduce hazardous fuels and to remove invasive species. This activity would be conducted on an as-needed basis and as resources allow. Short-term effects associated with these activities would include temporary effects on aesthetics, connectivity and localized wildlife use of the site.

Chapter 5

Consultation, Coordination, Preparation

5.0 Introduction

As outlined by FWS policy, the NEPA, and CEQ regulations for implementation (40 CFR 1500-1508), developing both a CCP and an EIS are collaborative processes. This chapter summarizes the FWS's efforts to involve the public; other agencies; and local, state and tribal governments in compiling the CCP/EIS. Consultation beyond the planning stage and for stepdown plans will continue to address concerns, issues and opportunities of mutual interest.

5.1 Agency Consultation and Coordination

In the course of developing the CCP and completing the NEPA analysis, the FWS contacted a number of federal, state and local agencies to gather information, solicit input on the issues of concern, and invite their continued involvement as a 'cooperating agency.' In general, cooperating agencies are defined as having: 1) authority over the proposed action;[169] 2) jurisdiction by law;[170] or 3) special expertise with respect to the environmental impacts expected to result from the implementation of the CCP or from which the FWS could benefit as it developed the CCP/EIS.[171] The FWS held its first cooperating agency meeting on August 13, 2002, to provide information on the Monument and the CCP/EIS process, answer questions, and discuss what it means to be a cooperating agency as per NEPA/CEQ requirements.

Due to the high level of interest by area tribal governments, the FWS provided for tribal participation on the cooperating agency team as 'consulting governments.' This is in addition to, not a substitute for, agency-to-agency consultation (see below).

Fifteen agencies and/or governments elected to become cooperating agencies or consulting governments—the city of Richland, Adams County, Benton County, Grant County; WDOE, WDFW, WDNR, ACOE, BOR, BPA, DOE, Federal Highway Administration; BOR, CTUIR, Nez Perce, and Yakama Nation.

A total of fourteen cooperating agency meetings have been held to date. The FWS, cooperating agencies, and consulting governments convened to gather and exchange information; provide technical

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[169] An agency has discretionary authority if it has the ability to add conditional measures as part of the proposed action's approval.

[170] An agency has jurisdiction by law if it has the authority to approve, veto, or finance all or part of the proposed action.

[171] An agency has special expertise if it has statutory responsibility (not approval authority), agency mission, or related program experience with regard to the proposed action.

input; coordinate the NEPA process; ensure compliance with laws and existing plans; write sections of the plan; and review and comment on internal drafts. All participants were encouraged to attend FAC meetings, public meetings, and public workshops.

5.2 Monument Federal Advisory Committee

In January of 2001, the Secretary of the Interior chartered the FAC, subject to the guidelines and provisions of the Federal Advisory Committee Act (41 CFR Parts 101-6 and 102-3). The FAC was created to provide local advice to the FWS and DOE on development of the CCP/EIS for the Monument.

The original 13-member FAC (see Appendix G) was comprised of one person each representing the state, county government, city government, Native American tribes, public utilities, economic development, the environmental community, outdoor recreation, education, and the public-at-large; and three members representing the scientific community. The FAC was re-chartered in January of 2003 to include nineteen members, although new members were never appointed. The DOI allowed the FAC to sunset on January 10, 2005.

The FAC held twenty meetings between June 2001 and January 2005. The FAC used the meetings to formulate advice for the FWS and DOE about CCP/EIS-related topics such as public involvement strategies, planning issues, vision, goals, objectives, alternatives and special issues including White Bluffs slumping and elk population management. Each meeting was open to the public, with public comments taken at a specified time. Meeting dates were published in the *Federal Register* and sent to local and regional media outlets prior to each meeting. Committee records can be accessed at the WSU's Tri-Cities campus library in the DOE Reading Room. Minutes of each FAC meeting are posted on the Monument's web site. FAC records are also documented on a General Services Administration website, including meeting minutes, FAC advice to the FWS and DOE, FAC accomplishments, and committee operating costs.

5.3 Consultation with Native American Governments

Throughout the planning process, and in accordance with FWS and NEPA policy, the FWS has consulted with the four federally recognized Native American tribes in the area—the CTUIR, CCT, Nez Perce Tribe, and Yakama Nation. In addition, the FWS has consulted with the Wanapum Band. Although the Wanapum are not a federally recognized tribe because they did not negotiate a treaty with the United States, they historically occupied lands within the Monument and maintain traditional connections to the Monument to this day.

The FWS initiated consultation on the CCP with a March, 2002, letter of invitation to participate in the CCP/EIS planning process. Consultations continued on a regular basis. Following are the consultations and meetings to date:

CCT

July 2002
July 2003
October 2003

CTUIR

April 1999
June 1999
June 2001
July 2001
August 2001
October 2002
November 2002
February 2003
April 2003
May 2003
July 2003
January 2004
August 2004
October 2004

Nez Perce Tribe

June 1999
June 2001
September 2001
October 2001
June 2002
November 2002
March 2003
April 2003
July 2003
April 2004
September2004

Yakama Nation

July 1999
May 2001
June 2001
January 2002
May 2002
June 2002
July 2002
January 2003
July 2003
September 2003
January 2004
February 2004
June 2004

Wanapum

October 2002
July 2003
April 2003

5.4 Formal Scoping

Prior to developing an EIS, the scope of the document—that is, what will be covered and in what detail—must be determined. Scoping is open to the public and state and local governments, as well as to affected federal agencies. This open process gives rise to important opportunities for better and more efficient NEPA analyses and simultaneously places responsibilities on public and agency participants alike to surface their concerns early.

The scoping period has specific objectives: 1) to identify the affected public and agency concerns; 2) to identify those concerns early in the EIS process; 3) to facilitate an efficient EIS preparation process, through the assembly of cooperating agencies, assignment of EIS development/writing tasks, ascertainment of all the related permits and reviews that must be scheduled concurrently, and establishment of time frames; 4) to define the issues and alternatives that will be examined in detail in the EIS, while simultaneously devoting less attention and time to issues which cause no concern; and 5) to save time in the overall process by helping to ensure that draft statements adequately address relevant issues, reducing the possibility that new comments will cause a statement to be rewritten or supplemented.

Scoping can lay a firm foundation for the rest of the decision-making process. If the EIS can be relied upon to include all the necessary information for formulating policies and making rational choices, the agency will be better able to make a sound and prompt decision. In addition, if it is clear that all reasonable alternatives are being seriously considered, the public will usually be more accepting of the choice among them. Sometimes the scoping process enables early identification of a few serious problems with a proposal, which can then be resolved or the proposal modified as the proposal is still being developed.

As undertaken by the Monument, scoping is a process, not an event or a meeting. It has continued throughout the planning and development of this EIS; public comments have been welcomed at any time throughout EIS/CCP development.

5.4.1 Notice of Intent

The FWS began the public scoping period by publishing a Notice of Intent to prepare the CCP in the *Federal Register*, on June 12, 2002. The FWS subsequently extended the initial ninety-day comment period by thirty days to end October 12, 2002. In addition to basic information about the CCP/EIS project, the notice provided information on the planning process; public involvement opportunities; tribal government involvement; the FAC and their role in the CCP; a history of the Monument; an explanation of the Monument's purpose as described in the Monument Proclamation; a description of the initial issues, concerns and opportunities as developed by the FWS and FAC; and a description of recent land use and planning efforts.

5.4.2 Other Public Notices

The planning team sent an initial news release to all local media contacts in television, newspaper, radio and other mass media outlets (e.g., organization newsletters). A week prior to each of the four public scoping meetings (see below), the planning team sent a public service announcement to the mass media contacts with specific information on the meeting location and meeting format.

Additionally, the planning team made telephone calls prior to each meeting to elected and government officials, area residents, and organizations interested in the Monument to remind them of the meeting. At the same time, the planning team sent a public notice via email to a distribution list of people and organizations interested in receiving information on the Monument. The FWS also mailed Planning Update #1, which announced the meetings, to those in the DOE Hanford mailing data base in August, 2002.

5.4.3 Public Scoping Meetings

Four public scoping meetings and one Monument open house were held during the 120-day comment period. During that time, FWS staff accepted official comments via: 1) oral comments captured on flipcharts at the scoping meetings; 2) emails or letters sent to the FWS Regional (Portland, Oregon) or Monument Offices; 3) completion of worksheets in a Planning Workbook; 4) telephone calls to the Monument Office; and/or 4) completion of a comment sheet included in Planning Update #1. All comments gathered during the period were recorded and summarized in a Public Scoping Report, which is available on the Monument's web site. The date and place of each of the four meetings were:

- August 28, 2002, Mattawa High School, Mattawa, Washington.
- September 5, 2002 Seattle Airport Radisson Hotel, Seattle, Washington.
- September 9, 2002 Washington State University Tri-Cities Campus, Richland, Washington.
- September 17, 2002 Yakima Convention Center, Yakima, Washington.

Public comments received since the close of the official public scoping period in October 2002, have been noted and compiled with those previously collected.

5.5 Additional Scoping and Other Sources of Input

The FWS has given approximately sixty public presentations highlighting the CCP/EIS project. Audiences include the WDFW; DOE; EPA; PNNL; Energy Northwest; TNC; Lower Columbia Basin Audubon Society; Government Accountability Project; Richland Public Facilities Commission; Tri-Cities Economic Development Council; Commissioners of Adams, Benton, Franklin and Grant Counties; Kennewick Community Education; the Native Plant Society of Washington; Partners for Arid Lands Stewardship; Kiwanis Clubs; Rotary Clubs; Hanford Retirees; Tri-Cities Visitor and Convention Bureau; B-Reactor Museum Association; teacher workshops, FWS lectures at refuges and training sessions; Hanford Communities; Hanford Advisory Board; city of Mattawa; and Richland Rod and Gun Club. Many presentations included a PowerPoint program, a traveling exhibit display, distribution of brochures and planning updates, and question and answer opportunities. Thoughts and issues brought forth by the public and/or agency personnel at these presentations have been used in development of the CCP.

Tours of the Monument were organized for numerous interested organizations and individuals—tribes, Washington congressional representatives, Tri-City Herald Editorial Board, WDFW, CRITFC, Washington Fish and Wildlife Commission, and local farmers and ranchers. These tours provided the FWS with valuable input for use in development of the CCP.

The FWS also conducted internal resource reviews on visitor services, wildlife and habitat, cultural resources, and geological and paleontological resources. In addition to FWS staff, the FWS assembled teams of resource experts from local, state and federal agencies and tribes to assist with the resource reviews.

5.5.1 Elk Summit

One of the biggest challenges facing the Monument is the management of the Rattlesnake Hills Elk Herd. Multiple jurisdictions and intermingled land ownerships have contributed to complex management challenges related to the herd. The WDFW and FWS hosted a workshop on April 5-6, 2004, in Prosser, Washington, to address these challenges. The two-day "Elk Summit" was attended by tribal representatives, county commissioners, the DOE, environmental groups, fish and wildlife professionals, and local farmers and ranchers.

The goals of the workshop were three-fold: 1) establish open lines of communication among all parties interested in management of the elk herd; 2) share updated facts, such as elk population numbers, habitat quality, and agricultural losses; and 3) identify potential herd management actions that could be taken to reduce losses. There was no expectation that all issues would be resolved during this meeting; however, the WDFW and FWS believed that accomplishing the above goals would be of great value in the cooperative management of the elk herd.

The Conservation Breeding Specialist Group (CBSG) was invited to assist with the workshop.[172] The process designed by the CBSG began with tasks designed to increase appreciation of each other's perspectives and to focus initially on problem analysis rather than solutions. Over the course of the two days, exact concerns of all parties were identified, a range of possible solutions were discussed, and positive next steps were agreed upon. These results, and a complete workshop summary, are available on the Monument's web site. The outcome of the workshop will be used in the development of the step-down Wildlife and Habitat Management Plan.

5.6 Planning Workshops

The FWS conducted three public planning workshops that brought together a diverse group of interests to develop drafts of the Monument's vision statement, goals, preliminary management alternatives, and management objectives. The workshops were designed as three-day sessions, each building on the progress from the previous workshop and feedback from the FAC. The CBSG designed and conducted these workshops. Approximately fifty people participated in each of the workshops. Final workshop reports can be found on the Monument's web site.

5.7 Planning Updates and News Releases

The FWS distributed five planning updates (summarized below) to individuals, agencies and organizations on the Monument's mailing list, which originally contained over 800 entries—1,300 by the end of the public comment period.[173]

- Planning Update 1: August 2002, provided an overview of the CCP process.

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[172] The CBSG, based at the Minnesota Zoo, is one of over 100 specialist groups within the Species Survival Commission, which is itself one of six commissions comprising the World Conservation Union. Founded in 1948 and headquartered in Switzerland, the World Conservation Union unites 980 government agencies and non-governmental organizations across 140 countries to address worldwide environmental issues. The CBSG specializes in process design and facilitation of workshops to develop management plans for endangered species or conservation issue. CBSG workshops bring together all the stakeholders to find common ground and understanding on management of a species, a refuge, or an issue of ecological concern.

[173] Subsequent to the close of the draft CCP/EIS comment period, the FWS sent a letter to all mailing list entries asking them to respond back if they would like to remain on the Monument's distribution list. A self-addressed postcard was included to facilitate responses. Based on the responses, the Monument mailing/distribution list has been reduced by two-thirds to approximately 420 individuals and organizations (Appendix U). It is expected that this will increase with release of the final CCP.

- Planning Update 2: July 2003, presented scoping results, introduced draft vision statement and management goals for the Monument.

- Planning Update 3: October 2003, described four initial draft alternatives.

- Planning Update 4: November 2004, presented proposed new management units, further refined the draft management alternatives and presented the FAC-generated alternative, solicited recipient responses indicating preference to receive a paper copy or CD of the draft CCP/EIS.

- Planning Update 5: October 2005, presented additional alternatives to be covered in the CCP, updates to those previously identified, and presented a revised time line for distribution of the draft CCP.

The Monument's web site at http://hanfordreach.fws.gov posts all news releases, planning updates, and related materials.

5.8 Review of Draft CCP

The FWS released the draft CCP/EIS on December 6, 2006, for public review and comment. The initial comment period was to close on February 23, 2007, eighty days later.[174] During that initial period, requests for extensions were received from the Yakama Nation and Lower Columbia Basin Audubon Society. As a result, the FWS extended the comment period for an additional fifteen days to March 10, 2007.

During the ninety (or ninety-five) day comment period, the FWS received 308 timely comment letters.[175] These comment letters to the draft CCP/EIS were provided to the Portland, Oregon, offices of Jones & Stokes, an international environmental consulting firm, for review and cataloging. The

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[174] Due to mailing transit times and the end-of-year holidays, the comment period was more realistically seventy-five days.

[175] The term 'letters' is defined as an written correspondence received during the comment period related to the draft CCP/EIS. Almost half the "letters" were actually in the form of email (105). Seventy-two comments were submitted through the Monument's web site. One comment was submitted via telephone and twenty-three through open house comment sheets. Only 107 letters were actually sent via United States Postal Service mail or through other carriers.

One problem related to the use of email, and especially the web, is that many pieces of correspondence were anonymous. As such, there is no way to verify the validity of the comment/commenter, or to clarify points made. Likewise, there is no way to distribute the final version of the plan back to those providing comments anonymously.

overwhelming majority of letters focused on four main themes—Boat Launches, Horseback Use, Hunting on Islands, and the Observatory on Rattlesnake Mountain—and comments were organized around these themes.[176] A fifth category, "Other," was included to capture all other comments not fitting within these topics. Additional, minor themes are identified within each of the five main topics.

Very few direct comments were received on the factual content of the draft. Most comments were directed at hunters' rights, access to public lands, wildlife management, etc., expressing the writer's opinion of how the Monument should be managed. These comments were grouped together according to the categories discussed above. Where the opinion expressed provided some level of detail, or was based on a real or perceived fact, the FWS has provided a response. Where the comment represented solely an opinion and was not supported by any assertion, the FWS considered them in selection of the preferred alternative but did not respond to them here, other than to thank the writers for expressing their opinions and thoughts.

5.8.1 Public Open Houses

During the comment period, the FWS held four public open houses to answer questions from the public and to listen to concerns, comments and ideas. The open houses were an evening event on January 30, 2007, in the Mattawa Elementary School Gym; an evening event January 31, 2007, at the Sunnyside Community Center; an afternoon event February 5, 2007, at the Hampton Inn in Richland; and an evening event February 8, 2007, at the Red Lion Hotel in Pasco.[177] The open houses in Mattawa and Sunnyside were lightly attended, with eighteen and twelve people signing in, respectively. The Richland open house attendance was significantly higher, with forty-three sign-ins. The Pasco open house was fairly heavily attended, seventy-four attendees signing in, although how many of those people were there for the McNary and Umatilla National Wildlife Refuges CCP is unknown.

5.9 List of Preparers

Many people assisted in the writing of this CCP. While the FWS hopes that the following lists are complete, there were so many people providing assistance, it is possible that some people's name were inadvertently omitted. If so, please know that your contributions are valued and that the omission was in error.

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[176] Due to the uniformity of comments and the volume of letters received, copies of the actual letters are not reprinted here.

[177] The February 8 open house was a joint event with the McNary and Umatilla National Wildlife Refuges, which also had a draft CCP out for public review and comment.

5.9.1 Core Planning Team

- Paula Call, Outdoor Recreation Planner, U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, Washington
- Ron Crouse, Information and Education Specialist, U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, Washington
- Tom Ferns, Project Manager, Department of Energy, Richland Operations Office, Richland, Washington
- Jenna Gaston, Archeologist, U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, Washington
- Mike Marxen, Planner, U.S. Fish and Wildlife Service, Division of Planning, Sherwood, Oregon
- Woody Russell, NEPA Compliance Officer, Department of Energy, Richland Operations Office, Richland, Washington
- David Smith, Supervisory Natural Resource Specialist, U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, Washington

5.9.2 Additional Preparers

- Don Anglin, Fisheries Biologist, U.S. Fish and Wildlife Service, Division of Fisheries, Vancouver, Washington
- Jane Bardolf, Planner, U.S. Fish and Wildlife Service, Division of Planning, Sherwood, Oregon
- Betsy Bloomfield, Biologist, The Nature Conservancy, Ellensburg, Washington
- Florence Caplow, Botanist, Washington Department of Natural Resources, Olympia, Washington
- James Evans, Biologist, The Nature Conservancy, Seattle, Washington
- Glen Frederick, Planner, U.S. Fish and Wildlife Service, Division of Planning, Sherwood, Oregon

- Lindsey Hayes, Contaminants Specialist, U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, Washington
- Jack Heisler, Refuge Operations Specialist, U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, Washington
- Greg Hughes, Project Leader, U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, Washington
- Heidi Newsome, Biologist, U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, Washington
- Mike Ritter, Deputy Project Leader, U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, Washington
- Sharon Selvaggio, Planner, Planner, U.S. Fish and Wildlife Service, Division of Planning, Sherwood, Oregon

5.9.3 Contractors

- Jennifer Barnes, Jones & Stokes, Bellevue, Washington (Economics and Transportation)
- Patrick Blair, Sunnyside, Washington (Wilderness)
- Brent Bouldin, Jones & Stokes, Portland, Oregon (Chapter 4 Writing/Editing)
- Kevin Butterbaugh, EDAW, Seattle, Washington (Aesthetics)
- Sergio Capozzi, EDAW, Seattle, Washington (Public Use)
- Richard Easterly, SEE Botanical, Tenino, Washington (Vegetation Inventory)
- Rosalie Ferri, Ellensburg, Washington (Wilderness, Cultural Resources)
- Larry Goral, Jones & Stokes, Sacramento, California (Writing/Editing)
- Mark Greenig, EDAW, Seattle, Washington (Aesthetics)
- Eric Gustafson, Richland, Washington
- Stacy McDowell, Jones & Stokes, Portland, Oregon (Public Comment Analysis)

- Catherine Rudiger, Jones & Stokes, Sacramento, California (Writing/Editing)
- Debra Salstrom, SEE Botanical, Tenino, Washington (Vegetation Inventory)
- Erin VanDehey, Jones & Stokes, Portland, Oregon (Chapters 2 and 4)
- Derek Van Marter, Triangle Associates, Seattle, Washington (Scoping, Federal Advisory Committee)

5.9.4 Cooperating Agency and Consulting Government Staff

- Kristie Baptiste, Nez Perce Tribe, Lapwai, Idaho
- Wyn Birkenthal, City of Richland Parks and Recreation Department, Richland, Washington
- Bill Erickson, U.S. Army Corps of Engineers, Seattle, Washington
- Tom Ferns, Department of Energy, Richland Operations Office, Richland, Washington
- Adam Fyall, Benton County Office of County Commissioners, Prosser, Washington
- Mary Hollen, Bonneville Power Administration, Richland, Washington
- Aimee Kinney, U.S. Army Corps of Engineers, Seattle, Washington
- Paul LaRiviere, Washington Department of Fish and Wildlife, Pasco, Washington
- Mike Livingston, Washington Department of Fish and Wildlife, Pasco, Washington
- Jay McConnaughey, Yakama Nation, Union Gap, Washington
- Rudy Plager, Adams County Office of County Commissioners, Ritzville, Washington
- Donna Postma, Bureau of Reclamation, Ephrata, Washington
- David Rice, U.S. Army Corps of Engineers, Seattle, Washington
- Don Rose, Bonneville Power Administration, Portland, Oregon
- Ron Skinnarland, Washington Department of Ecology, Kennewick, Washington

- Hector Torres, Grant County Office of County Commissioners, Ephrata, Washington
- Althea Wolf, Confederated Tribes of the Umatilla Indian Reservation, Pendleton, Oregon
- Mark Ziminske, U.S. Army Corps of Engineers, Seattle, Washington

5.9.5 National Monument Federal Advisory Committee

- Royace Aikin, Batelle, Richland, Washington (Alternate)
- Leo Bowman, Benton County Office of the Commissioners, Prosser, Washington
- Frank Brock, Franklin County Office of the Commissioners, Pasco, Washington (Alternate)
- Rex Buck, Wanapum, Ephrata, Washington (Alternate)
- Nancy Craig, Grant County Public Utilities District #5, Ephrata, Washington (Alternate)
- Dennis Dauble, Pacific Northwest National Laboratory, Richland, Washington (Alternate)
- David Geist, Pacific Northwest National Laboratory, Richland, Washington
- Eric Gerber, Richland, Washington (Alternate)
- Michele Gerber, Historian, Richland, Washington
- Harold Heacock, Tri-Cities Industrial Development Council, Kennewick, Washington (Alternate)
- Greg Hughes, U.S. Fish and Wildlife Service, Richland, Washington (Designated Federal Officer)
- Rick Leaumont, Lower Columbia Basin Audubon Society, Richland, Washington
- Mike Lilga, Lower Columbia Basin Audubon Society, Richland, Washington (Alternate)
- Valoria Loveland, Richland, Washington (Alternate)
- Gene Schreckhise, Washington State University, Richland, Washington
- Alice Shorett, Triangle Associates, Seattle, Washington (Facilitator)

- Ron Skinnarland, Washington Department of Ecology, Richland, Washington (Alternate)
- Rich Steele, Columbia River Conservation League, Richland, Washington
- Jeff Tayer, Washington Department of Fish and Wildlife, Yakima, Washington
- Bob Thompson, Mayor, Richland, Washington (Alternate)
- Kris Watkins, Pasco, Washington
- Jim Watts, Tri-Cities Industrial Development Council, Kennewick, Washington (Chair)
- Karen Wieda, Pacific Northwest National Laboratory, Richland, Washington
- Mike Wiemers, Columbia River Conservation League, Richland, Washington (Alternate)

5.9.6 GIS and Mapping

- Jenny Barnett, GIS Specialist, U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, Washington
- Liz Cruz, GIS Specialist, U.S. Fish and Wildlife Service, Portland, Oregon
- Lindsey Hayes, GIS Specialist, U.S. Fish and Wildlife Service, Hanford Reach National Monument, Richland, Washington
- Erin Stockenberg, GIS Specialist, U.S. Fish and Wildlife Service, Portland, Oregon

5.9.7 Additional Assistance—Review, Consultation, Etc.

- Scott Aikin, U.S. Fish and Wildlife Service, External Affairs, Portland, Oregon
- Kevin Clarke, Department of Energy, Richland Operations Office, Richland, Washington
- Paul Dunigan, Department of Energy, Richland Operations Office, Richland, Washington
- Nell Fuller, U.S. Fish and Wildlife Service, Division of Refuges, Portland, Oregon
- Ben Harrison, U.S. Fish and Wildlife Service, Division of Planning, Portland, Oregon

- Kevin Kilbride, U.S. Fish and Wildlife Service, Division of Refuges, Portland, Oregon
- Steve Moore, U.S. Fish and Wildlife Service, Division of Refuges, Portland, Oregon
- Fred Paveglio, U.S. Fish and Wildlife Service, Division of Refuges, Portland, Oregon
- Anan Raymond, U.S. Fish and Wildlife Service, Division of Cultural Resources, Portland, Oregon
- Annabelle Rodriguez, Department of Energy, Richland Operations Office, Richland, Washington
- Alex Teimouri, Department of Energy, Richland Operations Office, Richland, Washington
- Dana Ward, Department of Energy, Richland Operations Office, Richland, Washington

5.9.8 Hanford Reach National Monument Management

- Greg Hughes, Project Leader
- Lee Albright, Deputy Project Leader
- Mike Ritter, Deputy Project Leader

Appendices

Appendix A – Glossary & Abbreviations

ABC: American Bird Conservancy.

ACHP: Advisory Council on Historic Preservation. A Presidential advisory board, created by the National Historic Preservation Act, to advise on matters concerning historic preservation. The Advisory Council on Historic Preservation governs review and compliance by federal agencies in conjunction with the state level review by the State Historic Preservation Officer.

ACOE: (United States) Army Corps of Engineers.

ADA: Americans with Disabilities Act.

ADT: Average Daily Traffic.

Adaptive Management: An approach to managing the Monument's resources that builds upon learning—based on best available science, common sense, experience, experimenting, new scientific discoveries and monitoring—by adjusting management practices based on what was learned. Where possible, Monument management projects will be designed to produce knowledge along with meeting other resource objectives.

AEC: (United States) Atomic Energy Commission.

Aesthetic: Of or relating to the sense of beauty. (Source: Webster's II Dictionary)

Affected Environment: In an environmental impact statement, a description of the existing environment covering information that directly relates to the scope of the proposed action and alternatives that are analyzed. (Source: CLUP)

AHPA: Archeological and Historic Preservation Act.

ALE: Fitzner-Eberhardt Arid Lands Ecology Reserve.

Alternative: A set of objectives and strategies or means of achieving refuge purposes and goals, helping fulfill the National Wildlife Refuge System mission, and resolving issues. (Source: Draft FWS Manual 601 FW 4)

Anadromous Fish: Fish that normally migrate to salt water as juveniles and return to freshwater as adults to spawn. (Source: Draft FWS Manual 601 FW 4)

Archeological Resource: Material remains of past human life or activities, including (but not limited to), pottery, basketry, bottles, weapons, tools, structures, and graves, or any portion of the foregoing items, as well as the physical site or context in which it is found. (Source: Considering Cultural Resources)

ARPA: Archaeological Resources Protection Act of 1979. Protects cultural resources and outlines permitting procedures as well as violations and fines. (Source: Considering Cultural Resources)

BAER: Burned Area Emergency Rehabilitation. Planned actions to stabilize and prevent unacceptable degradation to natural and cultural resources, to minimize threats to life or property resulting from the effects of a fire, or to repair/replace/construct physical improvements necessary to prevent degradation of land resources. Emergency stabilization actions must be taken within one year of containment of a wildland fire. Emergency rehabilitation actions are undertaken within three years of containment of a wildland fire to repair or improve fire-damaged lands unlikely to recover naturally to management approved conditions.

Basalt: A dark grey to black, fine grained igneous rock composed primarily of calcium feldspar and pyroxene, with or without olivine. This material underlies the Hanford Site. (Source: CLUP)

BCR: Bird Conservation Region.

Biological Diversity (Biodiversity): The variety of life and its processes, including the variety of living organisms, the genetic differences among them, and communities and ecosystems in which they occur. (Source: Draft FWS Manual 601 FW 4) It also defines the interrelationships within and among various levels of ecological organization. Conservation, protection and restoration of biological species and genetic diversity are needed to sustain the health of existing biological systems. Federal resource management agencies must examine the implications of management actions and development decisions on regional and local biodiversity.

Biological Integrity: Biotic composition, structure, and functioning at genetic, organism, and community levels comparable with historic conditions, including the natural biological processes that shape genomes, organisms and communities. (Source: Draft FWS Manual 601 FW 4)

BLM: (United States) Bureau of Land Management.

BMP: Best Management Practice(s). As a means of accomplishing an action, the practices that are based on the best available science and generally accepted standards for the field, as well as being the most effective and practicable (including technological, economic and institutional considerations).

BOR: (United States) Bureau of Reclamation.

B.P.: Before Present.

BPA: (United States) Bonneville Power Administration.

CalTech: California Institute of Technology (Irvine).

Candidate Species (Federal): A species for which there is sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list it as endangered or threatened but issuance of the proposed rule is precluded (i.e., by other listing activity or lack of funding).

Candidate Species (State): Wildlife species that are under review by the Washington Department of Wildlife for possible listing as endangered, threatened, or sensitive.

Central Hanford: That portion of the entire Hanford Nuclear Reservation (i.e., Hanford Site) that was not included within the Hanford Reach National Monument.

CCP: Comprehensive Conservation Plan. The master land planning document used by the U.S. Fish and Wildlife Service to administer the agency's lands (i.e., national bison ranges, national game preserves, national monuments, national wildlife refuges, waterfowl production areas, wetland management districts, and wildlife management areas).

CCT: Confederated Tribes of the Colville Reservation.

CD: Compatibility Determination.

Census Bureau: (United States) Census Bureau.

CEQ: (United States) Council on Environmental Quality.

CERCLA: Comprehensive Environmental Response, Compensation & Liability Act.

cfs: Cubic Feet Per Second. The standard measure of the flow rate of a river.

CFR: Code of Federal Regulations.

CIC: (Washington State University) Consolidated Information Center.

CLUP: Comprehensive Land Use Plan. Developed by the Department of Energy to direct land use within the Hanford Site.

Compatibility Determination: A written determination, usually signed by the Refuge Manager and Regional Chief, signifying that a proposed or existing use of a national wildlife refuge is a compatible use or is not a compatible use. (Source: Draft FWS Manual 601 FW 4)

Compatible Use: A proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgement, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purpose(s) of the national wildlife refuge. (Source: Draft FWS Manual 601 FW 4)

Connectivity (Habitat Connectivity): The arrangement of habitats that allows organisms and ecological processes to move across the landscape.

Conservation and Management: To sustain and, where appropriate, restore and enhance, healthy populations of fish, wildlife, and plants utilizing methods and procedures associated with modern scientific resource programs. (Source: Draft FWS Manual 601 FW 4)

Contaminants: Chemicals present at levels greater than those naturally occurring in the environment resulting from anthropogenic or natural processes that potentially result in changes to biota at any ecological level.

Council: Northwest Power and Conservation Council.

CPI: Consumer Price Index. The Consumer Price Index is a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services.

Criterion 1 (State Listed and Candidate Species): State listed species are those native fish and wildlife species legally designated as endangered, threatened, or sensitive. State Candidate Species are those fish and wildlife species that will be reviewed by the department for possible listing as endangered, threatened, or sensitive. Federal candidate species are evaluated individually to determine their status in Washington and whether inclusion as a priority species is justified.

Criterion 2 (Vulnerable Aggregations): Vulnerable aggregations include those species or groups of animals susceptible to significant population declines, within a specific area or statewide, by virtue of their inclination to aggregate. Examples include heron rookeries, seabird concentrations, marine mammal haul-outs, shellfish beds, and fish spawning and rearing areas.

Criterion 3 (Species Considered to be of Recreational, Commercial, and/or Tribal Importance by Washington State): Native and non-native fish and wildlife species of recreational or commercial importance and recognized species used for tribal ceremonial and subsistence purposes that are vulnerable to habitat loss or degradation.

CRITFC: Columbia River Intertribal Fish Commission.

Cryptobiotic Crust: See Microbiotic Crust.

Cryptogam: A plant that bears no flowers or seeds but propagates by means of spores. Cryptogamic organisms make up a cryptogamic crust or surface on certain soils.

CTUIR: Confederated Tribes of the Umatilla Indian Reservation.

Cultural Landscape: The distinctive setting or land use pattern associated with an historic site or areas such as a homestead, mining district, or townsite. There is evidence of human manipulation of the land through purposeful design, cultivation or extraction.

Cultural Resources: The physical remains, objects, historic records, and traditional lifeways that connect us to our nations's past. (Source: Considering Cultural Resources)

CWA: Clean Water Act (Federal Water Pollution Control Act).

dB: Decibel.

DOA: (United States) Department of the Army.

DOD: (United States) Department of Defense.

DOE: (United States) Department of Energy.

DOE-RL: (United States) Department of Energy – Richland Operations.

DOI: (United States) Department of the Interior.

Ecosystem: A biological community together with its associated non-living environment, functioning as a unit. (Source: Draft FWS Manual 601 FW 4/LPO) A system made up of a community of animals, plants, and bacteria and its interrelated physical and chemical environment.

ECPA: Electric Consumers Protection Act.

EE: Environmental Education. A teaching process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations and commitments to make informed decisions and take responsible action.

EIS: Environmental Impact Statement. A detailed written statement required by section 102(2)(c) of the National Environmental Policy Act, analyzing the environmental impacts of a proposed action, adverse effects of the project that cannot be avoided, alternative courses of action, and any irreversible and irretrievable commitment of resources. (Source: 40 CFR 1508.11/LPO)

Endangered Species (Federal): A species that is likely to become extinct throughout all or a significant portion of its range. These species are listed by the United States Fish and Wildlife Service.

Endangered Species (State Plants): A species that is likely to become extinct throughout all or a significant portion of its range within the state of Washington.

Endangered Species (State Wildlife): Wildlife species native to the state of Washington that are seriously threatened with extinction throughout all or a significant portion of its range within the state.

Environmental Health: Composition, structure, and functioning of soil, water, air and other abiotic features comparable with historic conditions, including the natural abiotic processes that shape the environment. (Source: Draft FWS Manual 601 FW 4)

Environmental Justice: The fair treatment of people of all races, cultures, and income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Executive Order 12898 requires federal agencies to identify and address and potentially disproportionate high and adverse human health and environmental effects of agency policies, programs and activities on minority and low-income populations. (Source: CLUP)

Environmentally Preferable Alternative: The environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in the NEPA, Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources. Section 1505.2(b) requires that, in cases where an EIS has been prepared, the Record of Decision must identify all alternatives that were considered, ". . . specifying the alternative or alternatives which were considered to be environmentally preferable." (Source: Council on Environmental Quality, 40 Questions)

EO: Executive Order.

EPA: (United States) Environmental Protection Agency.

EPZ: Emergency Planning Zone. A land use classification used by the Department of Energy.

Equestrian: Relating to horses or horseback riding.

ESA: Endangered Species Act.

ESU: Evolutionary Significant Unit.

Ethnography: The descriptive and analytic study of the culture of particular groups or communities. Such studies are often done through interviews with community members and often through living in

and observing a community (a practice referred to as "participant observation"). (Source: NPS National Register Bulletin: Guidelines for Evaluating and Documenting Traditional Cultural Properties)

Ethnohistory: The study of historical data, including but not necessarily limited to, documentary data pertaining to a group or community, using an ethnographic perspective. (Source: NPS National Register Bulletin: Guidelines for Evaluating and Documenting Traditional Cultural Properties)

Ethnocentrism: Viewing the world and the people in it only from the point of view of one's own culture and being unable to sympathize with the feelings, attitudes, and beliefs of someone who is a member of a different culture. (Source: NPS National Register Bulletin: Guidelines for Evaluating and Documenting Traditional Cultural Properties)

EUZ: Exclusive Use Zone. A land use classification used by the Department of Energy to denote a singular use.

FAA: (United States) Federal Aviation Administration.

FAC: Hanford Reach National Monument Federal Advisory Committee.

FACA: Federal Advisory Committee Act.

Fauna: The animals of a specified region or time.

FERC: Federal Energy Regulatory Commission.

Fishery: A place to catch fish. The Hanford Reach of the Columbia River is a popular sport fishing area for steelhead, chinook salmon, sturgeon, and smallmouth bass.

Floodplain: A plain along a river subject to periodic flooding (Source: Webster's II Dictionary). Floodplains are composed of sediment deposited by floods.

Flora: The plants of a specified region or time.

FLPMA: Federal Land Policy and Management Act.

FONSI: Finding Of No Significant Impact.

Forage: Vegetation of all forms available and of a type used for animal consumption.

Foundation Plant Communities: Intact assemblages of native plant species that serve as sources for seed and propagation material for disturbed sites and plant community natural regeneration. Also

referred to as "remnant" plant communities, these serve as a representation of plant communities that were historically wide-spread within the Columbia Basin.

FR: Federal Register.

FTE: Full Time Equivalent.

FWS: (United States) Fish and Wildlife Service.

FY: Fiscal Year.

GCEDC: Grant County Economic Development Council.

Geological Resources: Natural features related to the form of the earth or its solid surface. Rattlesnake Ridge, the Saddle Mountains, and the White Bluffs are a few of the key geological resources of Hanford Reach National Monument.

GMA: (Washington State) Growth Management Act.

GMU: (Washington State) Game Management Unit.

Goal: A descriptive, open-ended, often broad statement of desired future conditions that conveys a purpose but does not define measurable units. (Source: Draft FWS Manual 601 FW 4)

GPL: Gravitation Physics Laboratory.

GPS: Global Positioning System.

HAB: Hanford Advisory Board.

Habitat: A specific set of physical conditions in a geographic area that surrounds an organism, a single species, a group of species, or a large community and are required by an organism for survival and reproduction. The place where and organism typically lives. In wildlife management, the major components of habitat are food, water, cover, and living space.

Habitat Diversity: Refers to the number, interspersion, and relative abundance of indigenous plant and animal species and communities. It also refers to the horizontal and vertical structure of a plant community. (Source: Draft FWS Manual 601 FW 4)

HABS/HAER: Historic American Building Survey/Historic American Engineering Record.

Hanford Islands: Hanford Reach National Monument Islands. The 13 islands in the Columbia River that are part of the Hanford Reach National Monument.

Hanford Reach: A reach is a portion or stretch of a river. The 51-mile Hanford Reach is the last free-flowing non-tidal stretch of the Columbia River in the U.S. Most of it, 46.5 miles, is contained in the Monument.

Hanford Site: The entire area, from the top of the Saddle Mountains to the top of Rattlesnake Mountain, originally acquired for the Hanford Nuclear Reservation.

Historic Conditions: Composition, structure and functioning of ecosystems resulting from natural processes that are believed, based on sound professional judgement, to be present prior to substantial human changes to the landscape. (Source: Draft FWS Manual 601 FW 4)

Historic Preservation: Includes identification, evaluation, documentation, excavation, curation, acquisition, protection, rehabilitation, restoration, stabilization, maintenance and any combination of the foregoing activities relative to cultural resources. (Source: Considering Cultural Resources)

Historic Records: Any historical, ethnographic, architectural documents, drawings and images that provide a record of the past. (Source: *Considering Cultural Resources*)

HMS: Hanford Meteorology Station.

HNRTC: Hanford Natural Resource Trustee Council.

HSS: Highways of Statewide Significance.

Hydrology: The science dealing with the properties, distribution and circulation of water.

Hz: Hertz.

IBA: Important Bird Area.

Ibid: Latin for "the same place." Here, it refers to a repetition of the preceding citation.

Impact: Synonymous with effects and includes ecological, aesthetic, historic, cultural, economic, social, or health whether direct, indirect or cumulative. Impacts may also include those resulting from actions which may have both beneficial and detrimental (adverse) effects. Impacts may be considered as direct, indirect or cumulative.

Impact Severity Rating: Thresholds used in this Comprehensive Conservation Plan for analyzing the scope, scale and intensity of effects on natural, cultural, and recreational resources. The four levels of impacts include:

Negligible: Resources would not be affected, or the effects would be at or near the lowest level of detection. Resource conditions would not change or would be so slight that there would not be of any measurable or perceptible consequence to a population, plant community, cultural resource, recreation opportunity or visitor experience.

Minor: Effects would be detectable but localized, small, and of little consequence to a population, plant community, cultural resource, recreation opportunity or visitor experience. Mitigation, if needed to offset adverse effects, would be easily implemented and successful.

Moderate: Effects would be readily detectable and localized, with consequences to a cultural resource, population, plant community level or specific recreation opportunity or visitor experience. Mitigation measures would be needed to offset adverse effects, would be extensive in nature and moderately complicated to implement; and probably would be successful.

Major: Effects would be obvious and would result in substantial consequences to cultural resources, populations, plant communities within the local area and region, or recreation opportunities and visitor experiences within the Monument. Extensive mitigating measures would be needed to offset adverse effects; would be large-scale in nature and very complicated to implement; and the probability of success would not be guaranteed. In some instances, major effects would include the irretrievable loss of the resource.

Time and duration of impacts have been defined as:

Short-term: An effect that generally would last less than a single year or season.

Long-term: A change in a resource or its condition that would last longer than a single year or season.

IMPLAN: Impact Analysis for Planning.

Improvement Act: National Wildlife Refuge System Improvement Act.

Indicator Species: A species of plant or animal that is assumed to be sensitive to habitat changes and represents the needs of a larger group of species.

Interpretation: A communication process that forges emotional and intellectual connections between the interests of the audience and the inherent meanings in the resource.

Invasive Species: Plant or animal species that tend to spread rapidly and harmfully. For example, cheatgrass invasion of native shrub-steppe displaces native species and alter natural fire regimes. Many invasive species are also noxious weeds.

IPM: Integrated Pest Management. Used to treat targeted invasive plant species on the Hanford Reach National Monument. Manual, mechanical, biological, cultural (e.g., prescribed fire, competitive plantings), and chemical treatment methods used to achieve prioritized weed control objectives. Invasive species managers draw upon the full range of appropriate control technologies to develop integrated treatment plans for target species at selected priority sites. Treatment methodologies are based upon the best information available from literature and professional experience, tailored to the characteristics of the particular species and site.

IPSIMP: Integrated Plant Species Inventory and Management Plan.

Issue: Any unsettled matter that requires a management decision, e.g., an initiative, opportunity, resource management problem, threat to the resources of the unit, conflict in uses, public concern, or the presence of an undesirable resource condition. (Source: Draft FWS Manual 601 FW 4)

ISTEA: Intermodal Surface Transportation Efficiency Act.

KOP: Key Observation Point. These are a series of locations identified to describe the Monument's visual and aesthetic resources.

KV: Kilovolt.

LIGO: Laser Interferometer Gravitational Wave Observatory.

Long-term Impact: A change in a resource or its condition that would last longer than a single year or season.

LOS: Roadway Level of Service. These are qualitative measures of road congestion that describe operational conditions within a traffic stream and take into consideration such factors as volume, speed, travel time, and delay.

Major Impact: Effects would be obvious and would result in substantial consequences to cultural resources, populations, plant communities within the local area and region, or recreation opportunities and visitor experiences within the Monument. Extensive mitigating measures would be needed to offset adverse effects; would be large-scale in nature and very complicated to implement; and the

probability of success would not be guaranteed. In some instances, major effects would include the irretrievable loss of the resource.

Management Unit: An administrative unit for refuge management purposes. Under the Preferred Alternative, the Monument is divided into six management units.

MCAS: Mid-Columbia Archaeological Society.

McNary Islands: McNary National Wildlife Refuge Islands. McNary manages six islands in the Columbia River; three are within the Monument boundary and three are adjacent; jurisdiction will be transferred to the Monument.

McRiver NWRC: Mid-Columbia River National Wildlife Refuge Complex.

Microbiotic Crust: A diminutive collection of mosses, lichens, liverworts, algae, and bacteria that form a soil stabilizing crust. Microbiotic crusts are formed by living organisms and their by-products, creating a crust of soil particles bound together by organic materials on the surface of many soil types which fills the spaces between bunchgrass clumps within shrub-steppe habitats. Also known as cryptogamic, cryptobiotic, and microphytic, these organisms serve important functions in soil stability, moisture retention, nutrient transport, and plant community stability. The names are all meant to indicate common features of the organisms that compose soil crusts.

Migratory Birds: Those species of birds that migrate from place to place, either within the United States or between countries, to complete different stages of their life cycle. These species are listed under §10.13 of 50 CFR Chapter 1 - United States Fish and Wildlife Service, Department of Interior. (Source: Draft FWS Manual 601 FW 4)

Minor Impact: Effects would be detectable but localized, small, and of little consequence to a population, plant community, cultural resource, recreation opportunity or visitor experience. Mitigation, if needed to offset adverse effects, would be easily implemented and successful.

MIST: Minimum Impact Suppression Technique(s). Used to describe methods of firefighting having the smallest environmental impacts on resources while still accomplishing fire suppression.

MIT: Massachusetts Institute of Technology.

Mitigation: Avoiding, minimizing, rectifying, reducing, eliminating, or compensating for impacts. (Source: Draft FWS Manual 601 FW 4, paraphrased)

Moderate Impact: Effects would be readily detectable and localized, with consequences to a cultural resource, population, plant community level or specific recreation opportunity or visitor experience.

Mitigation measures would be needed to offset adverse effects, would be extensive in nature and moderately complicated to implement; and probably would be successful.

Monitoring: Tracking changes of selected parameters over time.

Monument: Hanford Reach National Monument.

Monument Proclamation: Hanford Reach National Monument Proclamation, Presidential Proclamation 7319. See also "Proclamation."

MOU: Memorandum of Understanding.

mph: Miles Per Hour.

NABCI: North American Bird Conservation Initiative.

NAGPRA: Native American Graves Protection and Repatriation Act of 1991. Specifies actions to be taken by federal agencies with regard to Native American human remains, funerary objects, objects of cultural patrimony, and sacred objects. (Source: Considering Cultural Resources)

NAS: National Audubon Society.

National Register: National Register of Historic Places. Established through the National Historic Preservation Act of 1966, the register is administered by the National Park Service. It is the nation's master inventory of known historic properties, including buildings, structures, sites, objects and districts that possess historic, architectural, engineering, archaeological or cultural significance at the national, state and local levels. (Source: Considering Cultural Resources)

National Register District: As designated under the National Historic Preservation Act, a district consists of a group of archaeological sites, features, buildings, structures or landscape elements which share a similar context such as theme, location or time frame.

Native: With respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem. (Source: Draft FWS Manual 601 FW 4)

Negligible Impact: Resources would not be affected, or the effects would be at or near the lowest level of detection. Resource conditions would not change or would be so slight that there would not be of any measurable or perceptible consequence to a population, plant community, cultural resource, recreation opportunity or visitor experience.

NEPA: National Environmental Policy Act.

NERP: National Environmental Research Park.

NGO: Non-Government Organization.

NHPA: National Historic Preservation Act. Outlines historic preservation responsibilities of federal agencies. (Source: *Considering Cultural Resources*)

NHS: National Highway System.

NOAA: (United States) National Oceanic and Atmospheric Administration.

NOAA-Fisheries: (United States) National Oceanic and Atmospheric Administration Fisheries. This agency was formerly known as the National Marine Fisheries Service.

Non-native Invasive Species: Invasive species are plants and animals that are introduced into new areas in which they are not among the native flora and fauna, and because they no longer face the natural enemies or competition from their place or origin, spread or reproduce prolifically. Non-native invasive species can cause significant changes to ecosystems, upset the ecological balance, create economic disruptions, and harm plants and wildlife. Within this document the words non-native invasive species, invasives, noxious weeds, and weeds are used synonymously to represent those non-native species that persist on the Monument and increase the risk of habitat fragmentation and degradation.

Noxious Weed: A plant species designated by federal or state law as generally possessing one or more of the following characteristics: aggressive or difficult to manage; parasitic; a carrier or host of serious insect or disease; or non-native, new, or not common to the United States. (Source: Federal Noxious Weed Act)

NPDES: National Pollutant Discharge Elimination System.

NPL: National Priority List. The NPL is a prioritization list under the Comprehensive Environmental Response, Compensation and Liability Act.

NPS: (United States) National Park Service.

NRHP: National Register of Historic Places.

NWI: National Wetlands Inventory.

NWR: National Wildlife Refuge.

NWRS: National Wildlife Refuge System.

NWSRS: National Wild and Scenic Rivers System. Established by the Wild and Scenic Rivers Act of 1968 to protect rivers and their immediate environments that have outstanding scenic, recreation, geologic, fish and wildlife, historic, cultural, and other similar values and are preserved in free-flowing conditions. See also Wild and Scenic River.

OAHP: (Washington) Office of Archaeology and Historic Preservation.

Objective: A concise statement of what we want to achieve, how much we want to achieve, when and where we want to achieve it, and who is responsible for the work. Objectives derive from goals and provide the basis for determining strategies, monitoring refuge accomplishments, and evaluating the success of strategies. Objectives should be attainable, time-specific, and measurable. ((Source: Draft FWS Manual 601 FW 4)

ODFW: Oregon Department of Fish and Wildlife.

Ordinary High Water Mark: The line that water impresses on land by covering it for sufficient periods to cause physical characteristics that distinguish the area below the line from the area above it. Characteristics of the area below the line include, when appropriate, but are not limited to, deprivation of the soil and substantially all terrestrial vegetation.

ORV: Off-Road Vehicle.

ORV: When discussing wild and scenic rivers, an ORV is an "outstandingly remarkable value" as defined by the Wild and Scenic Rivers Act. An Outstandingly Remarkable Value is a regionally or nationally significant or exemplary scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar value associated with a river, causing the river to be eligible for inclusion in the National Wild and Scenic Rivers System. (Source: Wild and Scenic Rivers Act of 1968, paraphrased)

OSHA: Occupational Safety and Health Administration.

Overlay Wildlife Refuge: A wildlife refuge on land which is owned by one or more federal agencies but managed by the United States Fish and Wildlife Service. (Source: CLUP)

PALS: Partners for Arid Lands Stewardship.

Paleontological Resources: The preserved (fossilized) remains of plants and animals that existed in various geological periods, usually prior to human existence.

PCB: Polychlorinated Biphenyl.

Permit: A short-term, revocable authorization to use public lands for specific purposes.

PHS: Priority Habitats and Species.

PIF: Partners in Flight.

Planning Area: The area upon which the planning effort will focus. A planning area may include lands outside existing planning unit boundaries currently studied for inclusion in the Refuge system and/or partnership planning efforts. It also may include watersheds or ecosystems outside of our jurisdiction that affect the planning unit. At a minimum, the planning area includes all lands within the authorized boundary of the refuge. (Source: Draft FWS Manual 601 FW 4)

Plateau: Columbia Plateau Physiographic Province.

PMU: (Washington State) Population Management Unit.

PNCA: Pacific Northwest Coordination Agreement.

PNNL: Pacific Northwest National Laboratory.

POC: Points of Contact.

Post-contact: A time period referring to occupation of the area by Euro-Americans, usually assumed to be about 1800 in this region.

Pre-contact: A time period referring to the occupation of the land solely by Native Americans and prior to the occupation by Euro-Americans. Generally equates to approximately pre-1800 in this region.

Preferred Alternative: The alternative which the agency believes would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical and other factors. The concept of the "agency's preferred alternative" is different from the "environmentally preferable alternative," although in some cases one alternative may be both. (Source: Council on Environmental Quality, 40 Questions)

Prescribed Fire: A fire ignited by management actions to meet specific objectives. (Source: Draft FWS Manual 601 FW 4) An intentionally or naturally ignited fire that burns under specified conditions that allow the fire to be confined to a predetermined area and produce the fire behavior and fire characteristics required to attain planned fire treatment and resource management objectives.

Prey Species: An animal taken by a predator as food.

Priority 1 Species (State Plants): Those taxa that are in danger of becoming extinct throughout their ranges. Populations are at critically low levels or their habitats are degraded or depleted to a significant degree. These taxa are the highest priorities for preservation.

Priority 2 Species (State Plants): Those taxa that will become endangered in Washington if factors contributing to their population decline or habitat degradation or loss continue. These taxa are high priorities for preservation efforts.

Priority 3 Species (State Plants): Those taxa that are vulnerable or declining and could become endangered or threatened in Washington without active management or removal of threats. These taxa should be important in the analysis of potential preserve sites.

PRISM: Program for Regional and International Shorebird Monitoring.

Proclamation: Hanford Reach National Monument Proclamation, Presidential Proclamation 7319. See also "Monument Proclamation."

Proper Functioning Condition: Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; filtering sediment, capturing bedload; aiding floodplain development; improving flood-water retention and ground-water recharge; aiding development of root masses that stabilize streambanks against cutting action; aiding development of diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and supporting greater biodiversity. The functioning condition of riparian-wetland areas is a result of interaction among geology, soil, water, and vegetation.

Proposed Species For Listing (Federal): A species for which a proposed rule to list as endangered or threatened has been published in the *Federal Register*.

PUD: Public Utilities District.

PUP: Pesticide Use Proposal.

Purposes of the Monument: The purposes specified in or derived from the law, proclamation, executive order, agreement, public land order, donation document, or administrative memorandum establishing, authorizing, or expanding a national wildlife refuge or refuge subunit. (Source: Draft FWS Manual 601 FW 4)

PWC: Personal Watercraft.

Raptors: Birds of prey, such as the eagle, falcon, hawk, or owl.

RCRA: Resource Conservation and Recovery Act.

RCW: Revised Code of Washington.

Review 1 Species: A plant species in need of additional field work before a status can be assigned.

Review 2 Species: A plant species with unresolved taxonomic questions.

RMIS: (National Wildlife) Refuge Management Information System.

Riparian: Of or on the bank of a natural course of water. (Source: Webster's II Dictionary). For example, riparian vegetation includes any and all plant-life growing on the bank of a stream or the edge of, but not within, a pond or lake.

RNA: Research Natural Area. A federal land designation that establishes areas with predominantly natural conditions and processes for research and educational purposes. They may include typical or unusual plant or animal types, associations, or other biotic phenomena; and/or characteristic or outstanding geologic, soil, or aquatic features or processes. The public may be excluded or restricted from such areas to protect resource values and research studies.

ROD: Record of Decision.

RONS: Refuge Operating Needs System.

Sacred Site: As defined by Executive Order 13007, a specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe as sacred by virtue of its established religious significance to, or ceremonial use by an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site. (Source: Considering Cultural Resources)

SCBID: South Columbia Basin Irrigation District.

Sensitive Species (State Plants): A species that is likely to become endangered or threatened in a significant portion of its range within the state of Washington.

Sensitive Species (State Wildlife): Wildlife species native to the state of Washington that are vulnerable or declining and are likely to become endangered or threatened throughout significant portions of their ranges within the state without cooperative management or the removal of threats.

SEPA: (Washington) State Environmental Policy Act.

Short-term Impact: An effect that generally would last less than a single year or season.

SHPO: (Washington) State Historic Preservation Officer.

Shrub-steppe: Arid land dominated by shrubs and grasses where soil and moisture limit the growth of trees. Washington State Department of Fish and Wildlife considers shrub-steppe a priority habitat. Shrub-steppe habitats on the Monument support many rare plants.

Site: When referring to cultural resources; the location of an event, occupation or activity, building or structure or natural feature with cultural significance.

Solitude: The state of being alone. (Source: Webster's II Dictionary) Many people seek out natural areas, such as the Monument, in order to experience the feeling of solitude and to at least temporarily escape the crowds, noise, and technology of modern society.

Special Status Species: Wildlife and plant species either federally listed or proposed for listing as endangered or threatened; state-listed; or determined priority species.

Spot Treatment: The application of chemicals to control non-native invasive species directly onto a target plant, using a backpack spraying unit, hand-held wand, wick or other application device.

Step-down Management Plan: A plan that provides specific guidance on management subjects (e.g. habitat, public use, fire, safety) or groups of related subjects. It describes strategies and implementation schedules for meeting Comprehensive Conservation Plan goals and objectives and is usually subsequent, subservient and complimentary to the Comprehensive Conservation Plan. (Source: Draft FWS Manual 601 FW 4)

Strategy: A specific action, tool, technique, or combination of actions, tools, and techniques used to meet unit objectives. (Source: Draft FWS Manual 601 FW 4)

SUP: Special Use Permit.

T&E Species: Threatened and Endangered Species.

TCP: Traditional Cultural Property. A historic property whose eligibility for inclusion to the National Register of Historic Places is derived from its significant role in the traditional but often continuing lifeways of a community. (Source: Considering Cultural Resources.

TEA-21: Transportation Equity Act for the 21st Century.

TE&S Species: Threatened, Endangered and Sensitive Species.

Threatened Species (Federal): A species that is likely to become endangered in the foreseeable future.

Threatened Species (State Plants): A species that is likely to become endangered in the foreseeable future.

Threatened Species (State Wildlife): Wildlife species native to the state of Washington that are likely to become endangered in the foreseeable future throughout significant portions of their ranges within Washington without cooperative management or the removal of threats.

TNC: The Nature Conservancy.

TPA: Tri-Party Agreement. Also known as the Hanford Federal Facility Agreement and Consent Order. An agreement between the Department of Energy, United States Environmental Protection Agency, and the state of Washington on cleanup and mitigation measures for the Hanford Site.

Traditional/Religious Values: Places that possess values important to Native American tribal groups or other ethnic groups for traditional cultural or religious reasons. Traditional cultural values may not necessarily be associated with easily definable sites or objects, such as is the case with sacred peaks or viewsheds. (Source: Considering Cultural Resources)

TRIDEC: Tri-City Industrial Development Council.

Trust Responsibility: The fiduciary obligations that attach to the United States as trustee of the assets and resources that the United States holds in trust for Native American governments and their members, the treaty and statutory obligations of the United States toward Native American governments and their members, and other legal obligations that attach to the United States by virtue of the special relationship between the federal government and Native American governments. The identification and quantification of trust assets is recognized as an ongoing and evolving process. (Source: The Native American Policy of the U.S. Fish and Wildlife Service)

USC: United States Code.

USDA: United States Department of Agriculture.

USFS: United States Forest Service.

USGS: United States Geological Survey.

Vegetation Type: A classification of the plant community based on the dominant plant species in the community. (Source: CLUP)

Visitor Center: Hanford Reach National Monument Heritage and Visitor Center.

Visitor Day: Twelve visitor hours which may be aggregated by one or more persons in single or multiple visits.

Visual Resources: The visible physical features on a landscape, such as land, water, vegetation, structures, and other features.

Vision Statement: A concise statement of what the planning unit should be, or what we hope to do, based primarily upon the National Wildlife Refuge System mission and specific refuge purposes, and other mandates. (Source: Draft FWS Manual 601 FW 4)

WAC: Washington Administrative Code.

Watch List Species: A species more abundant and/or less threatened in Washington than previously assumed.

Watershed: All land and water within the confines of a drainage divide.

Watershed Function: The ability of a watershed to effectively and safely capture, store and release precipitation.

WDFW: Washington Department of Fish and Wildlife.

WDNR: Washington Department of Natural Resources.

WDOE: Washington Department of Ecology.

WDPR: Washington Department of Parks and Recreation.

Wetlands: Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. (Source: Draft FWS Manual 601 FW 4)

WHR: Washington Heritage Register.

Wild and Scenic River: A portion of a river that has been designated by Congress as part of the National Wild and Scenic Rivers System. (Source: CLUP) In 1994 the Hanford Reach was found eligible and suitable for designation with a "recreational" classification. Recreational classifications are those "rivers or sections of rivers readily accessible by road or railroad that may have some development along their shorelines and may have undergone some impoundment or diversion in the past." (Source: Wild and Scenic Rivers Act)

Wilderness Units: Areas that have been designated by Congress as units of the National Wilderness Preservation System. (Source: Draft FWS Manual 601 FW 4)

Wildfire: An unwanted wildland fire. (Source: Draft FWS Manual 601 FW 4)

Wildlife-dependent Recreation: A use of a national wildlife refuge involving hunting, fishing, wildlife observation and photography, or environmental education and interpretation. The National Wildlife Refuge System Improvement Act of 1997 specifies that these are the six priority general public uses of the National Wildlife Refuge System. (Source: Draft FWS Manual 601 FW 4)

Withdrawn Lands: Lands the Department of Energy has "borrowed" from other federal agencies for its mission. (Source: CLUP)

WIU: Wilderness Inventory Unit. A portion of public land evaluated to determine its roadless character and to find the presence of wilderness characteristics. (Source: Section 2©) of the Wilderness Act)

WNHP: Washington Natural Heritage Program.

WOFM: Washington Office of Financial Management.

WPPSS: Washington Public Power Supply System.

WRIA: Water Resource Inventory Area.

WSDOT: Washington State Department of Transportation.

WSU: Washington State University.

WTP: Washington Transportation Plan.

Yakama Nation: Confederated Tribes and Bands of the Yakama Nation.

YCC: Youth Conservation Corps.

Appendix B – Comments Received During Public/Agency Review Period and FWS Responses

The FWS released the Draft CCP/EIS on December 6, 2006, for public review and comment. The initial comment period was to close on February 23, 2007, eighty days later.[178] During that initial period, requests for extensions were received from the Yakama Nation and Lower Columbia Basin Audubon Society. As a result, the FWS extended the comment period for an additional fifteen days to March 10, 2007.

During the ninety (or ninety-five) day comment period, the FWS received 308 timely comment letters.[179] These comment letters to the Draft CCP/EIS were provided to the Portland, Oregon, offices of Jones & Stokes, an international environmental consulting firm, for review and cataloging. The overwhelming majority of letters focused on four main themes—Boat Launches, Horseback Use, Hunting on Islands, and the Observatory on Rattlesnake Mountain—and comments were organized around these themes.[180] A fifth category, "Other," was included to capture all other comments not fitting within these topics. Additional, minor themes are identified within each of the five main topics.

Very few direct comments were received on the factual content of the draft. Most comments were directed at hunters' rights, access to public lands, wildlife management, etc., expressing the writer's opinion of how the Monument should be managed These comments were grouped together according to the categories discussed above. Where the opinion expressed provided some level of detail, or was based on a real or perceived fact, the FWS has provided a response. Where the comment represented solely an opinion and was not supported by any assertion, the FWS considered them in selection of the preferred alternative but did not respond to them here, other than to thank the writers for expressing their opinions and thoughts.

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[178] Due to mailing transit times and the end-of-year holidays, the comment period was more realistically seventy-five days.

[179] The term 'letters' is defined as an written correspondence received during the comment period related to the Draft CCP/EIS. Most "letters" were actually in the form of email (sixty-three). Eleven comments were submitted through the Monument's web site. Only thirteen letters were actually sent via United States Postal Service mail or through other carriers.

One problem related to the use of email, and especially the web, is that many pieces of correspondence were anonymous. As such, there is no way to verify the validity of the comment/commenter, or to clarify points made. Likewise, there is no way to distribute the final version of the plan back to those providing comments anonymously.

[180] Due to the uniformity of comments and the volume of letters received, copies of the actual letters are not reprinted here.

Boat Launches

The majority of letters received during the comment period were directed at operation of boat launches along the Columbia River. Of these, indicated a desire to continue operations as they currently exist, especially that of the White Bluffs Boat Launch.

Boat Launches – Opposed To Further Restrictions

Comments: While most letters did not provide a rationale as to why the status quo should be maintained, several writers did provide an explanation of their thoughts. Reasons included:

1) Many, if not most anglers like to fish the middle stretch of the river. Eliminating the White Bluffs Boat Launch would mean an increase in travel times, thereby impacting the fishing experience.

2) Increased travel distances would have a corresponding increase in fuel consumption, noise pollution, and bank erosion from boat wakes.

3) Closing the White Bluffs Boat Launch would increase congestion at other boat launches.

4) Closing boat launches would decrease access points for rescue operations and create undue safety issues.

5) Closing launches to motorized use would exhibit 'favoritism' to floatboaters.

6) Closing the White Bluffs Boat Launch would negatively impact handicapped and elderly boaters and could be a violation of the Americans With Disabilities Act (ADA).

7) Closing the White Bluffs Boat Launch would negatively impact the economies of communities north of the Monument.

8) Improvements made to the White Bluffs Boat Launch would create sedimentation and disturb salmon spawning habitat.

9) Closing the White Bluffs Boat Launch would close off mid-river access to anglers and other boaters who did not own, or could not afford, a jetboat.

Response: The argument that closing the White Bluffs Boat Launch would unduly impact people who own propeller or small boats is especially compelling, and the FWS revised preferred alternative reflects the need to maintain this boat launch. Likewise, the desire to limit fuel consumption, keep

noise pollution concentrated, and provide for a quality fishing experience (as opposed to spending significant time in transit) factored into this decision.

Of the other points raised:

1) It is unlikely that erosion would be impacted by any decision over boat launches, given the much larger likely impact of river fluctuations from dam operations and bank slumping from irrigation return.

2) With the understanding that other boat launches would be developed before any would be closed, it is unlikely that congestion would become a factor. Likewise, as any additional boat launches would most likely be located north of the river, there should not be any impact to communities north of the Monument.

3) As the White Bluffs Boat Launch is not currently ADA compliant, there would be no impacts to handicapped or elderly persons. In fact, replacement boat launches would be fully ADA compliant.

4) No construction of any boat launches would occur during periods when it would impact salmon spawning or other sensitive wildlife cycles (e.g., great blue heron nesting).

In short, the points raised by the boating community were compelling, and the preferred alternative has been revised to reflect both the need to retain the White Bluffs Boat Launch and provide for additional, developed boat launches in areas where boat launching is creating safety and resource concerns (see Chapter 4). However, in order to maintain a quality experience and control resource damage, there will likely be a need to develop limits to use at the White Bluffs Boat Launch.

Comments: A couple of letters expressed a desire to see the Ringold launching area remain unchanged, the reasoning being that the undeveloped area supports boat launching at all river levels.

Response: Any boat ramp constructed would be sited and designed to accommodate existing river operations.

Boat Launches – Support Additional Restrictions

Comments: Again, many letters supported alternatives that imposed restrictions on boat launches, including closure in some cases. Of the letters that provided rationale, none proposed a closure of the river to motor traffic or any elimination of all boat launches. Instead, they proposed changes to boat use, such as closing the river to motorboats two days a week or somehow limiting motorboat use. Some letters suggested that the White Bluffs Boat Launch be closed in order to provide sanctuary for wildlife.

Response: Options that control surface use of the river (eliminating boat traffic, implementing motor-free days) are not within the jurisdiction of the FWS. One option proposed that is within the FWS's jurisdiction—closure of the White Bluffs Boat Launch to provide sanctuary for wildlife. However, the FWS does not considered this to be a likely outcome of closure. The area immediately adjacent to the White Bluffs Boat Launch would likely see a decrease in motorboat use; however, as many people like to fish in this area, those traversing long stretches of the river to reach this area would generate significant disturbance in reaching their preferred fishing sites. Likewise, disturbance would increase around launches remaining open. The overall impacts to wildlife could actually be increased should there be no boat launch in the middle section of the river.

Boat Launches – Other Comments

Comments: As noted, comments on boat launches represented the majority of comments received. However, most comments were actually suggestions on how to operate and/or improve either the launches or access. These included:

1) Improving launches at Vernita, Ringold and White Bluffs into fully developed boat launches.

2) Providing launching facilities for floatboaters separate from that of motorboats.

3) Improving road access and parking facilities, and restricting use to those areas.

4) Providing permanent sanitary facilities.

5) Implementing a fee system for boat launching.

6) Providing more law enforcement presence.

7) Provide for a boat launch on the south shore of the river.

Response: Due to numerous factors—public safety, easier access for law enforcement, population increases, and resource protection concerns—the FWS believes many of these ideas could be implemented. The revised preferred alternative reflects a need to provide for better facilities (roads, restrooms, parking, the launches themselves) at all major boat launching sites. Likewise, an increased law enforcement presence is desired, funding dependent. However, although the CCP does include alternatives that consider a boat launch on the south shore, given the current state of Hanford Site cleanup and security concerns, the preferred alternative does not include a boat launch along the south shore; it would be appropriate to reconsider this option when the CCP is revised following changes in DOE operations. The question of fees will be addressed in a step down plan.

Comments: Other comments received centered around resource protection when/if construction occurs. These include consultation with rare plant botanists and cultural resource specialists.

Response: The FWS is committed to involving all experts in design and implementation of recreational facilities.

Horseback Use

Horseback riding was also a controversial topic, generating a large volume of letters. These letters were split along two lines—restricting or eliminating horseback use, or in opposition to restrictions. In should be noted that the Appropriate Uses test (Appendix H) has found that cross-country (unrestricted) horseback use is not an appropriate use of the Monument, but that horseback use on FWS roads and designated trails is an appropriate and compatible use.

Horseback Use – Oppose Additional Restrictions

Comments: Numerous letters were received in opposition to restricting horseback use on the Monument, citing a wide range of rationale. Comment letters stated that insufficient research has been conducted to prove that elimination of cross-country horseback riding from the Monument is necessary, and several letters sent citations for alternative research on the impacts of horses to public lands. Other comments stated that horseback use is less intrusive to wildlife than hiking or that cross-country horseback riding would have minimal effect on habitat relative to the existing elk population. Several letters noted that uses other than horseback riding spread weeds (i.e., shoes, tires, birds, wind, etc.). One letter stated that equestrian use is an alternative to hiking to promote the "Big 6" uses of national wildlife refuges. Others noted that horse could serve as a means to visit non-motorize areas for disabled visitors; one letter stated that limiting horseback use is discriminatory or limiting towards handicapped or elderly individuals and/or non-compliant with the ADA. Several letters requested that the ability to use stock for hunting purposes not be eliminated. Others stated that limiting horseback use to shared trails with motorized traffic is unacceptable. One letter suggested that eliminating horseback use would be detrimental to the local economy.

Response: The preferred alternative allows for horseback use on FWS roads and designated trails. As noted, cross-country (unrestricted) horseback use was found to be not appropriate under the Appropriate Uses test for the Monument (Appendix H), and as described in detail in the Horseback Riding Compatibility Determination (Appendix I). Due to the potential threats to Monument resources which could occur from unrestricted horseback riding, this activity will be allowed only on FWS roads and designated trails.

Horseback Use – Support Additional Restrictions

Comments: Most letters received on horseback use were opposed to restrictions. However, a few supported controlling horseback use. Most of these letters stated that horseback use damages vegetation and microbiotic crust, is not compatible with resource protection, and/or spreads noxious weeds, thereby increasing fire danger. Others stated that horseback use must be restricted to be consistent with Goal 7 and/or resource protection goals while others stated that horses should be limited to designated well-defined trails only.

Response: As described in detail in the Horseback Riding Compatibility Determination, when done in the appropriate manner and locations, the use of horses to support wildlife-dependent activities can be an appropriate use and compatible use on a national wildlife refuge. The preferred alternative supports this and the use of horses on the Monument, although to be compatible with resource needs, horseback use must be limited to FWS roads and designated trails (see Appendix M).

Horseback Use – Additional Comments

Comments: Although most horse-related letters discussed horseback riding restrictions, some writers provided other suggestions. One letter suggested that the FWS work with other agencies and horseback riding groups on promoting a weed-free forage and hay program. Another writer suggested a horse camp be established at Vernita or Ringold. Another requested that the trailhead off Highway 225 not be depicted on maps as it will increase hiking traffic and conflict with horseback use.

Response: These are all viable suggestions which will be addressed through development of a subsequent step down Visitor Services or Equestrian Plan.

Observatory

Comments: The second largest volume of comments received, after boat launches, was over the possible removal of the observatory on Rattlesnake Mountain. Comment letters opposed to the idea stated that the removal of the observatory was not necessary, would limit educational opportunities, particularly astronomy, and would be an unnecessary expense. Other comment letters stated that operation of the observatory has minor environmental impacts, that remote operation limits physical access but still provides educational opportunities via the internet, and that it offers tourist opportunities and the associated economic opportunities. Still other comment letters were opposed to the relocation of the observatory and stated that this action would degrade the quality of the observations as the remote location, dark skies, and elevation improved observations. One letter stated that the telescope was the largest in the state of Washington.

Letters in support of removal noted the positive impacts to natural and cultural resources (e.g., the elimination of artificial raptor perches; see Chapter 4), including restoration of native habitats and a site sacred to Native Americans in the area. Other letters favored relocation of the observatory to promote natural and tribal restoration of the area, or as a better option than demolition.

Response: The observatory is not a recommended use of the Monument (see Section 2.10.2.11 Objective 1-11: Restoration of Lithosol Habitat) and the preferred alternative reflects the actions that the FWS has identified as being in the best interest of resource protection. While the CCP notes that there would be minor environmental impacts from removal (see Chapter 4), the benefits of observatory removal and native habitat restoration outweigh these minor, temporary impacts. Alternate observatory facilities in the area (Sunnyside, Columbia Basin College) can provide education opportunities while protecting Monument resources.[181] Since the observatory is located in a closed area of the Monument where general public access is restricted, relocation of the observatory to a publically accessible location could offer opportunities to develop tourism, economic and educational opportunities.

Hunting

Hunting – Support

Comments: Many comment letters received that were in general support of hunting on the Monument. Specific ideas submitted included: 1) Implementation of a permit system to control hunting; 2) conducting all hunting as per WDFW regulations; 3) allowing the use of temporary blinds; 4) support for the current WDFW pheasant release program; 5) opening the area around the Saddle Mountain Lake for upland bird hunting; and 6) using waterfowl hunting as a means of population control. Hunting by Native American tribal members was also discussed with the idea that tribal access must be maintained according to treaty rights and that Native Americans be given a priority status related to hunting; there were also letters that did not support any special considerations for tribal members.

Response: The FWS supports hunting as a priority public use when determined compatible on a refuge-specific basis with refuge purposes and the NWRS mission. Hunting on the Monument is compatible with the purposes of the Monument and the resources to be protected (see the Hunting Compatibility Determination in Appendix I). This is reflected in the preferred alternative, which allows for the expansion of hunting should the status of lands under DOE control change.

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[181] According to the University of Washington Astronomy Department, the Rattlesnake Mountain telescope is not the largest in the state of Washington, although it is the largest of a certain, narrowly defined type.

In response to specific points, the FWS does not believe a permit system is needed at this point, although that remains an option into the future should the need arise (e.g., if there is too much hunting pressure). All hunting on the Monument is done in accordance with WDFW regulations, but the FWS must retain the option to be more restrictive to protect resources, to comply with FWS policies, or meet the purposes of the Monument. One example is the use of temporary blinds, which are allowed under WDFW regulations and on the Monument; however, blinds on the Monument may not be constructed from live vegetation in order to protect the habitats denoted in the Monument Proclamation. Likewise, the WDFW allows for pheasant releases; however, pheasant releases on the Monument are not allowed as the introduction of non-native species is contrary to FWS policy (601 FW 3.14F. and 3.16B). In other instances, FWS policy and the resource protection goals of the Monument are in perfect concert with WDFW regulations and programs. For example, under the preferred alternative, additional lands may be opened for upland bird hunting, but the lands around Saddle Mountain Lake fall within a long-standing WDFW waterfowl sanctuary and will remain closed to hunting. Additionally, in the case of waterfowl hunting, limits are established nationally in coordination with states based on a harvestable surplus and are not set by the WDFW or the Monument.

With respect to tribal hunting and access, all treaty rights will be honored. Tribal hunting will be conducted in accordance with these existing treaties, national and state laws, and DOE and FWS polices and procedures (see Section 2.3.1). As land management changes, all access and use issues will be developed as per above and in consultation with Native American tribes.

Hunting – Oppose

Comments: Several comment letters stated that hunting is incompatible with resource protection, research on the Monument, and/or the purposes of the NWRS; many of these writers also felt that hunting is morally wrong. Others would allow for hunting, but had specific suggestions on how to improve the program or protect resources, including: 1) Disallowing hunting above the ordinary highwater mark on islands; 2) not allowing the use of blinds; 3) discontinuing the WDFW's pheasant stocking program; and 4) not herding/trapping wildlife via aircraft or motor vehicle.

Response: The U.S. Congress has identified six wildlife-dependent public uses (including hunting) which are to be given special consideration in planning for and management of national wildlife refuges. When determined compatible, such uses are to be encouraged. Although some members of the public find hunting to be morally wrong, others recognize it as a traditional use of a renewable natural resource which provides the user with an enhanced appreciation for, and understanding of, fish, wildlife, plants and their habitats. The FWS manages national wildlife refuges, including associated public uses such as hunting, consistent with this congressional direction (see 16 U.S.C. 668dd-668ee). On the Monument, hunting has been found to be compatible with the purposes of the Monument and resource protection needs (see the Hunting Compatibility Determination in Appendix I); this is reflected in the preferred alternative. The compatibility determination addresses the parameters under

which hunting is compatible. These parameters include: 1) Blinds can be used as long as they are not constructed from live vegetation; 2) hunting above the highwater mark on islands is not compatible with resource protection (hunting below this point does not fall under the jurisdiction of the FWS); 3) and pheasant stocking must be discontinued as introduction of non-native species is contrary to FWS policy (601 FW 3.14F. and 3.16B). When hunting on the Monument, the use of aircraft and motor vehicles for herding/trapping is not allowed under state or federal law; however, these are accepted wildlife management methods in certain situations and under certain circumstances, and the FWS may need to use herding in efforts to control wildlife populations (see Section 2.10.1.5, Objective C-9: Wildlife Population Control).

Hunting – Other

Comments: A few comments were received that were not directly related to a position on hunting. These included: 1) a requested clarification on the meaning of the "hunting exclosure" on Map 11 (now Map 13); 2) a request to specify all hunting seasons on the Monument between September and March; and 3) a questioning of whether or not the FWS has adequate personnel to oversee a hunting program.

Response: Areas where hunting is not permitted, but other public uses are, are identified as "hunting exclosures" (this has been defined in Sections 2.9.2.4.3 and 2.9.2.4.6). At present, individual hunting seasons, bag limits, and take are defined by the state of Washington as published in the annual WDFW Big Game and Migratory and Upland Game Pamphlets. This CCP will establish the areas open/closed to hunting, although changes will first need to be codified in federal regulation. Likewise, variations from state regulations will be identified in federal regulations and, with the help of the state of Washington, in the annual WDFW game pamphlets. The specifics of hunting on the Monument are defined in the existing Sport Hunting Plan, although some modifications will likely be necessary with approval of the final CCP. This Sport Hunting Plan has already established that the Monument has adequate personnel to oversee the hunting program.

Elk Populations and Population Control

Comments: The Monument's elk herd remains a focus of controversy, mostly over the size of the elk population and its corollary depredation of field crops on farms adjacent to the Monument. Several comments received stated that herd size should be based on the carrying capacity of the Monument and that a biological carrying capacity study for the Monument and adjacent lands should be undertaken. A few letters noted that input from local landowners should be considered as to the size of the herd and that plans for herd size management should be included in all alternatives. Other writers focused on specific elk management methods, including: 1) Elk hunting should be allowed on the ALE (Rattlesnake Unit); 2) elk should be relocated if the population becomes too large; 3) government hunters should be used to cull the elk herd; and 4) hazing, baiting, or fencing should be

used as a means of elk control. Finally, a couple of letters stated that the cost to local landowners related to management of elk should be reimbursed by the FWS.

On the other hand, numerous writers did not believe the elk herd is a problem, or that it should be controlled. These letters expressed almost exactly the opposite opinions from those noted above, including: 1) Elk hunting should not be allowed on the Monument; 2) trapping and relocation are not cost or biologically effective; and 3) Government hunters should not be used to cull the elk herd.

Response: The FWS is also committed to working with the WDFW on all wildlife populations and supports the recommendations of the WDFW's Rattlesnake Hills Elk Strategic Management Plan (February 2000) and Yakima Elk Herd Plan (December 2002). These plans call for a population size of 350 or less elk in the Rattlesnake Hills Elk Herd. These plans were developed, and are revised, through a public process whereby all parties (e.g., landowners) participate in determining herd size. In support of these plans—and as good wildlife management practice—the CCP includes the full range of population control measures under each alternative, including the preferred alternative. Included within these measures are most of the suggested strategies. Although the DOE has found elk hunting for recreation is not in line with its goals for the ALE, the FWS believes an elk population control hunt could be a useful management technique in the future.[182] Relocation is a management option and is been included in the range of population control methods covered by the CCP, as has the use of government employees to cull the elk herd and fencing to control it. These are actions that the FWS could undertake and fund on the land the FWS manages. Regulations do not allow for baiting and the hazing of wildlife from federal lands. Management of elk on non-federal lands is the jurisdiction and responsibility of the WDFW.

Island Access

Comments: Access to islands in the Columbia River, both those within the Monument and several that are part of the McNary National Wildlife Refuge but addressed in this CCP, generated several letters, both in favor of keeping the islands closed and in favor of opening them to numerous uses. Several letters expressed a desire to open the islands to boaters (for the beaches) and hunters year round, while a couple of letters stated that seasonal closures would be sufficient. Respondents who acknowledged that FWS jurisdiction ends at the ordinary high water mark requested that this be made clear in the CCP and understood the closure only applies to areas above that point. Other writers wanted management of islands to be consistent between the Monument and the McNary and Umatilla National Wildlife Refuges.

Response: For reasons outlined in the CCP/EIS (see Chapters 2 and 3), the FWS has determined that the islands should be closed above the ordinary high water mark to protect natural and cultural

[182] A recreational elk hunt has been found to be a compatible use of the Monument north of the Columbia River in areas open to the public.

resources. The CCP clearly identifies island access will be maintained below the ordinary high water mark and that hunting and fishing can continue below that point. This continued closure has been coordinated with those of the McNary and Umatilla National Wildlife Refuges, and island access is consistent across all refuges, to the extent possible or practical.

Monument Access

Comments: The FWS received numerous comments regarding access to the Monument. Most of these comments were quite specific as to areas, type of access, or uses allowed. Of the general comments received, several stated public access to the Monument should be increased, while others stated that public access should not be increased. Another suggestion was that all public access and recreational activities should be guided by Goal 7. A couple of letters stated that all areas open to, or being considered for, public access should undergo comprehensive biological inventorying. One writer proposed limiting human trespass/development for wildlife preservation through a firmly established maximum number of visitors per year. Others stated that the accommodation of public use should not decrease the allocation of budget resources for conservation management, while others did not want to see any fees for use.

Response: The FWS has concluded that the Monument can support additional access to certain areas, as outlined in Chapter 2, and the preferred alternative opens additional areas, pending DOE approval under cleanup operations. All access is guided by the ten management goals identified for the Monument, although some balancing of management between the goals will be necessary; the preferred alternative strikes the balance the FWS believes is appropriate for the Monument. All areas will be subject to some form of monitoring, even if it is only observation by professional biologists; monitoring is a component of all resource management goals under all alternatives.[183] At this time, demands and impacts on resources are not sufficient to warrant imposing use limits. The FWS will monitor public use, and should use levels reach a stage where resources are being unduly impacted, the FWS will work with the public and local governments to implement appropriate protections. While protection of Monument resources is paramount, providing for public use and enjoyment of the Monument is also important. The FWS believes the preferred alternative does the best job of balancing public use with resource protection. At this time, no fees are being planned. However, this could change for operation and maintenance of certain facilities (i.e., fee demonstration site).

Comments: Among areas with access specifically identified:

1) Keep access to the top of Saddle Mountain.

2) The entire Wahluke Slope should be open to public access.

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[183] The more administrative resources available, the greater the extent of inventorying and monitoring possible. The FWS will have to make informed trade-offs with limited budgets and staffing.

3) Open access to the Benton County side of the river.

4) Rattlesnake Mountain should be open to public access. A variation of this comment was that the McGee Ranch (west end of the Rattlesnake Unit), including the Umtanum Ridge, should be open to public access.

5) Public access of the Riverlands area (the area immediately adjacent to the Columbia River south and west of the Vernita Bridge) should be allowed to continue, including designated roads and trails. The Vernita area west of State Route 240 should be open to public access.

6) Provide road, trail and/or boat access to B Reactor.

Response: In the same order as presented above.

1) Access to all of Saddle Mountain is provided for in the preferred alternative.

2) The preferred alternative opens the entire area to some form of public access, pending DOE release of areas from safety considerations.

3) The preferred alternative calls for limited, controlled access, budget and agency resources permitting. As the DOE releases lands for possible public access, the FWS will work with the DOE to provide appropriate access.

4) The FWS has determined that the entire Rattlesnake Unit should be closed to unrestricted public access due to resource concerns, as outlined in Chapter 2.

5) Currently, there are no designated trails in the area; all trails are 'social' trails. The DOE has determined that the area on the south side of the river should be closed due to security concerns, and the CCP reflects that decision. The area on the north side of the river is open and would remain so under the preferred alternative (see Chapter 2 for specific details).

6) Should the B Reactor become a publically accessible resource, the FWS will work with the DOE and other agencies (e.g., NPS) to ensure proper access.

Comments: Among the type of access specifically identified:

1) Off-road vehicles should be restricted on the Monument.

2) Only allow low-impact recreational activities.

3) Any management plan selected must be compliant with the Americans with Disabilities Act.

Response: In the same order as presented above.

1) The Monument Proclamation prohibits motorized and non-motorized off-road vehicles.

2) For the most part, the CCP is centered around low-impact activities. However, in accordance with the concepts behind Alternative C-1 (the preferred alternative), certain areas will have high concentrations of use (e.g., around boat launch areas). This is in order to minimize impacts elsewhere.

3) Implementation of the CCP will be in compliance with the ADA, although many of the finer details will not emerge until subsequent stepdown plans are written.

Comments: Among the uses allowed in certain areas specifically identified:

1) The road from the observation point across the White Bluffs should remain open for non-motorized use.

2) Limit access to Rattlesnake Mountain for educational or maintenance only.

3) Open access to Saddle Mountain Lakes for recreational fishing.

Response: In the same order as presented above.

1) The road will remain open as long as the road remains safe for public access.

2) Due to resource concerns, the preferred alternative limits public access to guided tours, conducted by either the FWS or FWS-trained docents.

3) The Saddle Mountain Lakes are managed by the BOR as a valid existing right. The FWS will work closely with the BOR to evaluate public use and access (e.g., fishing) on the Saddle Mountain Lakes. If it is determined that fishing can be safely conducted, and in accordance with DOE releases of lands to other uses, the BOR and FWS may allow fishing in the Saddle Mountain Lakes.

Trails

Comments: As already evidenced, access to the Monument generated by far the greatest interest and number of comments. While most of these were over boat access, numerous comments addressed trails. Some writers would like to see a wide variety of trails and trail uses—hiking, trail running,

mountain biking, and snowshoeing trails.[184] Other comments were focused on specific trail locations: 1) Along Rattlesnake Ridge from Horn Rapids to the Vernita Bridge; 2) along the crest of the White Bluffs traversing the entire Hanford Reach; 3) from the White Bluffs Boat Launch to the Saddle Mountains crest; and 4) interpretative trails at the Saddle Mountain Overlook and Rattlesnake Mountain. Several writers stated that trails on the Monument should be part of a larger interconnected "trail system."

While most of the comments received were in support of trails, there were a few that wanted limitations, or had concerns over resource protection. Comments ranged from the idea that expanding the hiking trails is excessive and not compatible with protecting resources to allowing for trails but limiting them (and all uses) to one side of the Columbia River. Others were focused on specific trails: One writer thought that a proposed trail corridor on the McGee Ranch (Rattlesnake) Unit may be too close to the endemic plant Umtanum desert buckwheat population and that a proposed trail(s) in the Hanford Dunes area may negatively impact the state's largest population of gray cryptantha. In any event, this writer stated that all trails should be developed in consultation with rare plant biologists and herpetologists.

Response: The preferred alternative allows for development of trails systems.[185] However, the exact location, number, design, etc., will be part of a subsequent Visitor Services Plan, not the CCP. The step down planning process will involve the public and existing plans, such as Benton County's Trail Plan, in identifying the appropriate trail configurations and uses. This includes the possibility of one or more trails on the Rattlesnake Unit and interpretive trails there and throughout the Monument. All of the Monument's trails will be designed with the idea of tying into other trail systems (e.g., Benton County, state of Washington) where feasible, appropriate and compatible.

The FWS has concluded that trails can be developed which allow for public use while protecting Monument resources, as analyzed in Chapter 4. While most trails would be on the north side of the river, due to most open areas being on that side, where appropriate and possible, trails on the south side of the river would be considered. For example, a trail through a portion of the Hanford Dunes area would allow the public to enjoy this unique resource. All trails would be sited in environmentally acceptable locations through development of a step down Visitor Services Plan. This includes protection of all rare or sensitive plants and animals. To help ensure this protection, trail development would be a public process, and all appropriate experts would be consulted.

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[184] Trail running is not an appropriate use of national wildlife refuges.

[185] The Monument Proclamation prohibits off-road biking; biking is only allowed on roadways. Certain roadways will be incorporated into the Monument's trail system.

Motorized Road Access

Comments: While few letters focused on motorized access to the Monument, those that did had specific ideas about that access. Among those comments was that there should be automobile access to the top of Rattlesnake Mountain, the Hanford Dunes, and to parts of the Monument's interior for the elderly. On the other hand, a few writers felt that motorized access (including helicopters) should be limited throughout the entire Monument. Another writer wanted to see the road between the locked gates (north of the Ringold Fish Hatchery, upstream of the Hanford Ferry landing) be reconstructed to complete the road east of the Columbia River, allowing for loop travel.

Response: Due to resource and public safety concerns, as outlined in Chapter 2, the FWS and DOE do not intend to open the Rattlesnake Mountain Road to general public access. Resource concerns also are also the reason that the FWS does not propose to open motorized access into the Hanford Dunes. However, access to a hiking trailhead in the Hanford Dunes is a possibility (to be addressed in a step down plan), pending DOE and Energy Northwest concurrence on public safety issues. Most of the available roads within the Monument's interior are open to use under the preferred alternative; the FWS is limited to additional motorized access by the current road configuration.

The FWS believes, as addressed in Chapter 4, that some level of motorized access is possible while still protecting Monument resources. The preferred alternative, which provides for essentially the current levels of road access, will be sufficient to provide public access while first protecting resources. All aircraft are limited to a 1,000 floor over the Monument by the FAA.

Due to safety concerns (over the current landslide location), budget constraints (for moving the road), and resource protection needs, the preferred alternative recommends continuation of the current situation, where access between the locked gates on the Ringold River Road through the area is by foot, horseback, or bicycle. Currently, all but the three miles between the locked gates are accessible by automobile, including for those with limited mobility.

Camping

Comments: Several letters discussed camping on the Monument, ranging from not allowing camping to providing spaces for recreational vehicles. A couple of letters identified specific locations for campsites—including the Hanford Dunes, along Highway 24, at the Ringold and Vernita boat launch areas, and at Sacagawea State Park[186]—while others wanted camping throughout the Monument. However, the vast majority of letters related to camping for floatboaters. While a couple were opposed to the idea, or wanted the sites open to all boaters, most of these letters wanted floatboater campsites

[186] Sacagawea State Park is not part of this CCP and is not near the Monument.

midway along the Hanford Reach. Specific ideas presented included limiting camping to a few days at a time and the establishment of a permit system.

Response: The FWS thoroughly considered allowing camping on the Monument. However, other than camping for floatboaters due to public safety concerns, camping was not found to be an appropriate use of the Monument (see Appendix H). Specifically, camping is not conducive to resource protection needs. There are also numerous other camping opportunities in the vicinity of the Monument.

The one exception to camping on the Monument is in support of floatboating, which in turn is supportive of several "Big 6" wildlife-dependent activities. If funding becomes available, such facilities could be provided in order to accommodate family-oriented wildlife-dependent recreation and to provide for public safety. The entire Hanford Reach often cannot be traversed safely in one day, especially by families.[187] Without providing for a limited number of reservation-only campsites for floatboaters, an entire segment of the public would be excluded from boating on the river. All use would be at designated sites, allocated through a lottery/permit system, and be for one night only to provide for public safety. This option is included in the preferred alternative.

Other Comments

Although most of the comments received were focused on the topics already addressed, the public, Native American tribes, and other agencies provided comments over a broad range of topics.

Other Recreation and Recreation Facilities Comments

Comment: Recreational opportunities should not be restricted on the Monument.

Response: As noted elsewhere, resource protection is the primary responsibility of the FWS. All public uses must be appropriate and compatible with protection of resources (see Appendices H and I).

Comment: The forms and locations of recreational activities should be compatible with high standards of resource protection.

Response: By FWS policy, recreation activities must be found appropriate (Appendix H) and compatible (Appendix I) with the purposes of the Monument before lands can be open to such uses.

[187] Powerboat users can safely access and exit the Monument within one day.

Comment: Dogs should be allowed off-leash.

Response: Dogs allowed off-leash, and not in support of a wildlife-dependent activity (e.g., hunting), was found to be not appropriate under the Appropriate Uses analysis (see Appendix H) and are not consistent with resource protection.

Comment: Sporting dog field trials should be allowed.

Response: Most of the activities associated with field dog trials have been found to be either inappropriate or incompatible with Monument purposes, for example, off-trail horse use, camping, use of non-native species (see Appendices H and I).

Comment: Several suggestions were made to improve recreation:

- Provide sufficient receptacles for litter control in any area of frequent public access.
- Include an unmanned interpretive center at the Vernita Rest Area.
- There should be fewer interpretive signs and trails.

Response: Details like this will be addressed in step down plans, such as a Visitor Services Plan. These comments will be retained for consideration at that time.

Comment: The number of parking areas should not be reduced. Closure of the Ringold parking lots would not reduce maintenance costs.

Response: Several parking lots are underutilized and create avenues for the spread of noxious weeds, as well as causing the need to expend funds that could be best used elsewhere. The closure of two little-used parking lots in the Ringold Unit—none providing boat access—will help reduce maintenance costs and the spread of noxious weeds. Additional parking facilities will likely be constructed in other areas to accommodate public use.

Comment: The size of the parking areas should be increased to accommodate trucks with horse trailers.

Response: This is a detail best addressed in either a Visitor Services or Equestrian Plan.

Comment: Revise map 20 to show the Yakima River and boat launch sites along the river, including Benton City, Horn Rapids Park, Snively Road and Hyde Road.

Response: Due to boat passage impediments along the Yakima River, the FWS does not believe the suggested map modifications are warranted. Map 20 reflects the boat launches that are typically used to access the Hanford Reach.

Comment: The Hanford Reach should be included in the Columbia River Water Trail System.

Response: The FWS has taken tentative first steps to have the Hanford Reach be recognized as a water trail.

Comment: Scientific research should have priority over recreation.

Response: The FWS believes both research and recreation are important and can be accommodated on the Monument. Scientists will have areas like the Rattlesnake Unit to conduct research by permit, while public use can be provided for elsewhere. That does not mean that any use is exclusive of another in any area. For example, research, especially that benefitting the Monument, can be conducted anywhere on the Monument, while limited public use will occur on the Rattlesnake Unit.

Comment: Section 4.13.1.3 acknowledges an increased risk of vandalism on utility facilities associated with those alternatives providing trail and boat launch facilities (page 4-184). However, no measures to mitigate this adverse effect are proposed. We suggest considering the location of utility infrastructure when planning visitor facilities, similar to the proposed best management practices for avoidance of sensitive resources described in Section 4.0.1.2.1).

Response: The change has been made.

Staffing, Budgets and Administration

Comment: Adequate staff and budget should be provided to ensure protection of resources.

Response: The FWS has developed staffing plans to meet the objectives of each alternative (see Chapter 2). The FWS believes the identified staffing levels would provide for public use while protecting the Monument's resources. However, these are optimum staffing levels; near-future budget projections suggest it is unlikely that such levels could be reached for several years.

Comment: Funding should be adequate to meet environmental, safety and staffing needs and to monitor open and closed areas.

Response: The FWS agrees. However, there are many equally important national priorities competing for funding. Staffing is a function of funding, which is a function of the congressional appropriation process. However, if it is believed an area cannot be adequately managed to protect resources with existing staff, by policy it would be closed to public use. At this time, the FWS believes it has adequate staff to keep various areas of the Monument open to public use.

Comment: There should be increased patrols of the Monument and the implementation of fines for those who violate the rules.

Response: The staffing chart in Chapter 2 reflects a desire for additional law enforcement personnel, and if funding becomes available, staffing would be increased. Fines are set by federal and state laws and policies.

Comment: The staff should include a geologist.

Response: If the writer is referring to the current staff, funding and other concerns do not allow for a geologist at this time. If the writer is referring to the future as envisioned by the CCP, most alternatives include a geologist (see the staffing chart in Chapter 2), including the preferred alternative.

Comment: The administrative offices should not be relocated.

Response: In line with national and regional needs and cost-savings, the office will be relocated to Burbank, Washington (McNary National Wildlife Refuge).

Geological and Paleontological Resources

See also specific geological comments at the end of this appendix.

Comment: The CCP/EIS does not adequately address the geologic and paleontologic resources.

Response: The writer did not provide additional rationale around which to respond further.

Comment: Numerous papers exist for additional information on geologic resources. These should be included in the CCP.

Response: The Monument Proclamation identified the geologic resources that must be protected. The CCP addresses those resources and their protection, albeit at a landscape scale. The additional information provided will be retained to be used in step down plans that specifically need that level of detail.

Comment: The slumping of White Bluffs is due to excess irrigation water diverted to ponds and unlined canals behind the bluffs.

Response: While this is likely the cause (see Chapter 3), until additional studies are conducted, the exact cause, and likely remedies, cannot be fully determined. This issue has been determined to be outside the scope of this CCP/EIS.

Comment: The CCP should include a plan for protecting the White Bluffs from landslides.

Response: Landslides are a serious problem, and a comprehensive study by the USGS has been recommended. As noted elsewhere, this issue has been determined to be outside the scope of the CCP process.

Comment: Daily fluctuations of river levels exacerbate bank erosion at Locke Island.

Response: While this is likely occurring, issues related to management of the Columbia River system are outside the scope of this CCP and are addressed through other means (see Chapter 3).

Invasive Species and Noxious Weeds

Comment: The FWS needs to work with partners (local organizations, counties, etc.) on an appropriate noxious weed control program.

Response: The FWS already does this, and every alternative in the CCP includes objectives to expand these partnerships and programs.

Comment: Insufficient response to invasive species may result in irreversible harm to resources.

Response: The FWS agrees and will continue to implement the IPSIMP.

Comment: The costs to local landowners of noxious weed and fire control should be reimbursed by the FWS.

Response: By law and policy, all federal landowners must be involved in noxious weed management, including the FWS. The FWS will follow all regulations to meet its obligations concerning noxious weed management. The FWS has existing management plans to control noxious weeds and fire; the public was involved in their development and will be invited to provide input on future revisions.

Fire Management

Comment: Authorize fire protection to protect the lives and property of those who live and work around the Monument.

Response: The FWS works in partnership with numerous local fire programs and agencies to protect life and property.[188] The FWS and partners will undertake all reasonable measures to protect the public and property.

Comment: The FWS should review and revise the Fire Management Plan sooner than five years.

Response: The FWS Fire Management Plan is a living document and is subject to change and modification within the five years.

Comment: Fire breaks should be created along all roads.

Response: All roads are considered firebreaks. In addition, most Monument road rights-of-way are treated (e.g., mowing, spraying) to widen the fire break and enhance fire protection. Most public highway rights-of-way through the Monument are disked to enhance fire protection.

Comment: Retain water collection/pumping facilities at the foot and/or summit of Rattlesnake Mountain for fire/life protection.

Response: The existing water storage on the Rattlesnake Unit will be maintained.

Comment: Include impacts to special status species resulting from fire prevention and fire fighting activities.

Response: These impacts are addressed in Chapter 4, albeit briefly. They are considered at greater length, appropriately, in the existing Fire Management Plan, and they will be further addressed when the plan is revised.

Biological Resources and Management

See also specific comments of the WDNR at the end of this appendix.

Comment: The FWS should complete a biological inventory of the entire Monument and develop a related monitoring plan.

Response: TNC completed a biological inventory and analysis of the Hanford Site, published in 1999. The FWS and TNC have continued to build on this inventory since that time and will continue to do so into the future. All management goals and alternatives, including the preferred alternative, include a monitoring component.

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[188] FWS policy mandates that the first priority in firefighting is to protect firefighters and the public. The FWS is not authorized to combat structural fires.

Comment: Monitoring of rare or sensitive species on islands, in the riparian areas of the Columbia River Corridor Unit, and on the Hanford Dunes should be conducted. Of special note, the White Bluffs bladderpod should be monitored on the Wahluke Unit to determine the response of the plants to management actions.

Response: Monitoring of rare plant and animal species will occur throughout the Monument, possibly as a cooperative effort with other agencies and groups. Monitoring of the White Bluffs bladderpod will continue; current plans indicate monitoring every three to five years. The most recent monitoring was completed in 2007.

Comment: The source for rare plant occurrences should be referenced.

Response: The FWS has repeatedly listed the WNHP, TNC, PNNL and FWS as the source for the status of rare plants within the Hanford Site. If the commenter was referring to some other usage, insufficient detail was provided to make changes to the CCP.

Comment: Restoration of riparian structure and function affords a high "payoff" in habitat value, and this restoration should be considered under all alternatives.

Response: All alternatives provide for riparian restoration. The differences are in the level of annual restoration efforts.

Comment: Clarify if riverine emergent wetland species are more significant than upland species on page 2-56.

Response: The FWS assumes the writer is referring to the protection of rare plant populations. If so, the FWS has an obligation to protect rare plant populations wherever they are found on the Monument, and one area is not more important than another.

Comment: The CCP/EIS does not adequately address fishery resources.

Response: The writer appended several pages of technical data on the Columbia River fishery that were submitted to other FWS offices that are directly involved in management of fishery resources. As the Monument does not have direct management responsibility over the Columbia River or the fishery, the facts presented are outside the scope of the CCP and are best addressed through these other offices and programs.

Comment: Avoid the use of "listed" when pertaining to species of concern.

Response: The CCP has been amended to reflect this, except where common word usage indicates otherwise.

Comment: The use of the word "severely" with regard to Chinook spawning habitat impacts is unfounded and conflicts with acknowledgment of healthy habitat later in the same sentence.

Response: The FWS cannot find this reference within the CCP/EIS.

Comment: The CCP should acknowledge that the FWS signed the Hanford Reach Fall Chinook Protection Program Agreement; add the FWS and Yakama Nation as signatories to the Hanford Reach Fall Chinook Protection Program Agreement in the footnote on page 3-72.

Response: The CCP has been amended to reflect this.

Comment: Add an objective to work with Mid-Columbia Hourly Coordinating Group on any proposed changes to river flow operations.

Response: There are no proposed changes to river flow operations resulting from this CCP.

Non-treaty Valid Existing Uses

Comment: The water pumping and transmission systems within the Monument must not be negatively affected by Monument management or operation.

Response: The systems related to the BOR's Columbia Basin Project are considered a valid existing right under the Monument Proclamation; the systems on the Monument will not be negatively impacted.

Comment: No closures are required to protect transmission towers from climbing or trespass.

Response: The CCP/EIS does not suggest that any closures are needed to avoid climbing on transmissions towers. Nor is trespass a problem in and of itself requiring any closures. However, protection of sensitive transmission equipment—a valid existing right under the Monument Proclamation—may be needed in certain areas, at certain times, and/or under special circumstances.

Comment: Allow operation of new or modified facilities at the 400 Area.

Response: The CCP would not impact the DOE operations in the 400 Area.

Comment: Evaluate the existing wells for potential use.

Response: Due to public safety concerns, the FWS does not have any plans to use any of the existing wells; most "wells" are actually water quality monitoring facilities. Furthermore, most of the wells

that currently exist are located in the Rattlesnake Unit or on DOE lands within the river corridor on the south shore, which are closed to general public use.

Issues Outside the Scope of the CCP

Comment: Any plans for the Monument must not impact payments in lieu of taxes (PILT).

Response: The FWS is not aware of how any portion of the CCP would impact PILT. At this time, the only action that the FWS is aware of that may impact PILT would be a change in land ownership, which is outside the scope of this CCP.

Comment: The Black Rock Reservoir may affect water levels in the Hanford Reach.

Response: Black Rock Reservoir, like all river flow issues, is outside the scope of the CCP and will be addressed through other processes and divisions of the FWS.

Comment: The EIS does not adequately address hazardous material contamination or cleanup.

Response: This issue is outside the scope of the CCP, is under the purview of other agencies, and has been—and is being—addressed through other processes and procedures.

Boundaries

Comment: The EIS should address the areas that have been cleaned up and might be included in the Monument in the future.

Response: At this time, there are no plans to expand the national wildlife refuge,[189] and the future land disposition plans of the DOE are unclear; the CCP only addresses lands within the Monument. Should additional lands be considered in the future, additional or supplemental NEPA coverage would be needed. Likewise, the CCP would be supplemented at such time as appropriate.

Comment: Boundary issues at the Horn Rapids Enclaves needs to be resolved.

Response: The Horn Rapids Park is not part of the Monument, and therefore any issues related to the park are outside the scope of this CCP.

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[189] The Monument can only be expanded by the President or Congress. However, it must be remembered that the Monument is also a national wildlife refuge, and the FWS could undertake management of additional lands as part of the NWRS.

Comment: Denote private boundaries more distinctly on mapping, fence boundaries, and areas that are susceptible to frequent trespass.

Response: Details on signing and public information will be addressed in either a Visitor Services or Signing Plan. This comment will be retained to be addressed at that time.

Cultural and Archaeological Resources

Comment: The CCP does not adequately address the risk to cultural/archaeological resources.

Response: The FWS acknowledges that specific details concerning cultural resource management are lacking from the CCP. This is by design; the FWS has identified the creation of a cultural resources management plan as a top priority. This step down plan will provide specific management direction for all cultural resources.

Comment: The White Bluffs Ferry Landing should be preserved as an historical monument for families impacted by the Manhattan Project.

Response: Under the preferred alternative, the FWS has no immediate plans to alter the landing. If, at some point in the future, it becomes necessary to make modifications to the landing to accommodate public use, the FWS will make every reasonable effort to be sensitive to the needs of earlier inhabitants of the area.

Comment: Historically significant structures such as the B Reactor and the old Hanford School should be preserved.

Response: The FWS supports the preservation and interpretation of these and other structures related to the Manhattan Project. However, these structures are outside the Monument boundaries, and the FWS has no management responsibilities for them.

Comment: It is stated that five to fifteen archaeological sites and historic structures should be inspected semi-annually. Why 5-15, and how has this number been determined? Does this mean, for example, that two buildings and three archaeological sites will be inspected? Without some explanation, this figure and recommendation seem entirely arbitrary. It also implies that only 5-15 sites merit inspection, while there are other known archaeological sites and historic properties worthy of yearly inspection.

Response: The number was based on the best professional judgement of a staff archeologist as to what could realistically be accomplished given funding and time limitations. The FWS does not consider one site inherently more important than another. Additional detail and identification of sites will be provided in a subsequent step down Cultural Resources Management Plan.

Comment: The bibliography does not show consultation of major historic properties documents prepared for Hanford (Harvey and Battelle).

Response: The Literature Cited (Appendix T) only lists documents and sources the FWS used in preparation of the CCP. It is not intended to be a bibliography and was mistakenly noted as such in the Draft CCP; the correction has been made.

Tribal Issues

Comment: The CCP/EIS does not adequately address tribal treaty rights.

Response: The CCP is very clear—and states it numerous times—that existing treaty rights will be honored in accordance with FWS policy.

Comment: The final CCP/EIS should include the process used to consult with affected tribes, outcomes of such consultations, and how tribal issues were addressed.

Response: Tribal consultation is addressed in Chapter 5.

Working With Others

Comment: There should be opportunities for volunteers to be involved with managing/ maintaining the Monument.

Response: The FWS will continue to make extensive use of volunteers.

Comment: The FWS should include the Ice Age Floods Institute as a consulting organization.

Response: The FWS provided for extensive public involvement in the development of this CCP, including the opportunity for all organizations to be involved. The FWS will continue to partner with the Ice Age Floods Institute on other projects (e.g., Hanford Reach Heritage and Interpretive Center, Columbia National Wildlife Refuge, development of interpretive trails).

Comment: Combine the second and third visual impacts strategies to read: "Seek cooperation with those agencies carrying out projects and activities within the Monument to develop design standards and guidelines for structures and utilities to be built that would minimize visual impacts to the Monument."

Response: The second strategy has been modified to reflect the desire of the FWS to work in cooperation with affected organizations in developing design standards.

Comment: The FWS should work with the BPA on the Implementation MOU agreed upon in the Letter of Agreement dated March 31, 2005.

Response: Until an ROD has been signed for this CCP, the FWS does not have final direction on what to implement. Following the ROD, the FWS will be in a position to work on the MOU.

Comment: Clarify the roles and responsibilities of other entities outside of the FWS and DOE.

Response: Other agency roles have been defined to the extent needed for the CCP.

Comment: The ACOE identified a specific office to discuss partnerships related to management of fish and aquatic habitat.

Response: The FWS thanks the ACOE for its offer and will pursue this offer as appropriate.

Comment: Clarify if "jurisdiction" means "authority" on the Monument.

Response: These terms have been defined in the glossary.

Comment: Section C.1.3 does not include a discussion of Section 404 of the Clean Water Act (page C-5), nor Section 10 of the Rivers and Harbors Act. Please be aware that Fish and Wildlife Service may be required to obtain a Department of the Army permit for some types of activities described in the CCP/EIS (e.g., boat launches).

Response: The FWS is fully aware that permits under either act may be necessary for construction activities within waters of the United States. Section C.1.3 has been changed to mention these acts.

Specific Editorial Comments

The ACOE suggested the following editorial corrections:

- Section 1.10.3, first paragraph: Use of the term, "cultural artifacts" is misleading. It should state, "The historic buildings and structures, including industrial and operational artifacts, associated with the Manhattan Project . . ." **(Correction made.)**

- Section 2.10.6.4: Change "National Register of Historic Sites" to "National Register Listed and Eligible Properties." **(Correction made.)**

- Section 2.10.6.4, Rationale and Strategies: This paragraph is confusing where it states that the site has experienced, "the removal of nearly all historical structures." It would be better to reword to, "Since many historic properties have been removed over time, those that remain,

including buildings, structures, and historic and prehistoric archaeological sites should be fully evaluated for National Register eligibility." **(Correction made.)**

- Section 3.20.3: This Section is inappropriately titled. It should be "National Register Listed and Eligible Properties." **(Correction made.)**

- The explanation of "historic districts" is somewhat misleading. An historic district is a catch-all term for concentrations of resources—prehistoric archaeology, historic archaeology, historic buildings, historic structures, objects, landscapes, etc. The Monument has several National Register listed historic districts, most of which are archaeological in nature. **(No correction necessary.)**

- Page 3-194, top paragraph: It states that 127 sites have been evaluated. It should be clarified whether all of these 127 sites/properties are considered eligible for listing in the National Register, or whether only some of these 127 sites are considered eligible. Are there known to be other eligible sites and districts, beyond the known 127 sites? **(The CCP has been rewritten to attempt to clarify.)**

- Page 3-194: Where it says, ". . . all of which are archaeological in nature and most of which comprise several sites." Again, this is confusing. By its nature, historic districts are composed of individual sites. **(No correction necessary.)**

The WDNR suggested the following editorial corrections:

- Page 2-56: This section should perhaps also cite Caplow, F. 2003. Studies of Hanford Rare Plants, 2002. Washington Department of Natural Resources Natural Heritage Report 2003-04. Prepared for the Washington Office of The Nature Conservancy. **(Correction made.)**

- Caplow and Beck 1996 and Soll and Soper 1996 are cited but not included in the Bibliography in Appendix R. **(Correction made.)**

- Page 2-57: Reference is made to seventeen unusual taxa, but not indicated what these are, or the source of this designation. **(Correction made.)**

- Caplow and Beck 1996 are cited but not included in the Bibliography in Appendix R. **(Correction made.)**

- Soll 1999 is cited but is not included in the Bibliography in Appendix R. Possibly means Soll et al. 1999. **(Correction made.)**

- Page 3-39 (bottom paragraph): Cottonwood is described as non-native. Some species are non-native, but black cottonwood is native and an important riparian tree. **(Correction made.)**

- Page 3-40: Should Beck and Caplow 1996 be cited here? **(No correction necessary.)**

- Awned halfchaff sedge is the common name used in the text on page 3-58 for *Lipocarpha aristulata*; on pg. 3-55 and in table 3.1 it is called *Aristulate lipocarpha*. **(Correction made.)**

- Rattlesnake Mountain milkvetch is the name used for *Astragalus conjunctus* var. *rickardii* on page 3-57, called basalt milkvetch in Table 3.1. **(Correction made.)**

- *Populus trichocarpa* is now named *Populus balsamifera* ssp. *trichocarpa*. **(Correction made.)**

- *Agropyron spicatum* is now named *Pseudoroegneria spicata*. **(Correction made.)**

- Page 3-41: *Oenothera caespitosa* ssp. *caespitosa* (not var.). **(Correction made.)**

- Page 3-41: *Ericameria nauseosa* rather than *Chrysothamnus*, *Chrysothamnus* is still used for *C. viscidiflorus*. **(Correction made.)**

- Page 3-41: *Achnatherum hymenoides* rather than *Oryzopsis*. **(Correction made.)**

- Page 3-41: *Hesperostipa comata* rather than *Stipa*. **(Correction made.)**

- *Hypericum majus* is called Greater Canadian St. John's wort in Table 3.1, but just Canadian St. John's wort on page 3-59. Either one is okay, but since the list is alphabetical by the first word, it makes it hard to cross reference the table and the text. **(Correction made.)**

- Page 3-42: *Poa secunda* rather than *Poa sandbergii*. **(Correction made.)**

- As noted elsewhere, *Physaria* is now recognized as the genus of what was formerly regarded as *Lesquerella*. **(Correction made.)**

- Page 3-55: Now, with the addition of *Gilia leptomeria* to the state threatened list, there are twelve species listed in Washington as threatened or endangered. **(Correction made.)**

- Page 3-56: Could reference source of this information about rare plant occurrences. **(No correction necessary.)**

- Page 3-57: Caplow and Beck 1997 cited, but not in the bibliography. **(Correction made.)**

- Page 3-58: Newcomb 1958 and Lindsey 1994 are cited but are not in the bibliography. **(Correction made.)**

- In the species treatments on pages 3-58 to 3-69, the information is presenting in a variety of formats and orders. For example, the state status may be at the beginning of the treatment or at the end, and various terms like "listed," "considered," or "is" are used. While consistency of presentation may sound repetitive, it would make it much easier to find specific information. **(No correction necessary.)**

- Barnaby 1989 is cited but not in the bibliography in Appendix R. **(Correction made.)**

- Hitchcock et al 1973 should be Hitchcock and Cronquist 1973 (Hitchcock et al was a different publication, published in 1969). **(Correction made.)**

- Middle of the page, sensitive does not need to be capitalized. **(Correction made.)**

- Page 3-63: Gray cryptantha is also a federal species of concern. **(Correction made.)**

- Page 3-63, last paragraph: The status in parenthesis is not done anywhere else and probably not necessary. **(Correction made.)**

- Page 3-64, under Loeflingia: (Hickman ed. 1993) is (Hickman 1993) elsewhere. **(Correction made.)**

- Page 3-64, The Oregon Natural Heritage Program 1993 is cited but not in the Bibliography. **(Correction made.)**

- Page 3-66: As noted elsewhere, sand gilia is now Washington state threatened. **(Correction made.)**

- Page 3-67: Shining flatsedge is no longer on the Washington sensitive list. It is on the watch list. **(Correction made.)**

- Page 3-69: Toothcup is lowland toothcup in Table 3.1. **(Correction made.)**

- Page 3-90, Table 3.3: In some rows the column formatting is out of line. **(Correction made.)**

- The WNHP has just completed its 2007 rare plant list revision, and one species found at Hanford, *Gilia leptomeria*, has been elevated to state threatened status. **(Correction made.)**

- A name change for White Bluffs bladderpod: *Lesquerella tuplashensis* is currently named *Physaria tuplashensis* on the WNHP list. **(Correction made.)**

- Page 3-92, Table 3.5: Washington State does not have a designation of "Species of Concern," and to use that term here may cause confusion with the FWS designation. It would be explicit to call the table "Sensitive, Watch, and Monitor List Species," or "Special Status Species," as the following section is called, would be fine. Should this table be in section 3.12? **(Correction made.)**

- Page 3-92, Table 3.5: *Artemisia lindleyana* genus is mis-spelled. **(Correction made.)**

- Page 3-92, Table 3.5: *Camissonia ('Oenothera) pygmaea*: Is the apostrophe a typo? **(Correction made.)**

- Page 3-92, Table 3.5: *Lindernia dubia* var. *anagallidea*: Add the word "var." **(Correction made.)**

- Page 3-92, Table 3.5: *Penstemon eriantherus* var. *whitedii*: Add the word "var." **(Correction made.)**

- Page 3-92, Table 3.5: *Gilia leptomeria*: As noted above, elevated in status to state threatened, so move to Table 3.3. **(Correction made.)**

- Page 3-92, Table 3.5: Called Great Basin gilia here, sand gilia on pages 3-66 and 3-42. **(Correction made.)**

- Page 3-92, Table 3.5: *Pediocactus nigrispinus*: The correct name for Washington pediocactus. **(Correction made.)**

- Page 3-92, Table 3.5: *Cyperus bipartitus*: Now on the Washington Watch list, rather than sensitive. **(Correction made.)**

- Page 3-92, Table 3.5: *Lipocarpha aristulata*: Threatened, on Table 3.3. Is the apostrophe a typo? **(Correction made.)**

- Page 3-92, Table 3.5: *Pellaea glabella* var. *simplex*: Add the word "var." This is on the Washington watch list, not the threatened list. **(Correction made.)**

- Page 3-92, Table 3.5: *Eremogone franklinii* var. *thompsonii*: The genus name has been changed for Thompson's sandwort; add the word "var." and change status from R2 to R1.

- Page 4-61: Species are federally listed as endangered (E), threatened (T), and designated as candidates under the ESA, but designation as species of concern is more informal. Better to avoid the use of "listed" pertaining to species of concern, because saying "federally listed" does not include species of concern. The second paragraph under 4.2.5 says that federally

listed T&E and candidate species and species of concern on the Hanford Site "comprise . . . and two plant species." There are two plant candidate species, but there are four species of concern: *Astragalus columbianus*, *Cryptantha leucophaea*, *Lomatium tuberosum*, and *Rorippa columbiae*. **(Correction made.)**

- Great Basin gilia is also now state threatened. **(Correction made.)**

- In the last paragraph of page 4-61, the common name for *Ammannia robusta* is given as grand redstem, where in Table 3.3 and 3-67 scarlet ammannia is used (grand redstem included in parenthesis on 3-67.) Likewise, in this paragraph the common name for *Calyptridium roseum* is given as rosy pussypaws, while in Table 3.3 and on 3-66 rosy calyptridium is used. There is no correct common name, but using different ones in the text and tables makes it very hard to cross-reference in the document. **(Correction made.)**

- Appendix R: Bibliography: The Washington Natural Heritage Plan was last printed in 2003, with updates in 2005. **(Correction made.)**

- Appendix R: Bibliography The Washington Natural Heritage Program rare plant list is generally revised every two years. The 2002 or 1997 lists are not necessarily correct for the present time. This document has been revised in 2007, and should be available on-line. The citation should read: Washington Natural Heritage Program. 2007. List of Plants Tracked by the Washington Natural Heritage Program. Department of Natural Resources. Olympia, WA. On-line at: www.dnr.wa. op/refdesk/lists/plantrnk.html. **(Correction made.)**

One prominent local geologist suggested the following editorial corrections:

- Page 1-27, Section 1.10.4: As pointed out later in the document, slumping of the White Bluffs is occurring due to excess irrigation water diverted to ponds and unlined canals behind the bluffs that is seeping down to the Ringold Formation (Bjornstad 2006a). Once water encounters the impermeable Ringold Formation it moves laterally toward the bluffs; where the water seeps out along the bluffs and slumping occurs. This activity is beyond the control of the FWS since a number of federal and state agencies need to agree on the problem and address it together, which probably won't happen anytime soon. **(Change made.)**

- Page 2-37, Table 2.1: Staff needs include a geologist for all but Alternative A and D. It seems with expanded educational and interpretive work proposed for Alternative D a geologist would be needed here more than under any of the other alternatives. **(No correction necessary. Staffing decisions were made on the basis of the alternative's emphasis. In any event, Alternative D has not selected as the preferred alternative.)**

- Page 2-85, line 4: The statement, "The sand dunes are a result of the massive floods . . ." is false and misleading. The sand dunes are all much younger than the floods and not formed

by the floods or a direct result of the floods. The sand dunes have formed from wind reworking the uppermost flood deposits and redepositing the sand into dunes and therefore are only an indirect result of the floods. **(Change made.)**

- Page 2-85, line 6: I disagree with the statement "much is known about the Monument's geological and paleontological resources . . .". While much is known about the geology beneath the Hanford Site, much less is known about the geology beneath the Monument. **(Change made.)**

- Page 2-93, Rationale and Strategies: Erosion of Locke Island is the subject of new report that came out last year (Bjornstad, 2006b.) **(New work incorporated.)**

- Page 2-98, Interpretive Trails: One or both trails on Rattlesnake Mountain (Alternative D) should be interpretive trails to highlight the especially high concentration of ice-rafted erratics and bergmounds, in addition to the wonderful flora of this special area. **(This level of detail will be defined in a step down Visitor Services Plan.)**

- Page 2-101, Rationale and Strategies, second line: Add Earth Science Week (October) to list of special events to promote. **(Change made.)**

- Page 3-13, last paragraph: Daily fluctuations of river level, especially during periods of maximum runoff in June can exacerbate bank erosion at Locke Island (Bjornstad , 2006b), as well as other banks along the Columbia River. **(No correction necessary.)**

- Page 3-16, Vadose Zone, line 3: Since it is an informal stratigraphic term, the word "formation" in Hanford formation is always lowercase. **(No correction necessary.)**

- Page 3-17, Unconfined Aquifer System: The "Plio-Pleistocene unit" is an outdated term. It has been replaced with Cold Creek unit (informal) as documented in DOE (2002). **(Correction made.)**

- Page 3-18 and 3-19, Section 3.3.4: Somewhere in this section the movement of groundwater should be discussed whereby the process of excess irrigation water seeping through the Hanford formation along buried paleochannels atop the relatively impermeable Ringold Formation is leading to the formation of springs and landslide failures along the White Bluffs (Bjornstad 2006a). **(Change made.)**

- Page 3-26, Geologic History, #3: Add "and Cold Creek unit" after "Ringold Formation." **(Correction made.)**

- Page 3-26, Geologic History, #4: Not all Ice Age floods were from Lake Missoula. Therefore it is more accurate to use "Ice Age floods" rather than "Missoula Floods." Might add that the

earliest Ice Age floods occurred 1-2 million years ago (Bjornstad et al. 2001; Bjornstad 2006a). **(Correction made.)**

- Page 3-28, Missoula Floods, second paragraph: (Bjornstad and Fecht 1989) not in list of references. A better, more recent reference is Bjornstad et al. (2001) (in reference list above). **(Correction made.)**

- Page 3-28, 3rd line: Ice Age floods inundated the Monument dozens or more times, not just several times. **(Change made.)**

- Page 3-28, last line: Touchet Beds are composed of sand and silt, not just silt. Substitute "slackwater" for "silt." **(Correction made.)**

- Page 3-28, 3rd to last line: Lake Lewis was not a "glacial" lake. Substitute "hydraulically dammed" for "glacial." **(Correction made.)**

- Page 3-28, last line: Add "above sea level" after 1,200 feet. **(Change made.)**

- Page 3-29, second line: Lake Lewis is estimated to have lasted only a week or less. Replace (Baker 1978) with more recent (O'Connor and Baker 1992). **(Correction made.)**

- Page 3-30, Rock Strata and Structure, 3rd paragraph: The sedimentary deposits between basalt flows (Ellensburg Formation) and above the basalt (Ringold Formation) are unlithified and therefore technically not rock. Delete the term "rock" in reference to these mostly unconsolidated deposits. **(Correction made.)**

- Page 3-30: Cold Creek unit and Hanford formation are informal names so "unit" and "formation" should be lower case. **(No correction necessary.)**

- Page 3-31, Cold Creek Unit: The discussion of the Cold Creek unit is filled with errors and inaccuracies. Suggest the author rewrite after reading most recent documentation related to these strata (DOE 2002, citation in list above). **(Corrections made.)**

- Page 3-31, last line: Delete (Touchet Beds). Touchet Beds only consist of sand and silt and do not dominate the flood deposits. **(Correction made.)**

- Page 3-37: The description of erratics and bergmounds appears to be based on Bjornstad et al. 2003 and Bjornstad 2006a. The citations should be noted. **(Change made.)**

- Page 3-37, Paleontological Resources, first line: Change "middle" to "upper." The White Bluffs represent the uppermost Ringold Formation. **(Correction made.)**

- Page 3-122, second paragraph, line 6: The height of the White Bluffs varies along its length. In places they are up to 600 feet high. Use a range for height (e.g., 200-600 feet). **(Change made.)**

- Page 3-125, Topography: Prominent topographic features within the Wahluke Unit include the White Bluffs and landslides. **(Change made.)**

- Page 3-126, Topography: A prominent and significant topographic feature within the Saddle Mountain Unit is the Corfu Landslide (Bjornstad 2006a). Most of it lies north of the Monument, but parts of are within boundaries of the Monument, I believe. Nevertheless access to a spectacular viewpoint of the landslide is via the Monument from the south. **(Change made.)**

- Page 3-129, Topography: Major topographic features within the Rattlesnake Unit are hundreds of ice-rafted bergmounds that cover the surface between 600-1000 feet in elevation (Bjornstad 2006a). **(Change made.)**

- Page 3-211, 3rd paragraph: New findings on the effects of the river flow fluctuations and riverbank erosion are presented in a report published last year (Bjornstad 2006b, see citation above). **(No correction necessary.)**

- Page 4-22, Effects of Geological/Paleontological Resources, first paragraph: Yes, certain geological features (erratics, bergmonds, etc.) exist, but it is misleading to say they are well known. Locations of most erratics and bergmounds are still unknown. Mapped/inventoried locations of erratics/bergmounds on about 25% of Rattlesnake Unit were noted between 2002-2004 (Bjornstad et al. 2003). Locations for the remaining 75% of the Rattlesnake Unit are unknown. There are hundreds more erratics/ bergmounds on the Wahluke Unit that have yet to be located/inventoried. **(Correction made.)**

- Page 4-164, first paragraph: More trails might be expected to spread out use and increase solitude, not decrease it, as this paragraph seems to suggest.

- Page 5-4, 3rd line: Change "pubic" to "public." **(Correction made.)**

Appendix C – Monument Proclamation And Whitehouse Background Paper

Presidential Documents

Proclamation 7319 of June 9, 2000

Establishment of the Hanford Reach National Monument

By the President of the United States of America

A Proclamation

The Hanford Reach National Monument is a unique and biologically diverse landscape, encompassing an array of scientific and historic objects. This magnificent area contains an irreplaceable natural and historic legacy, preserved by unusual circumstances. Maintained as a buffer area in a Federal reservation conducting nuclear weapons development and, more recently, environmental cleanup activities, with limits on development and human use for the past 50 years, the monument is now a haven for important and increasingly scarce objects of scientific and historic interest. Bisected by the stunning Hanford Reach of the Columbia River, the monument contains the largest remnant of the shrub-steppe ecosystem that once blanketed the Columbia River Basin. The monument is also one of the few remaining archaeologically rich areas in the western Columbia Plateau, containing well-preserved remnants of human history spanning more than 10,000 years. The monument is equally rich in geologic history, with dramatic landscapes that reveal the creative forces of tectonic, volcanic, and erosive power.

The monument is a biological treasure, embracing important riparian, aquatic, and upland shrub-steppe habitats that are rare or in decline in other areas. Within its mosaic of habitats, the monument supports a wealth of increasingly uncommon native plant and animal species, the size and diversity of which is unmatched in the Columbia Basin. Migrating salmon, birds, and hundreds of other native plant and animal species rely on its natural ecosystems.

The monument includes the 51-mile long "Hanford Reach," the last free-flowing, non-tidal stretch of the Columbia River. The Reach contains islands, riffles, gravel bars, oxbow ponds, and backwater sloughs that support some of the most productive spawning areas in the Northwest, where approximately 80 percent of the upper Columbia Basin's fall chinook salmon spawn. It also supports healthy runs of naturally-spawning sturgeon and other highly valued fish species. The loss of other spawning grounds on the Columbia and its tributaries has increased the importance of the Hanford Reach for fisheries.

The monument contains one of the last remaining large blocks of shrub-steppe ecosystems in the Columbia River Basin, supporting an unusually high diversity of native plant and animal species. A large number of rare and sensitive plant species are found dispersed throughout the monument. A recent inventory resulted in the discovery of two plant species new to science, the Umtanum desert buckwheat and the White Bluffs bladderpod. Fragile microbiotic crusts, themselves of biological interest, are well developed in the monument and play an important role in stabilizing soils and providing nutrients to plants.

The monument contains significant breeding populations of nearly all steppe and shrub-steppe dependent birds, including the loggerhead shrike, the sage sparrow, the sage thrasher, and the ferruginous hawk. The Hanford Reach and surrounding wetlands provide important stop-over habitat for migratory birds, as well as habitat for many resident species. The area is important wintering habitat for bald eagles, white pelicans, and many species of waterfowl such as mallards, green-winged teal, pintails, goldeneye, gadwall, and buffleheads. The monument's bluff habitats provide valuable nesting sites for several bird species, including prairie falcons, and important perch sites for raptors such as peregrine falcons.

Many species of mammals are also found within the monument, including elk, beaver, badgers, and bobcats. Insect populations, though less conspicuous, include species that have been lost elsewhere due to habitat conversion, fragmentation, and application of pesticides. A recent biological inventory uncovered 41 species and 2 subspecies of insects new to science and many species not before identified in the State of Washington. Such rich and diverse insect populations are important to supporting the fauna in the monument.

In addition to its vital biological resources, the monument contains significant geological and paleontological objects. The late-Miocene to late-Pliocene Ringold Formation, known as the White Bluffs, was formed from river and lake sediments deposited by the ancestral Columbia River and its tributaries. These striking cliffs form the eastern bank of the Columbia for nearly half of the length of the Reach, and are significant for the mammalian fossils that they contain. Fossil remains from rhinoceros, camel, and mastodon, among others, have been found within these bluffs.

The Hanford Dune Field, located on the western shore of the Columbia in the southeastern part of the monument, is also of geologic significance. This active area of migrating barchan dunes and partially stabilized transverse dunes rises 10 to 16 feet above the ground, creating sandy habitats ranging from 2 to several hundred acres in size.

The monument also contains important archaeological and historic information. More than 10,000 years of human activity in this largely arid environment have left extensive archaeological deposits. Areas upland from the river show evidence of concentrated human activity, and recent surveys indicate extensive use of arid lowlands for hunting. Hundreds of prehistoric archaeological sites have been recorded, including the remains of pithouses, graves, spirit quest monuments, hunting camps, game drive complexes, quarries, and hunting and kill sites. A number of Native American groups still have cultural ties to the monument. The monument also contains some historic structures and other remains

from more recent human activities, including homesteads from small towns established along the riverbanks in the early 20th century.

Section 2 of the Act of June 8, 1906 (34 Stat. 225, 16 U.S.C. 431), authorizes the President, in his discretion, to declare by public proclamation historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be national monuments, and to reserve as a part thereof parcels of land, the limits of which in all cases shall be confined to the smallest area compatible with the proper care and management of the objects to be protected.

WHEREAS it appears that it would be in the public interest to reserve such lands as a national monument to be known as the Hanford Reach National Monument:

NOW, THEREFORE, I, WILLIAM J. CLINTON, President of the United States of America, by the authority vested in me by section 2 of the Act of June 8, 1906 (34 Stat. 225, 16 U.S.C. 431), do proclaim that there are hereby set apart and reserved as the Hanford Reach National Monument, for the purpose of protecting the objects identified above, all lands and interests in lands owned or controlled by the United States within the boundaries of the area described on the map entitled "Hanford Reach National Monument" attached to and forming a part of this proclamation. The Federal land and interests in land reserved consist of approximately 195,000 acres, which is the smallest area compatible with the proper care and management of the objects to be protected.

All Federal lands and interests in lands within the boundaries of this monument are hereby appropriated and withdrawn from all forms of entry, location, selection, sale, or leasing or other disposition under the public land laws, including but not limited to withdrawal from location, entry, and patent under the mining laws, and from disposition under all laws relating to mineral and geothermal leasing, other than by exchange that furthers the protective purposes of the monument.

For the purpose of protecting the objects identified above, the Secretary of the Interior and the Secretary of Energy shall prohibit all motorized and mechanized vehicle use off road, except for emergency or other federally authorized purposes, including remediation purposes. There is hereby reserved, as of the date of this proclamation and subject to valid existing rights, a quantity of water in the Columbia River sufficient to fulfill the purposes for which this monument is established. Nothing in this reservation shall be construed as a relinquishment or reduction of any water use or rights reserved or appropriated by the United States on or before the date of this proclamation.

For the purpose of protecting the objects identified above, the Secretary of the Interior shall prohibit livestock grazing.

The monument shall be managed by the U.S. Fish and Wildlife Service under existing agreements with the Department of Energy, except that the Department of Energy shall manage the lands within the monument that are not subject to management agreements with the Service, and in developing any management plans and rules and regulations governing the portions of the monument for which the

Department of Energy has management responsibility, the Secretary of Energy shall consult with the Secretary of the Interior.

As the Department of Energy and the U.S. Fish and Wildlife Service determine that lands within the monument managed by the Department of Energy become suitable for management by the U.S. Fish and Wildlife Service, the U.S. Fish and Wildlife Service will assume management by agreement with the Department of Energy. All agreements between the U.S. Fish and Wildlife Service and the Department of Energy shall be consistent with the provisions of this proclamation.

Nothing in this proclamation shall affect the responsibility of the Department of Energy under environmental laws, including the remediation of hazardous substances or the restoration of natural resources at the Hanford facility; nor affect the Department of Energy's statutory authority to control public access or statutory responsibility to take other measures for environmental remediation, monitoring, security, safety, or emergency preparedness purposes; nor affect any Department of Energy activities on lands not included within the monument.

Nothing in this proclamation shall be deemed to enlarge or diminish the jurisdiction of the State of Washington with respect to fish and wildlife management.

Nothing in this proclamation shall enlarge or diminish the rights of any Indian tribe.

The establishment of this monument is subject to valid existing rights.

Nothing in this proclamation shall interfere with the operation and maintenance of existing facilities of the Columbia Basin Reclamation Project, the Federal Columbia River Transmission System, or other existing utility services that are located within the monument. Existing Federal Columbia River Transmission System facilities located within the monument may be replaced, modified and expanded, and new facilities constructed within the monument, as authorized by other applicable law. Such replacement, modification, expansion, or construction of new facilities shall be carried out in a manner consistent with proper care and management of the objects of this proclamation, to be determined in accordance with the management arrangements previously set out in this proclamation.

Nothing in this proclamation shall be deemed to revoke any existing withdrawal, reservation, or appropriation; however, the national monument shall be the dominant reservation.

Warning is hereby given to all unauthorized persons not to appropriate, injure, destroy, or remove any feature of this monument and not to locate or settle upon any of the lands thereof.

IN WITNESS WHEREOF, I have hereunto set my hand this ninth day of June, in the year of our Lord two thousand, and of the Independence of the United States of America the two hundred and twenty-fourth.

William J. Clinton

President's Memo to Energy Secretary Bill Richardson
On the Hanford Reach National Monument

THE WHITE HOUSE
Office of the Press Secretary

For Immediate Release, June 9, 2000

MEMORANDUM FOR THE SECRETARY OF ENERGY

SUBJECT: Hanford Reach National Monument

The area being designated as the Hanford Reach National Monument forms an arc surrounding much of what is known as the central Hanford area. While a portion of the central area is needed for Department of Energy missions, much of the area contains the same shrub-steppe habitat and other objects of scientific and historic interest that I am today permanently protecting in the monument. Therefore, I am directing you to manage the central area to protect these important values where practical. I further direct you to consult with the Secretary of the Interior on how best to permanently protect these objects, including the possibility of adding lands to the monument as they are remediated.

WILLIAM J. CLINTON

Background Paper on the Hanford Reach National Monument[190]

This document was provided by the White House on the date the President signed the Proclamation.

THE ANTIQUITIES ACT

Section 2 of the Antiquities Act, 16 U.S.C. 431, authorizes the President to establish as national monuments "historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States . . ."

A. Objects of Historic or Scientific Interest

The Hanford Reach National Monument is a unique and biologically diverse landscape, encompassing an array of scientific and historic objects. This magnificent area contains an irreplaceable natural and historic legacy, preserved by unusual circumstances. Maintained as a buffer area in a Federal reservation conducting nuclear weapons development and, more recently, environmental cleanup activities, with limits on development and human use for the past 50 years, the monument is now a haven for important and increasingly scarce objects of scientific and historic interest. Bisected by the stunning Hanford Reach of the Columbia River, the monument contains the largest remnant of the shrub-steppe ecosystem that once blanketed the Columbia River Basin. The monument is also one of the few remaining archaeologically rich areas in the western Columbia Plateau, containing well-preserved remnants of human history spanning more than 10,000 years. The monument is equally rich in geologic history, with dramatic landscapes that reveal the creative forces of tectonic, volcanic, and erosive power.

The monument is a biological treasure, embracing important riparian, aquatic, and upland shrub-steppe habitats which are rare or in decline in other areas. Within its mosaic of habitats, the monument supports a wealth of increasingly uncommon native plant and animal species, the size and diversity of which is unmatched in the Columbia Basin. Migrating salmon, birds and hundreds of other native plant and animal species rely on its natural ecosystems.

The monument includes the 51-mile long "Hanford Reach," the last free-flowing, non-tidal stretch of the Columbia River. The Reach contains islands, riffles, gravel bars, oxbow ponds, and backwater sloughs that support some of the most productive spawning areas in the Northwest, where approximately 80 percent of the upper Columbia Basin's fall chinook salmon spawn. It also supports

[190] The boundaries of the monument are drawn on the map entitled "Hanford Reach National Monument." The Bureau of Land Management (BLM) will produce a description conforming to the BLM *Specifications for Descriptions of Tracts of Land for Use in Land Orders and Proclamations* as soon as practicable.

healthy runs of naturally-spawning sturgeon and other highly-valued fish species. The loss of other spawning grounds on the Columbia and its tributaries has increased the importance of the Hanford Reach for fisheries.

The monument contains one of the last remaining large blocks of shrub-steppe ecosystems in the Columbia River Basin, supporting an unusually high diversity of native plant and animal species. A large number of rare and sensitive plant species are found dispersed throughout the monument. A recent inventory resulted in the discovery of two plant species new to science, the Umtanum desert buckwheat and the White Bluffs bladderpod. Fragile microbiotic crusts, themselves of biological interest, are well developed in the monument and play an important role in stabilizing soils and providing nutrients to plants.

The monument contains significant breeding populations of nearly all steppe and shrub-steppe dependent birds, including the loggerhead shrike, the sage sparrow, the sage thrasher, and the ferruginous hawk. The Hanford Reach and surrounding wetlands provide important stop-over habitat for migratory birds, as well as habitat for many resident species. The area is important wintering habitat for bald eagles, white pelicans and many species of waterfowl such as mallards, green-winged teal, pintails, goldeneye, gadwall, and buffleheads. The monument's bluff habitats provide valuable nesting sites for several bird species, including prairie falcons, and important perch sites for raptors such as peregrine falcons.

Many species of mammals are also found within the monument, including elk, beaver, badgers, and bobcats. Insect populations, though less conspicuous, include species that have been lost elsewhere due to habitat conversion, fragmentation and application of pesticides. A recent biological inventory uncovered forty-one species, and two subspecies of insects new to science and many species not before identified in the state of Washington. Such rich and diverse insect populations are important to supporting the fauna in the monument.

In addition to its vital biological resources, the monument contains significant geological and paleontological objects. The late-Miocene to late-Pliocene Ringold Formation, known as the White Bluffs, was formed from river and lake sediments deposited by the ancestral Columbia River and its tributaries. These striking cliffs form the eastern bank of the Columbia for nearly half of the length of the Reach, and are significant for the mammalian fossils that they contain. Fossil remains from rhinoceros, camel, and mastodon, among others, have been found within these bluffs.

The Hanford Dune Field, located on the western shore of the Columbia in the southeastern part of the monument, is also of geologic significance. This active area of migrating barchan dunes and partially stabilized transverse dunes rises ten to sixteen feet above the ground, creating sandy habitats ranging from two to several hundred acres in size.

The monument also contains important archaeological and historic information. More than 10,000 years of human activity in this largely arid environment have left extensive archaeological deposits. Areas upland from the river show evidence of concentrated human activity, and recent surveys indicate

extensive use of arid lowlands for hunting. Hundreds of prehistoric archaeological sites have been recorded, including the remains of pithouses, graves, spirit quest monuments, hunting camps, game drive complexes, quarries, and hunting and kill sites. A number of Native American groups still have cultural ties to the monument. The monument also contains some historic structures and other remains from more recent human activities, including homesteads from small towns established along the riverbanks in the early 20th century.

The area in the monument was identified for preservation by the U.S. Department of Energy (DOE) in its November of 1999 Record of Decision adopting the Preferred Alternative in the Final Hanford Comprehensive Land-Use Plan EIS issued in September of 1999. Specific portions of this land are already subject to agreements that provide the U.S. Fish and Wildlife Service (FWS) with the responsibility to protect the wildlife and other natural resources. These lands are managed by the FWS under permits and agreements with the DOE. Currently, the FWS manages the 89,000 acre Wahluke Slope area under a 1971 permit from the DOE. The FWS also manages the 77,000 acre Arid Lands Ecology Reserve Unit under a 1997 permit from the DOE.

B. Land Area Reserved for the Proper Care and Management of the Objects to be Preserved

The Antiquities Act authorizes the President, as part of his declaration of a national monument, to reserve land, "the limits of which in all cases shall be confined to the smallest area compatible with the proper care and management of the objects to be protected . . ." 16 U.S.C. § 431. The area for reservation has been carefully delineated, based on review of available information, to meet the goals of effectively caring for and managing the objects in perpetuity.

The area includes the biological, geological, and historic objects identified in the proclamation and Attachment A accompanying this memorandum. The area of the monument is based on the conservation needs of the objects to be protected. Some of these objects, such as the biological resources, are present throughout the entire monument area. Others, such as the historic sites, are confined to smaller areas. The scientific value of many objects, including the biological resources, derives in part from their location at various sites or elevations throughout the monument.

Preservation of such objects requires, among other things, protection of enough land to maintain the conditions that have made their continued existence possible. The scientific value of many of the objects within the monument requires preservation of areas large enough to maintain the objects and their interactions. The biological objects in the area result from the fact that extensive sections of the Columbia Basin shrub-steppe ecosystem have been preserved by the lack of development and land conversion on the Hanford site. Many species must range within and through the area to maintain viable populations and their role in the ecosystem. This is especially important because of the loss of the shrub-steppe ecosystem and aquatic habitat in other parts of the Columbia Basin. Management of a patchwork of reserved lands would be impractical, as it would make it more difficult to care for the objects, reduce options for natural resource management and lead to inconsistent resource

management standards for overlapping resources. For these reasons, the reservation of a smaller area would undermine the proper care and management of the objects to be protected by the monument.

LEGAL EFFECTS OF THE PROCLAMATION

There are several significant aspects of the proclamation. First, it reserves only the federal lands in the area, because the Antiquities Act applies only to objects of historic or scientific interest "that are situated upon the lands owned or controlled by the Government of the United States." 16 U.S.C. § 431

Second, the proclamation is subject to valid existing rights. Thus, to the extent a person or entity has valid existing rights in the federal lands or resources within the area, the proclamation respects those rights. The exercise of such rights could, however, be regulated in order to protect the purposes of the monument.

Third, the proclamation appropriates and withdraws the federal lands and interests in lands within the boundaries of the monument from entry, location, sale, leasing or other disposition under the public land laws, including but not limited to withdrawal from location, entry, and patent under the mining laws and from disposition under all laws relating to mineral and geothermal leasing, other than by exchange that furthers the protective purposes of the monument. This withdrawal prevents the location of new mining claims under the 1872 Mining Law, and prevents the Secretary of the Interior from exercising discretion under the mineral leasing acts and related laws to lease or sell federal minerals within the boundaries of the monument.

Fourth, the proclamation reserves in the portion of the Columbia River within the boundaries of the monument, subject to valid existing rights and as of the date of the proclamation, sufficient water to fulfill the purposes for which the monument is established.

Fifth, nothing in the proclamation revokes any existing withdrawal, reservation, or appropriation; however, the national monument shall be the dominant reservation. Therefore, the federal agencies with existing management responsibilities for the land within the monument boundaries will continue to have such responsibilities, subject to the dominant reservation, as provided for in the proclamation. The reference in the proclamation to the national monument being the dominant reservation makes clear that, in the event of a conflict between this reservation and an existing withdrawal, reservation or appropriation, this reservation controls. The particular provisions of this proclamation, such as the specific reservations of rights and responsibilities of the DOE, are part of this monument reservation.

Sixth, nothing in the proclamation interferes with the operation and maintenance by the Bureau of Reclamation (BOR) of existing Columbia Basin Reclamation Project facilities located within the monument; however, the monument designation precludes new agricultural irrigation within the boundaries.

Seventh, nothing in the proclamation interferes with the operation and maintenance of the Federal Columbia River Transmission System, or other utility services located within the monument.

Eighth, nothing in the proclamation affects DOE's authority to manage lands within the monument as necessary to carry out the environmental cleanup mission or other environmental compliance within the monument. This includes the right to regulate or restrict public access, maintain security, impose safety requirements, install and maintain environmental monitoring facilities, and implement emergency preparedness. Such matters remain the responsibility of DOE. Likewise, nothing in the proclamation affects the DOE's responsibility under environmental laws including the remediation of hazardous substances or the restoration of natural resources injured by hazardous substances on monument lands. Nothing in the proclamation imposes any liability upon the Department of the Interior for the remediation of hazardous substances or the restoration of natural resources at the Hanford facility except as provided in agreements, including permits, between the DOE and the Department of the Interior, nor transfer to the Department of the Interior any of the DOE's responsibility to take measures for environmental remediation, monitoring, security, safety or emergency preparedness purposes. Further, nothing in the proclamation imposes any limitations or restrictions on the DOE activities conducted upon lands that are not included in the monument.

ADMINISTRATION OF THE MONUMENT

A. Management of the Monument

The federal lands in the area described in the proclamation are currently under the jurisdiction of the BLM, BOR, and DOE. In addition to acquiring privately held land, the DOE created the Hanford Site by withdrawing public land and entering into an agreement with the BOR to obtain management responsibility for certain withdrawn and acquired lands held by Reclamation as part of the Columbia Basin Project, north of the Columbia River. The DOE has a similar arrangement with the Bureau of Land Management. The FWS manages some of the lands within the monument area under permits and agreements with the DOE. For example, in the Wahluke Slope Area, the Saddle Mountain National Wildlife Refuge was created by the terms of a 1971 permit with the DOE; this Refuge includes land acquired by the BOR land and managed by the DOE as part of the Hanford Site. These arrangements are not altered by the proclamation, but all agreements should be reviewed to ensure consistency with the proclamation. The FWS and the DOE are expected to extend the agreements to other lands included in the monument that are not now managed by FWS.

The DOE manages the Hanford site pursuant to the Atomic Energy Act of 1954, as amended, and applicable Public Land Orders. The BLM manages public lands pursuant to its organic authorities, primarily the Federal Land Policy and Management Act of 1976 (FLPMA), 43 U.S.C. § 1702 et seq. The BOR holds lands for the Columbia Basin Project Act under that project's authorizing statute, at 16 U.S.C. § 835c, as amended. The FWS manages lands under its management jurisdiction pursuant

to the National Wildlife Refuge System Administration Act, 16 U.S.C. § 668dd-ee, and in accordance with agreements with the DOE.

The proclamation directs the Secretary of the Interior to manage the monument through the FWS under its existing authorities and existing agreements with the DOE, and under future agreements with the DOE as lands within the monument subject to the DOE cleanup responsibilities are determined by the DOE and the FWS to be suitable for transfer of management responsibility. The DOE will manage lands within the monument that are not subject to management agreements with the FWS (primarily the land bordering the south side of the Hanford Reach) under its existing authorities and consistent with the purposes of the monument.

B. Impact of Monument Designation on Existing or Planned Activities in the Area

1. Hazardous waste clean-up and restoration

The monument designation has no effect on hazardous waste clean-up or restoration of natural resources, as provided for in the eighth paragraph in the section on Legal Effects of the Proclamation, above. The DOE continues to be responsible for the clean up of hazardous waste and for any related restoration of natural resource injuries, except as provided in agreements, including permits, between the DOE and the Department of the Interior. Cleanup decisions by the DOE will continue to be coordinated with the appropriate federal and state regulatory agencies. Restoration of any injured natural resources will continue to be the responsibility of the DOE. Cleanup and restoration activities should be planned and accomplished in a cooperative manner among the agencies to facilitate the determination that specific areas are suitable for transfer of management responsibility to the FWS.

2. Agricultural activities

No grazing currently occurs within the monument boundaries. Therefore, the prohibition on grazing included in the proclamation does not change the status quo. The DOE has issued a license (#R006-94LI12799.000) to the S. Martinez Livestock, Inc., for a road right of way to herd livestock across the monument along what is commonly known as the Wanapum Road. This license is a valid existing right that is protected by the preservation of valid existing rights in the proclamation.

3. Recreation, hunting, fishing and similar activities

Much of the monument has been off limits to recreation and public access. However, wildlife dependent recreation (hunting, fishing, environmental education, wildlife observation, interpretation, and photography) does occur on the Wahluke Wildlife Recreation Unit on the Wahluke Slope. Such recreation would generally not be affected except where (1) the land managing agency, through processes required by existing law, identifies places where such uses ought to be restricted or prohibited as necessary to protect the federal lands and resources, including the objects protected by the monument designation; or (2) where the agency finds a clear threat from such a use to the federal

lands and resources, including the objects protected by the monument designation, and the circumstances call for swift protective action. Such uses remain subject to applicable laws and regulations, and therefore remain subject to regulation and limitation under such provisions for reasons other than establishment of the monument.

4. Use of existing rights-of-way (such as those established under Title V of FLPMA)

Use of existing rights-of-way would generally be subject to the same standards as described in the preceding section. Some existing rights-of-way may include valid existing rights. The exercise of such rights may be regulated in order to protect the purposes of the monument, but any regulation must respect such rights.

5. Access

For purposes of protecting the objects identified in the proclamation, it prohibits motorized and mechanized vehicle travel off road, except for emergency purposes, or other federally authorized purposes. The DOE retains its authority to control access to the monument for security, safety or emergency preparedness purposes. Because of the very limited public access to the site, off road vehicle use is already limited.

6. Mineral activities

Although exploration for gas has occurred in the area, deposits have proven to be small. Oil exploration was conducted in the Rattlesnake Mountain and Rattlesnake Hills area in the 1920s and 1930s, but useful deposits were not found. Big Bend Alberta Mining Company asserts an interest in minerals on approximately 1,200 acres within the monument. To the extent that rights exist, they would be treated as valid existing rights.

7. Indian rights

To the extent that Indian Tribes have rights pursuant to the Stevens Treaties of 1855 or any other federal law, those rights would be unaffected.

8. Hydroelectric operations

Instream flows in this stretch of the Columbia River are governed by the terms of the "Vernita Bar agreement" (agreement). That agreement, among several public utility districts, federal agencies and Indian tribes, provides an instream flow regime to protect salmon. Nothing in the proclamation abrogates the agreement.

9. Bonneville Power Administration

The Bonneville Power Administration (BPA) operates the Federal Columbia River Transmission System, which is partially located within the monument. The System is important to the Pacific Northwest, and includes facilities in and around the monument. The BPA has in various planning stages a number of projects to upgrade and expand transmission facilities that could be affected by the proposed monument, including rebuilding the Benton-Franklin Nos. 1 and 2 115 kilovolt (KV) transmission lines, and building a new 500 KV transmission line to parallel an existing (Schultz-Vantage-Hanford) 500 KV line. Nothing in the proclamation interferes with the operation and maintenance of the Federal Columbia River Transmission System located within the monument. Replacement, modification and expansion of existing Federal Columbia River Transmission System facilities, and construction of any new facilities, within the proposed monument, as authorized by other applicable law, may be carried out in a manner consistent with the proper care and management of the objects identified in the draft proclamation, as determined in accordance with the management arrangements set out in the draft proclamation.

Appendix D – Public Laws 100-605 And 104-333, Section 404

PUBLIC LAW 100-605

100th Congress
2nd Session

An Act

To authorize a study of the Hanford Reach of the Columbia River, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. COMPREHENSIVE RIVER CONSERVATION STUDY.

The Secretary of the Interior ("Secretary"), in consultation with the Secretary of Energy, shall prepare a comprehensive river conservation study for that segment of the Columbia River extending from one mile below Priest Rapids Dam downstream approximately fifty-one miles to the McNary Pool north of Richland, Washington, as generally depicted on the map entitled "Proposed Columbia River Wild and Scenic River Boundary" dated May 17, 1988, hereinafter referred to as the "study area" which is on file with the United States Department of the Interior. The study shall identify and evaluate the outstanding features of the study area and its immediate environment, including fish and wildlife, geologic, scenic, recreational, natural, historical, and cultural values, and examine alternatives for their preservation. In examining alternative means for the preservation of such values, the Secretary shall, among other things, consider the potential addition of all or a portion of the study area to the National Wild and Scenic Rivers System, and recommend a preferred alternative for the protection and preservation of the values identified. The Secretary shall cooperate and consult with the State and political subdivisions thereof, local, and tribal governments, and other interested entities in preparation of such a study and provide for public comment. The study shall be completed and presented to Congress within three years after the date of enactment of this Act.

SECTION 2. INTERIM PROTECTION.

(a) For a period of eight years after the enactment of this Act, within the study area identified in section 1 of this Act:

(1) No Federal agency may construct any dam, channel, or navigation project.

(2) All other new Federal and non-Federal projects and activities shall, to the greatest extent practicable:

(A) be planned, designed, located and constructed to minimize direct and adverse effects on the values for which the river is under study; and

(B) utilize existing structures and facilities including, but not limited to, pipes, pipelines, transmission towers, water conduits, powerhouses, and reservoirs to accomplish the purposes of the project or activity.

(3) Federal and non-Federal entities planning new projects or activities in the study area shall consult and coordinate with the Secretary to minimize and provide mitigation for any direct and adverse effects on the values for which the river is under study.

(4) Upon receiving notice from the entity planning the new project or activity, the Secretary shall, no later than ninety days after receiving such notice and consulting with the entity:

(A) review the proposed project or activity and make a determination as to whether there will be a direct and adverse effect on the values for which the river segment is under study; and

(B) review proposals to mitigate such effects and make such recommendations for mitigation as he deems necessary.

(5) If the Secretary determines that there will be a direct and adverse effect that has not been adequately mitigated, he shall notify the sponsoring entity and the Committee on Interior and Insular Affairs of the United States House of Representatives and the Committee on Energy and Natural Resources of the United States Serrate of his determination and any proposed recommendations.

(b) During the eight year interim protection period, provided by this section, all existing projects that affect the study area shall be operated and maintained to minimize any direct and adverse effects on the values for which the river is under study, taking into account any existing and relevant license, permit, or agreement affecting the project.

SECTION 3. AUTHORIZATION OF APPROPRIATIONS.

There are authorized to be appropriated not more than $150,000 for the purpose of conducting the study pursuant to section 1 of this Act.

Approved *November 4, 1988.*

Public Law 104-333, Section 404

104th Congress
1st Session

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

TITLE IV – RIVERS AND TRAILS

Section 404. Hanford Reach Preservation.

Section 2 of Public Law 100-605 is amended as follows:

(1) By striking "Interim" in the section heading.

(2) By striking "For a period of eight years after" and inserting "After" in subsection (a).

(3) By striking in subsection (b) "During the eight year interim protection period, provided by this section, all" and inserting "All."

Appendix E – Applicable Laws, Executive Orders and Policies

E.1 Federal Laws and Treaties

Relevant laws of the United States that might apply to the implementation of the land-use alternatives on the Monument are discussed in the sections that follow.

E.1.1 Treaties of the United States with American Indian Tribes of the Hanford Region

In May and June of 1855, at Wai-I-lat-pu (near present-day Walla Walla, Washington), leaders of various Columbia Plateau American Indian tribes and bands negotiated treaties with representatives of the United States. The negotiations resulted in three treaties, one with the fourteen tribes and bands of what would become the Yakama Nation, one with the three tribes that would become the CTUIR, and one with the Nez Perce Tribe. The treaties were ratified by the United States Senate in 1859. The negotiated treaties are:

- Treaty with the Walla Walla, Cayuse, etc. (June 9, 1855; 12 Stat. 945)
- Treaty with the Yakama (June 9, 1855; 12 Stat. 951)
- Treaty with the Nez Perce (June 11, 1855; 12 Stat. 957)

The terms of all three treaties are essentially the same. Each of the three tribal organizations agreed to cede large blocks of land to the United States. The tribes retained certain lands for their exclusive use (the three reservations) and also retained the rights to continue traditional activities outside the reservations. These reserved rights include the right to fish (and erect fish-curing facilities) at usual and accustomed places. These rights also include rights to hunt, gather foods and medicines, and pasture livestock on open and unclaimed lands.

The act of treaty-making between the United States and an Indian tribe has many legal consequences for both entities. The United States recognizes the existence of the tribe as a sovereign and initiates a government-to-government relationship with the tribe. At the same time, the tribe loses some aspects of its sovereignty, such as the right to negotiate (independently of the United States) with other foreign powers. In return, the United States and the tribe enter into a trust relationship, whereby the United States assumes the responsibility to preserve the rights and resources of the tribe from incursions by private entities, states, or the federal government itself. One aspect of this trust duty is

the need to consult with the tribes concerning decisions made by the federal government that could affect tribal rights or resources. In addition to these general legal consequences of treaty-making, the individual treaty itself defines particular new roles and responsibilities of the two governments, within the terms of the new legal relationship created by the treaty.

Every federal agency that makes decisions potentially affecting the rights or resources of federally recognized American Indian tribes shares in the trust responsibility duties of the federal government. This trust responsibility includes the duty to consult with those tribes concerning the potential impacts of agency decisions. As a result, the FWS regularly consults with the CTUIR, the Yakama Nation, and the Nez Perce Tribe concerning decisions being made by the FWS on the Monument that might affect tribal rights or resources.

E.1.2 International Treaties of the United States

E.1.2.1 Boundary Water Treaty of 1909

The Boundary Water Treaty (and the International Joint Commission) govern flow releases on the Kootenai River. Signed in 1909, it provides the principles and mechanisms to help resolve disputes and to prevent future ones, primarily those concerning water quantity and water quality along the boundary between Canada and the United States.

E.1.2.2 Columbia River Treaty of 1961

In 1961, the United States and Canada signed the Columbia River Treaty; it was ratified in 1964. The treaty provided for building four storage dams—three in Canada (Mica, Keenleyside and Duncan) and one in the United States (Libby). The reservoirs built and operated under the treaty represent almost half the water storage capacity on the Columbia River system. The treaty, however, addresses only hydropower generation and flood control; it contains no provisions related to environmental concerns, specifically the needs of salmon.

The three Canadian storage dams provide regulated flows that enable hydroelectric projects downstream in the United States to produce additional power benefits. The treaty requires the United States to deliver to Canada one-half of these downstream power benefits—the Canadian Entitlement. The United States' obligation to deliver the Canadian Entitlement extends to 2024, the first year the treaty can be terminated with ten years notice. The Canadian Entitlement Allocation Agreements (CEAA), also executed in 1964, established how the Canadian Entitlement was to be attributed to the six federal and five non-federal downstream hydroelectric projects. The CEAAs have been extended until 2024.

E.1.2.3 Migratory Bird Treaty Act of 1918

The Migratory Bird Treaty Act of 1918, as amended, is intended to protect birds that have common migration patterns between the United States and Canada, Mexico, Japan and Russia. The law regulates the harvest of migratory birds by specifying factors such as the mode of harvest, hunting seasons, and bag limits. This act stipulates that, except as permitted by regulations, it is unlawful at any time, by any means, or in any manner to "kill . . . any migratory bird." The FWS is the lead agency in implementation and enforcement of this act; other agencies consult with the FWS regarding impacts to migratory birds and to evaluate ways to avoid or minimize impacts in accordance with the FWS migration policy.

E.1.2.4 Pacific Salmon Treaty Act of 1985

The Pacific Salmon Treaty Act of 1985 ratified a treaty between the United States and Canada concerning Pacific salmon. The law is intended to protect and maintain Pacific salmon fisheries by regulating the fishing season. The law establishes panels with jurisdiction over certain areas. Associated regulations close the panel area to sockeye and pink salmon fishing unless opened by panel regulations or by in season orders of the Secretary of Commerce that give the effect to panel orders.

E.1.3 Federal Natural Resource Management, Cultural Resource Laws, Water Management, and Pollution Control

E.1.3.1 American Antiquities Preservation Act of 1906

The American Antiquities Preservation Act of 1906, as amended, protects historic and prehistoric ruins, monuments, and antiquities, including paleontological resources, on federally controlled lands.

E.1.3.2 American Indian Religious Freedom Act of 1978

The American Indian Religious Freedom Act of 1978 reaffirms American Indians' religious freedom under the First Amendment and sets United States policy to protect and preserve the inherent and constitutional right of American Indian tribes to believe, express and exercise traditional religions. This act also requires that federal agencies avoid interfering with access to sacred locations and traditional resources that are integral to the practice of religion.

E.1.3.3 Archeological and Historic Preservation Act of 1974

The Archaeological and Historic Preservation Act of 1974, as amended, protects sites that have historic and prehistoric importance.

E.1.3.4 Archaeological Resources Protection Act of 1979

The Archaeological Resources Protection Act of 1979, as amended, requires a permit for any excavation or removal of archaeological resources from federal or Indian lands. Excavations must be undertaken for the purpose of furthering archaeological knowledge in the public interest, and resources removed are to remain the property of the United States. Consent must be obtained from the Indian tribe or the federal agency having authority over the land on which a resource is located before issuance of a permit; the permit must contain terms and conditions requested by the tribe or federal agency.

E.1.3.5 Atomic Energy Act of 1954

The Atomic Energy Act of 1954, as amended, authorizes the DOE to establish standards to protect health or minimize dangers to life or property with respect to activities under DOE jurisdiction. The DOE has used a series of departmental orders to establish an extensive system of standards and requirements to ensure safe operation of DOE facilities.

E.1.3.6 Bald and Golden Eagle Protection Act of 1972

The Bald and Golden Eagle Protection Act of 1972, as amended, makes it unlawful to take, pursue, molest, or disturb bald and golden eagles, their nests, or their eggs anywhere in the United States. A permit must be obtained from the DOI to relocate a nest that interferes with resource development or recovery operations.

E.1.3.7 Clean Air Act of 1970

The Clean Air Act of 1970, as amended, is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the act requires each federal agency with jurisdiction over properties or facilities engaged in any activity that might result in the discharge of air pollutants to comply with all federal, state, interstate, and local requirements with regard to the control and abatement of air pollution.

E.1.3.8 Clean Water Act of 1977

The Clean Water Act of 1977, as amended, was enacted to "restore and maintain the chemical, physical and biological integrity of the Nation's water." The CWA prohibits "discharge of toxic pollutants in toxic amounts" to navigable waters of the United States. Section 313 of the CWA requires all branches of the federal government with jurisdiction over properties or facilities engaged in any activity that might result in a discharge or runoff of pollutants to surface waters, to comply with federal, state, interstate, and local requirements. Section 404 of the CWA authorizes the ACOE to regulate, through permits, the discharge of dredged or fill material into waters of the United States, including wetlands. Section 10 of the Rivers and Harbors Act of 1899 authorizes the ACOE to regulate, through permits, structures and work in navigable waters of the United States.

E.1.3.9 Comprehensive Conservation Study of the Hanford Reach of the Columbia River Act 1988

Public Law 100-605, passed by Congress on November 4, 1988, authorized a study of the Hanford Reach of the Columbia River to identify the outstanding features of the Hanford Reach and its immediate environment (including fish and wildlife, geologic, scenic, recreational, natural, historical, and cultural values), and to examine alternatives for their preservation. In addition to authorizing the study, the act protected the Hanford Reach from certain development for a period of eight years. In 1996, Section 404 of Public Law 104-333, the Omnibus Parks and Public Lands Management Act of 1996, amended this from an eight year period to permanent protection from certain types of development and mitigation of other actions.

Public Law 100-605, as amended, states:

- No federal agency may construct any dam, channel, or navigation project.

- All other new federal and non-federal projects and activities shall, to the greatest extent practicable: 1) be planned, designed, located and constructed to minimize direct and adverse effects on the values for which the river is under study; and 2) utilize existing structures and facilities including, but not limited to, pipes, pipelines, transmission towers, water conduits, powerhouses, and reservoirs to accomplish the purposes of the project or activity.

- Federal and non-federal entities planning new projects or activities in the study area shall consult and coordinate with the Secretary [of the Interior] to minimize and provide mitigation for any direct and adverse effects on the values for which the river is under study.

- Upon receiving notice from the entity planning the new project or activity, the Secretary [of the Interior] shall . . .: 1) review the proposed project or activity and make a determination as to whether there will be a direct and adverse effect on the values for which the river segment is under study; and 2) review proposals to mitigate such effects and make such recommendations for mitigation as he deems necessary. If the Secretary determines that there will be a direct and adverse effect that has not been adequately mitigated, he shall notify the sponsoring entity and the Committee on Interior and Insular Affairs of the United States House of Representatives and the Committee on Energy and Natural Resources of the United States Senate of his determination and any proposed recommendations.

- All existing projects that affect the study area shall be operated and maintained to minimize any direct and adverse effects on the values for which the river is under study, taking into account any existing and relevant license, permit, or agreement affecting the project.

The DOI, through the NPS, found the river eligible and suitable for designation as a national wild and scenic river. As such, federal agencies must comply with Section 5(d) of the Wild and Scenic Rivers Act and a 1979 Presidential Directive on avoiding or mitigating impacts to river eligible for designation into the National Wild and Scenic Rivers System.

E.1.3.10 Electric Consumers Protection Act of 1986

The Electric Consumers Protection Act amended the Federal Power Act (see Section C.1.3.13 below) to provide additional environmental protections in the licensing of hydroelectric projects. Each license is to include conditions to protect, mitigate and enhance fish and wildlife affected by the project. These conditions are to be based on recommendations received from the FWS, NOAA-Fisheries, federal land managers on whose land the project sits, and state fish and wildlife agencies (16 U.S.C. § 803(j)(1)). The FERC is empowered to resolve any instances in which such recommendations are viewed as inconsistent while according "due weight to the recommendations, expertise and statutory responsibilities" of the resource agencies.

E.1.3.11 Endangered Species Act of 1973

The Endangered Species Act of 1973, as amended, is intended to prevent the further decline of endangered and threatened species and to restore those species and their habitats. This act is jointly administered by the Departments of Commerce and Interior. Section 7 of this act requires agencies to consult with the FWS or the National Oceanic and Atmospheric Administration-Fisheries. This consultation determines whether endangered and threatened species or critical habitats are known to

be in the vicinity of a proposed action and whether an action will adversely affect listed species or designated critical habitats.

E.1.3.12 Federal Insecticide, Fungicide, and Rodenticide Act of 1972

The Federal Insecticide, Fungicide, and Rodenticide Act of 1972, as amended, governs the storage, use, and disposal of pesticides through product labeling, registration, and user certification.

E.1.3.13 Federal Power Act of 1920

The original Federal Power Act provides for cooperation between the FERC and other federal agencies, including resource agencies, in the licensing of hydropower projects. The FERC is authorized to issue licenses to construct, operate and maintain dams, water conduits, reservoirs and transmission lines to improve navigation and to develop power from any streams or other bodies of water over which it has jurisdiction. Following 1986 amendments (see Section C.1.3.10 above, Electric Consumer Protection Act), in deciding whether to issue a license, the FERC is required to give "equal consideration" to the following purposes—power and development; energy conservation; protection, mitigation of damage to, and enhancement of, fish and wildlife (including spawning grounds and habitat); protection of recreational opportunities; and preservation of other aspects of environmental quality.

E.1.3.14 Federal Water Pollution Control Act Amendments of 1972

The Federal Water Pollution Control Act Amendments of 1972 is the predecessor federal statute to the Clean Water Act of 1977.

E.1.3.15 Fish and Wildlife Conservation Act of 1980

The Fish and Wildlife Conservation Act of 1980, as amended, encourages all federal entities (in cooperation with the public) to protect and conserve the nation's fish and wildlife.

E.1.3.16 Fish and Wildlife Coordination Act of 1934

The Fish and Wildlife Coordination Act of 1934, as amended, promotes more effectual planning and cooperation between federal, state, public, and private agencies for the conservation and rehabilitation of the nation's fish and wildlife and authorizes the DOI to provide assistance.

E.1.3.17 Flood Control Act of 1944

The Flood Control Act, as amended and supplemented by other flood control acts and river and harbor acts, authorizes various ACOE water development projects. This statute expressed congressional intent to limit the authorization and construction of navigation, flood control, and other water projects to those having significant benefits for navigation and which could be operated consistent with other river uses. The act authorized the construction of numerous dams and modifications to previously existing dams. The Secretary of the Interior was authorized to construct, operate and maintain irrigation projects at ACOE reservoirs and dams, in accordance with existing reclamation laws, if authorized by Congress. Surplus power from reservoir projects was to be provided to the Secretary of the Interior to be transmitted for use at the "lowest possible rates."

E.1.3.18 Historic Sites, Buildings, and Antiquities Act of 1965

The Historic Sites, Buildings, and Antiquities Act of 1965 sets national policy to preserve historic sites, buildings, and antiquities for the inspiration and benefit of United States' citizens.

E.1.3.19 National Environmental Policy Act of 1969

The National Environmental Policy Act of 1969 (NEPA), as amended, establishes a national policy that encourages awareness of the environmental consequences of human activities and promotes consideration of those environmental consequences during the planning and implementing stages of a project. Under the NEPA, federal agencies are required to prepare detailed statements to address the environmental effects of proposed major federal actions that might significantly affect the quality of the human environment.

E.1.3.20 National Historic Preservation Act of 1966

The National Historic Preservation Act of 1966, as amended, provides for nomination for placement of sites with significant national historic value on the National Register of Historic Places (NPS 1988). Permits and certifications are not required under this act; however, consultation with the Advisory Council on Historic Preservation is required if a federal undertaking might impact a historic property resource. This consultation generally results in a memorandum of agreement that includes stipulations to minimize adverse impacts to the historic resource. Coordination with the State Historic Preservation Office is undertaken to ensure that potentially significant sites are properly identified and appropriate mitigation measures are implemented.

E.1.3.21 National Wildlife Refuge System Administration Act of 1966 (Amended by the National Wildlife Refuge System Improvement Act of 1997)

The National Wildlife Refuge System Administration Act of 1966, as amended, provides guidelines and directives for the administration and management of all lands within the system, including "wildlife refuges, areas for the protection and conservation of fish and wildlife that are threatened with extinction, wildlife ranges, game ranges, wildlife management areas, or waterfowl production areas." The Secretary of the Interior is authorized to permit by regulations the use of any area within the system provided "such uses are compatible with the major purposes for which such areas were established."

E.1.3.22 Native American Graves Protection and Repatriation Act of 1990

The NAGPRA directs the Secretary of the Interior to guide federal agencies in the repatriation of federal archaeological collections and collections affiliated culturally to American Indian tribes, which are currently held by museums receiving federal funding. This act established statutory provisions for the treatment of inadvertent discoveries of American Indians' remains and cultural objects. Specifically, when discoveries are made during ground disturbing activities, the following must take place: 1) activity in the area of the discovery must cease immediately; 2) reasonable efforts must be made to protect the items discovered; 3) notice of discovery must be given to the FWS Director and the appropriate tribes; and 4) a period of 30 days must be set aside following notification for negotiations regarding the appropriate disposition of these items.

E.1.3.23 Occupational Safety and Health Act of 1970

The Occupational Safety and Health Act of 1970, as amended, establishes standards to enhance safe and healthy working conditions in places of employment throughout the United States. The act is administered and enforced by the Occupational Safety and Health Administration (OSHA), an agency of the United States Department of Labor. Although the OSHA and the EPA both have a mandate to limit exposures to toxic substances, the jurisdiction of the OSHA is limited to safety and health conditions in the workplace. In general, each employer is required to furnish a place of employment free of recognized hazards likely to cause death or serious physical harm to all employees. The OSHA regulations establish specific standards telling employers what must be done to achieve a safe and healthy working environment. Employees have a duty to comply with these standards and with all rules, regulations, and orders issued by OSHA.

E.1.3.24 Pacific Northwest Electric Power Planning and Conservation Act of 1980

The Pacific Northwest Electric Power Planning and Conservation Act created the Northwest Power and Conservation Council (Council)—an interstate compact agency—and directed the Council to put fish and wildlife mitigation and enhancement on a par with hydroelectric power generation in the operation of the Federal Columbia River Power System. The goals of the act include: 1) ensuring an adequate, efficient, economical and reliable power supply; and 2) protecting, mitigating and enhancing fish and wildlife harmed by hydroelectric projects. The Council is responsible for promulgating a Regional Power Plan and a Fish and Wildlife Program. When developing its Fish and Wildlife Program, the Council defers to the recommendations of fish and wildlife managers, i.e., agencies and the tribes.

The act includes a duty for federal agencies that manage, operate, or regulate hydroelectric facilities in the Columbia Basin to provide "equitable treatment" for fish and wildlife with the other purposes for which the hydropower facilities are managed and operated. The Council describes equitable treatment as "meet[ing] the needs of salmon with a level of certainty comparable to that accorded the other operational purposes."

E.1.3.25 Wild and Scenic Rivers Act of 1968

The Wild and Scenic Rivers Act of 1968, as amended, protects selected national rivers possessing outstanding scenic, recreational, geological, fish and wildlife, historical, cultural, or other similar values. These rivers are to be preserved in a free-flowing condition to protect water quality and for other vital national conservation purposes. This act also instituted a National Wild and Scenic Rivers System, designated the initial rivers within the system, and developed standards for the addition of new rivers in the future.

E.2 State Laws

State and local statutes also apply to activities on the Monument when federal law delegates enforcement or implementation authority to state or local agencies. In general, state laws do not apply to the federal government based on the National Supremacy Clause that reads, "This constitution, and the laws of the United States which shall be made in pursuance thereof; and all treaties made, or which shall be made, under the authority of the United States, shall be the supreme law of the land; and the judges in every state shall be bound thereby, any thing in the constitution or laws of any state to the contrary notwithstanding" (Article 4, U.S. Constitution).

E.2.1 Growth Management Act of 1989

Most planning by local governments falls under the State of Washington Growth Management Act (GMA), which established a state-wide planning framework and created roles and responsibilities for planning at the local, regional, and state levels. The GMA required the largest and fastest growing counties (counties with more than 50,000 people or with a population growth of more than twenty percent in the past ten years) and cities within those counties to develop new comprehensive plans. Counties not required to plan may elect to do so. Benton, Franklin, and Grant Counties, along with the city of Richland, have elected to plan under the GMA requirements. Jurisdictions under GMA must prepare comprehensive plans that project growth for a minimum of twenty years.

E.2.2 Shoreline Management Act of 1971

The Shoreline Management Act of 1971 uses authority passed to the state by the federal Rivers and Harbors Act of 1899. Section 10 of the Rivers and Harbors Act prohibits the unauthorized obstruction or alteration of any navigable waters of the United States. Examples of activities requiring a United States Army Corps of Engineers permit include constructing a structure in or over any waters of the United States, excavation or deposit of material in such waters, and various types of work performed in such waters, including fill and stream channelization. The state is considered the owner of all navigable waterways within its boundaries.

The state has passed regulatory responsibility for the Shoreline Management Act to the affected county. Counties in Washington State regulate the shoreline (i.e., from the high-water mark to the low-water mark) through each county's Shoreline Management Master Plan and a shoreline permit system consistent with WDOE guidelines.

E.2.3 State Environmental Policy Act of 1971

The Washington State legislature enacted the State Environmental Policy Act of 1971 (SEPA). The statute was amended in 1983, and new implementing regulations (the SEPA rules) were adopted and codified by the WDOE in 1984 as Washington Administrative Code 197-11. The purpose and policy sections of the statute are extremely broad, including recognition by the legislature that "each person has a fundamental and inalienable right to a healthful environment. . . ." SEPA contains a substantive mandate that "policies, regulations, and laws of the State of Washington shall be interpreted and administered in accordance with the policies set forth."

The SEPA applies to all branches of state government, including state agencies, municipal and public corporations, and counties. It requires each agency to develop procedures implementing and supplementing SEPA requirements and rules. Although the SEPA does not apply directly to federal actions, the term "government action" with respect to state agencies is defined to include the issuance

of licenses, permits, and approvals. Thus, as in the NEPA, proposals (federal, state, or private) are evaluated, and may be conditioned or denied through the permit process, based on environmental considerations. The SEPA does not create an independent permit requirement, but overlays all existing agency permitting activities.

E.3 Executive Orders

This section identifies Presidential Executive Orders that clarify issues of national policy and provide guidelines relevant to Monument land-use planning.

E.3.1 Executive Order 11593, Protection and Enhancement of the Cultural Environment

Executive Order 11593 requires federal agencies to direct their policies, plans, and programs in a way that preserves, restores, and maintains federally owned sites, structures, and objects of historical or archaeological significance.

E.3.2 Executive Order 11988, Floodplain Management

Executive Order 11988 directs Federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for actions undertaken in a floodplain. This order further directs that floodplain impacts are to be avoided to the extent practicable.

E.3.3 Executive Order 11990, Protection of Wetlands

Governmental agencies are directed by Executive Order 11990 to avoid, to the extent practicable, any short- and long-term adverse impacts on wetlands wherever there is a practicable alternative.

E.3.4 Executive Order 12372, Intergovernmental Review of Federal Programs

Executive Order 12372 applies to state review of NEPA documents and to the coordination of state and federal NEPA processes. The goal of this Executive Order is to foster an intergovernmental partnership and a strengthened coordination and consultation process.

E.3.5 Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 directs all federal agencies, to the greatest extent practicable and permitted by law, to achieve environmental justice by identifying and addressing disproportionately high and adverse human health or environmental effects of agency programs, policies and activities on minority populations and low-income populations in the United States and its territories and possessions. This order directs each federal agency, to the extent permitted by existing law, to develop strategies to identify and address environmental justice concerns. The order further directs each federal agency, to the extent permitted by existing law, to collect, maintain, analyze, and make available information on the race, national origin, income level, and other readily accessible and appropriate information for areas surrounding facilities or sites expected to have a substantial environmental, human health, or economic effect on the surrounding populations. This action is required when these facilities or sites become the subject of a substantial federal environmental administrative or judicial action.

E.3.6 Executive Order 13007, Indian Sacred Sites

Executive Order 13007 directs federal agencies to take measures to protect and preserve American Indian tribes' religious practices. Federal agencies shall, to the extent practicable and permitted by law, and when consistent with essential agency functions, accommodate access to and ceremonial uses of sacred sites by American Indian tribes' religious practitioners. Further, the Executive Order states that federal agencies will comply with presidential direction to maintain government-to-government relations with tribal governments.

E.3.7 Executive Order 13112, Invasive Species

Issued on February 11, 1999, Executive Order 13112 is intended to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause. The Executive Order established an Invasive Species Council which created a National Invasive Species Management Plan detailing and recommending

performance-oriented goals, objectives and specific measures of success for federal agencies concerned about invasive species.

E.3.8 Executive Order 13175, Consultation and Coordination with Indian Tribal Governments

Executive Order 13175 further ensures that federal government agencies recognize the unique legal relationship the United States has with Indian tribal governments as set forth in the Constitution of the United States, treaties, statutes, other Executive Orders, and court decisions. It once again recognizes the right of Indian tribes to self-government and to "exercise inherent sovereign powers over their members and territory." It directs federal agencies to work with Indian tribes on a government-to-government basis to address issues concerning Indian tribal self-government, tribal trust resources, and Indian tribal treaty and other rights.

E.4 Presidential and Executive Branch Policies

President Clinton issued a memorandum to the heads of executive departments and agencies regarding government-to-government relations with tribal governments on April 29, 1994. This memorandum directed executive departments and agencies to implement activities that affect tribal rights in a "knowledgeable, sensitive manner respectful of tribal sovereignty." The memorandum outlined principles for executive departments and agencies to follow in their interactions with tribal governments and clarified the responsibility of the federal government to operate within a government-to-government relationship with federally recognized American Indian tribes.

The United States Department of Justice reaffirmed a long-standing policy regarding the relationship between the federal government and American Indian tribes (61 FR 29424). The policy states that the United States recognizes the sovereign status of Indian tribes as "domestic dependent nations" from its earliest days. The Constitution recognizes Indian sovereignty by classifying Indian treaties among the "supreme Law of the Land," and establishes Indian affairs as a unique area of federal concern.

The FWS American Indian policy commits the FWS to working with tribal governments on a government-to-government basis, recognizes the federal trust relationship with tribes and tribal members' treaty rights, and commits the FWS to consultation with tribes regarding agency activities that could potentially affect the tribes.

E.5 Federal and State Laws and Executive Orders That May Apply to the Department of Energy

As the underlying land owner, the DOE is a joint manager of the Monument. There are numerous other laws and orders that apply to the DOE, especially with regard to environmental cleanup of hazardous wastes.[191] These include:

- Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (Federal)
- Emergency Planning and Community Right-to-Know Act of 1986 (Federal)
- Federal Urban Land-Use Act of 1949 (Federal)
- Hazardous Waste Management Act of 1976 (State)
- Model Toxics Control Act of 1989 (State)
- National Defense Authorization Act of 2002 (Federal)
- Noise Control Act of 1972 (Federal)
- Nuclear Waste Policy Act of 1982 (Federal)
- Pollution Prevention Act of 1990 (Federal)
- Resource Conservation and Recovery Act of 1976 (Federal)
- Safe Drinking Water Act of 1974 (Federal)
- Toxic Substances Control Act of 1976 (Federal)
- Washington Clean Air Act of 1991 (State)
- Water Pollution Control Act of 1945 (State)
- Executive Order 12088, Federal Compliance with Pollution Control Standards
- Executive Order 12580, Superfund Implementation
- Executive Order 12856, Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements
- Executive Order 12866, Regulatory Planning and Review
- Executive Order 12875, Enhancing the Intergovernmental Partnership
- Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks

[191] These laws and orders also apply to the FWS. However, due to the differing missions of the FWS and the DOE, these laws and orders impact the DOE to a greater extent.

E.6 International Agreements

E.6.1 Pacific Northwest Coordination Agreement with United States Utilities

The Pacific Northwest Coordination Agreement (PNCA) is a direct outgrowth of the Columbia River Treaty. The PNCA, also signed in 1964, is a complex contract that provides for coordination of electric power production on the Columbia River to maximize reliability and power production and accommodates non-power objectives.

E.6.2 Non-Treaty Storage Agreement with Canada

This agreement governs the coordination and use of 4.5 million acre-feet of water storage behind Mica and Arrow Dams in British Columbia.

Appendix F – Permit to Operate A National Wildlife Refuge[192]

FIRST AMENDED MEMORANDUM OF UNDERSTANDING
BETWEEN
THE U.S. DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE
AND
THE U.S. DEPARTMENT OF ENERGY, RICHLAND OPERATIONS OFFICE
FOR
THE OPERATION OF THE FITZNER-EBERHARDT ARID LANDS ECOLOGY RESERVE AT THE HANFORD SITE

FOURTH AMENDEMENT TO THE WAHLUKE SLOPE PERMIT

This is the First Amended version of the document entitled: "The Memorandum of Understanding between the U.S. Fish and Wildlife Service and the U.S. Department of Energy, Richland Operations Office for the Operation of the Fitzner-Eberhardt Arid Lands Ecology Reserve at the Hanford Site," original signed June 20, 1997 (hereafter "Original MOU"). This document wholly incorporates and amends the originally signed version. The ALE permit issued concurrently with the Original MOU remains in force, with the understanding that nothing in said permit shall be interpreted to be inconsistent with this Amended MOU. This document is the fourth amendment to the Wahluke Slope Permit, Contract No. AT(45-1)-2249, and nothing in that permit shall be interpreted to be inconsistent with this Amended MOU.

WHEREAS, the U.S. Department of Energy (DOE) Hanford Site, Washington, possesses nationally significant natural, cultural, and scientific resources;

WHEREAS, under the 1971 Permit for Management and Recreational Use of the Wahluke Slope between the DOE and the U.S. Fish and Wildlife Service (FWS) and the Washington State Department of Fish and Wildlife (WDFW), as amended, the 1999 Memorandum of Concurrence for understanding management authorities and responsibilities between the DOE Assistant Secretary for Environmental Management and the DOI Assistant Secretary for Fish, Wildlife and Parks for the North Slope (Wahluke Slope) of the Hanford Site, and the 1997 Permit and Memorandum of Understanding for Management of the Fitzner-Eberhardt Arid Lands Ecology Reserve Between the DOE and FWS, the FWS currently manages the fish, wildlife, resources on a large portion of the Hanford Site as the Saddle Mountain unit of the National Wildlife Refuge System;

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[192] Taxonomy follows Hitchcock and Cronquist 1973. See Sackschewsky and Downs (2001) for a complete listing of Hanford Site vascular plants.

WHEREAS, the President of the United States in Presidential Proclamation 7319 created the Hanford Reach National Monument (Monument) which is superimposed over a large portion of the DOE Hanford Site and most of Saddle Mountain National Wildlife Refuge;

WHEREAS, the mission of the FWS is to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people; the mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans; resource management activities by the FWS will preserve the character of the Monument; and the Secretary of the Interior is authorized to provide assistance to, and cooperate with, Federal, State, Tribal governments and public or private agencies and organizations to protect and preserve wildlife and its habitat;

WHEREAS, DOE and the United States Department of the Interior are mutually interested in preserving the nationally significant resources which are present on the Monument;

WHEREAS, DOE has entered into agreements with the FWS, under which FWS has assumed management of these resources on portions of the Monument; and consistent with above authorities described herein, DOE remains responsible for the management and protection of these resources for those lands within the Monument not currently managed by FWS, as well as those lands on the Hanford Site not within the Monument;

WHEREAS, FWS and DOE have determined that the conservation and continued protection of the nationally significant resource values of the Refuge will further the mission of the FWS;

WHEREAS, to ensure that the Refuge is managed as a resource that provides an opportunity for Native Americans to exercise traditional religious and cultural activities consistent with the foregoing objectives;

THEREFORE, DOE-RL and FWS agree as follows:

1.0 DEFINITIONS:

1.1 The term "CCP" means Comprehensive Conservation Plan; a FWS document that describes the desired future conditions of the Refuge and provides long-range guidance and management direction for the Refuge project leader/manager to fulfill the purposes of the Refuge, contribute to the mission of the National Wildlife Refuge System, and to meet other relevant mandates.

1.2 The terms "Department of Energy" and "DOE" mean the United States Department of Energy including the DOE-Headquarters Office, District of Columbia (DOE-HQ), and/or DOE-Richland, Washington, Office (DOE-RL), and Office of River Protection (ORP), or any duly authorized representatives thereof.

1.3 The term "DOE Contractor" refers to the various key contractors at the Hanford Site, identified in Attachment 2 of the Memorandum of Understanding (MOU), which are delegated responsibility by DOE-RL for certain aspects of operations that may be on, or may affect, the Monument. DOE-RL may amend the list of contractors found in Attachment 2 and the amended list will become effective after DOE-RL notifies FWS in a manner consistent with the MOU.

1.4 The term "FACA" means Federal Advisory Committee Act. The Hanford Reach National Monument Planning Advisory Committee was formed under this Act, at the direction of the Secretary of the Interior, to make recommendations to FWS and DOE on the preparations of a Comprehensive Conservation Plan (CCP) for the Monument.

1.5 The term "FWS" means the United States Fish and Wildlife Service or any duly authorized representative thereof.

1.6 The term "FWS Project Leader" means the FWS designated official responsible for those areas of the Hanford Site under FWS management.

1.7 The term "Government" means the United States of America or any agency thereof.

1.8 The term "Hanford Reach National Monument" or "Monument" means the area identified in Presidential Proclamation 7319. Pending completion of a final legal description of the Monument, an interim boundary map is included in Attachment.

1.9 The term "Hanford Site" is that area of federally-owned land that lies within the semiarid Pasco Basin of the Columbia Plateau in southeastern Washington State which is managed by the DOE-RL. The site occupies an area of approximately 586 square miles located north of the city of Richland at the confluence of the Yakima River with the Columbia River. The Hanford Site extends approximately 48 miles north to south and 38 miles east to west.

1.10 The term "Service policy" means direction found in the FWS Manual, Refuge Manual, Executive Orders, or similar documents providing approved management guidance for FWS-administered lands and programs.

1.11 The terms "Saddle Mountain National Wildlife Refuge" or "Refuge" means:

> The 32, 000 acre area of the Hanford Site administered by FWS in accordance with the 1971 Permit for Management and Recreational Use of the Wahluke Slope between DOE and the Fish and Wildlife Service (FWS) and the Washington State Department of Fish and Wildlife as amended (1971 Permit), and the 1999 Memorandum of Concurrence for understanding management authorities and responsibilities between the DOE Assistant Secretary for Environmental Management and the DOI Assistant Secretary for Fish Wildlife and Parks for the North Slope (Wahluke Slope) of the Hanford Site (1999 MOC)

except for those areas within the Wahluke Slope that remain under DOE management (See Appendix 1 Map); the approximately 57,000 acres of the former Wahluke Wildlife and Recreational Area formerly managed by the Washington Department of Fish and Wildlife in accordance with the 1971 Permit and 1999 MOC except for those areas within the Wahluke Slope that remain under DOE management (See Appendix 1 Map); and the 77,000-acre Fitzner-Eberhardt Arid Lands Ecology Reserve managed in accordance with the 1997 Permit and Memorandum of Understanding for Management of the Fitzner-Eberhardt Arid Lands Ecology Reserve Between DOE and FWS, except for those areas that remain under DOE management (See Appendix 1 Map);

1.12 The term "Designated Federal Official" means an agency employee designated by the sponsoring agency to manage the affairs of a Federal Advisory Committee. As provided by the Federal Advisory Committee Act, the Designated Federal Official is responsible for: calling, attending, and adjourning meetings; approving agendas, maintaining required records on costs and membership; ensuring efficient operations; maintaining records for availability to the public; and providing copies of committee reports to the Committee Management Officer for forwarding to the Library of Congress.

2.0 AUTHORITIES:

2.1 DOE-RL enters into this agreement pursuant to the authority of the Economy Act, as amended (31 U.S.C. §1535); the Atomic Energy Act of 1954, as amended (42 U.S.C. §§ 2011-2259); the Energy Reorganization Act of 1974 (P.L. 93-438); the Department of Energy Organization Act (P.L. 95-91); Executive Order 12512; Presidential Proclamation 7319 and other applicable authorities.

2.2 FWS enters into this agreement pursuant to the authority of Sections 1 and 4 of the Fish and Wildlife Coordination Act, 16 U.S.C. Sections 661 and 664; the National Wildlife Refuge System Administration Act of 1966, 16 U.S.C. §§ 668dd-668ee as amended; the National Wildlife Refuge Improvement Act of 197 (P.L. 105-57); Antiquities Act 16 U.S.C. 431-433; Presidential Proclamation 7319; and other applicable authorities.

3.0 OBJECTIVES:

3.1 The primary objective of DOE in entering into this agreement is to ensure the preservation of natural and cultural resources of the Refuge while continuing current use of portions of the Refuge as a Research Natural Area and as a safety buffer for DOE-RL's ongoing missions on the Hanford Site.

3.2 The primary objective of the FWS in entering into this agreement is to ensure that the parts of the Monument managed by FWS are managed in accordance with Presidential Proclamation 7319 of June 9, 2000, under the:

1971 Permit for Management and Recreational Use of the Wahluke Slope between DOE and the Fish and Wildlife Service (FWS) and the Washington State Department of Fish and Wildlife as amended;

1999 Memorandum of Concurrence for understanding management authorities and responsibilities between the DOE Assistant Secretary for Environmental Management and the Department of Interior Assistant Secretary for Fish Wildlife and Parks for the North Slope (Wahluke Slope) of the Hanford Site;

1997 Permit and Memorandum of Understanding for Management of the Fitzner-Eberhardt Arid Lands Ecology Reserve Between DOE and FWS;

3.3 Other objectives of importance to both DOE and FWS are:

3.3.a To ensure that the integrity of the Refuge as an intact ecological unit is maintained;

3.3.b To ensure that the Refuge is managed as a resource that provides an opportunity for Native Americans to exercise traditional religious and cultural activities consistent with the foregoing objectives;

3.3.c To ensure that access to the Refuge is available for the educational, scientific, and recreational benefit of the public to the extent this access and use is consistent with the foregoing objectives and compatible with Refuge purposes;

3.3.d To ensure that worker safety and public protection are maintained;

3.3.e To ensure protection and preservation and continued monitoring of nationally significant cultural resources including archeological and historic resources and traditional cultural places.

4.0 FWS RESPONSIBILITIES:

4.1 MANAGEMENT PLANNING - FWS will be the lead agency developing a CCP and accompanying National Environmental Policy Act (NEPA) documentation for the Monument. This plan will be developed with the involvement of the public, local governments, other affected agencies, and affected Native American Tribes. Subject to appropriate funding, FWS will in good faith attempt to have a draft plan developed within 36 months of the signing of this MOU. The draft and final plan will be subject to timely review and approval by DOE-RL.

4.1.a The FWS will be the lead agency to form and work with the Hanford Reach National Monument Federal Planning Advisory Committee to develop the plan.

4.1.b FWS will consider using existing resource management plans (Hanford Site Biological Resources Management Plan, Noxious Weed Management Plan, Annual Sampling Plans, and the Hanford Cultural Resources Management Plan) and other resources and expertise to maximize efficiencies and minimize duplication of effort in developing the CCP.

4.2 ACCESS - FWS shall have responsibility for controlling access to the Refuge except for those entering under the authority of DOE-RL.

4.2.a An access agreement will be developed between FWS and DOE-RL to coordinate timely access.

4.2.b FWS shall provide those under FWS authority entering the restricted areas in the Refuge with information furnished by DOE concerning potential risks and appropriate procedures as required under the emergency preparedness planning documents and require that they have necessary equipment to allow for immediate notification in case of emergency situations.

4.2.c FWS shall identify appropriate points of contact (POC) and will consult with appropriate DOE-RL POCs, as identified in Attachment 4 of this MOU, regarding access control, and protective measures related to emergency preparedness.

4.2.d FWS will promptly notify the appropriate DOE-RL (POC) of any FWS activity, or activity by others under the jurisdiction of FWS, that may have the potential to impact any DOE-RL activity on the Hanford Site, or that may impact the ability of DOE-RL to adequately assess potential impacts from operations at Hanford on the health of the public or the environment. In addition, FWS will provide to DOE-RL a summary of ongoing activities, activities identified in active Special Use Permit applications, and planned activities on an agreed upon frequency, but no less than semi-annually.

4.2.e An FWS official will be the "Federal Agency Official" for implementing the Native American Graves Protection and Repatriation Act (NAGPRA) and the National Historic Preservation Act (NHPA) on the Refuge. FWS will promptly notify the appropriate DOE-RL POC of any "determination" under the NHPA, and any "inadvertent discovery" or planned "intentional excavation" under NAGPRA.

4.3 FWS shall be responsible for notifying DOE-RL if FWS discovers any hazardous (or dangerous), toxic, or radioactive wastes or other substances of concern, or of the release or threatened release of such substances on the Refuge as soon as reasonably possible following discovery.

4.4 FWS shall notify DOE-RL of any accident, injuries, fires, thefts, or similar events as soon as reasonably possible following discovery. Appropriate DOE-RL POCs are identified in Attachment 4.

4.5 FWS and its authorized representatives are responsible for assuring that the design, siting, construction, operation, maintenance, and repair of any new or existing facilities needed in the operation of the Refuge meet all cultural, environmental, health, and safety criteria under applicable laws and regulations, and are in accordance with FWS policy and the Monument Proclamation. All proposed new construction or modification of existing structures on Hanford Site lands must be approved by DOE-RL. DOE-RL will consult with FWS concerning structures required by DOE-RL to be placed on the Refuge to fulfill DOE missions. List of facilities on lands designated in Section 1.11 identified in Attachment 5.

4.6 FWS and its authorized representatives are responsible for compliance with all applicable laws and regulations for activities at the Hanford Site performed by FWS or its authorized representatives.

4.7 Unless otherwise agreed to by DOE-RL, the FWS and its authorized representatives are responsible, upon termination or expiration of this MOU, for funding the ultimate disposition of any FWS facilities constructed during the effective term of this agreement, including performing and documenting the environmental analysis of such disposition as required by NEPA and any other applicable statutory requirements. FWS proposed methods of disposition of constructed facilities on the Refuge are subject to DOE-RL approval.

4.8 FWS may, consistent with Service policy and within the limits of available personnel, provide various services to DOE-RL, upon request, on a cost reimbursable basis.

4.9 FWS will seek to enter into consultation agreements and access agreements as appropriate with Native American Tribes and peoples concerning traditional, cultural, and religious activities on the Refuge. Such agreements shall be subject to DOE-RL approval.

4.10 It is understood that FWS and DOE will cooperate to evaluate and reduce threats to the public and the environment. The FWS expressly recognizes that it shall be responsible for the costs associated with any removal or remedial action required by applicable laws or regulations which arise solely as a result of FWS management actions on the Refuge, or as a result of actions of others present on the Hanford Site who are under authority of the FWS, except for those parties authorized by DOE.

4.11 The Refuge Project Leader will serve as the Designated Federal Official to the Hanford Reach National Monument Planning Federal Advisory Committee.

4.12 The FWS is responsible for implementation of Public Law 100-605 as amended by Section 404 of P.L. 104-333 (Hanford Reach Protection).

4.13 FWS will promptly share environmental and cultural resource information with DOE-RL.

4.14 FWS will consult with DOE-RL in regards to any new land use proposals which may affect the Hanford Site or land designated by the Comprehensive Land Use Plan, Proclamation, or Memorandum as suitable for inclusion into the Monument and/or Refuge.

5.0 DOE-RL RESPONSIBILITIES:

5.1 DOE-RL is responsible for Payment in Lieu of Taxes for the Hanford Site to the extent such payments are required under the Atomic Energy Act.

5.2 DOE-RL is responsible for the administration of all third party rights and uses, including easement, licenses, and permits granted by DOE-RL to third parties for activities that are ongoing on the Hanford Site as identified in Attachment 3 to this MOU. This responsibility includes administrative controls, access, and infrastructure maintenance to support the third party activities. DOE-RL will consult with the FWS Project Leader regarding any new, or changes to, grants of easements, licenses, permits, or any other activities involving third parties on the Monument.

5.3 DOE-RL shall revise Attachments 2, 3, 4, and 5 of this MOU on an annual basis, or more often as required. Copies of the revisions shall be made available to FWS.

5.4 DOE-RL will consult with FWS to determine the need for additional analysis and monitoring of contaminants on the Refuge. FWS shall be responsible, fiscally and physically, for meeting objectives solely the responsibility of FWS. FWS will consult with and utilize existing capabilities and monitoring programs to maximize efficiency in performing any monitoring programs and avoid duplication of activities and/or capabilities to the extent possible.

5.5 DOE-RL, through its contractor(s), to the extent that DOE-RL and FWS agree to be appropriate and feasible, is responsible for providing FWS the use of, and making available, the existing and future developed Hanford Site support services, including the infrastructure, the electric power supply, telecommunications support, records and data from past, present, and future Refuge programs, and other needed site services for these lands.

5.6 DOE-RL shall notify the FWS Project Leader of any significant accident, injuries, fires, material releases, thefts, or other unusual occurrences or which might affect Refuge lands as soon as reasonably possible following discovery.

5.7 DOE-RL will continue to support tribal participation in the Hanford Site decision making process commensurate with their responsibilities identified in this MOU.

5.8 DOE-RL shall be responsible for providing to the FWS Project Leader access to available information on past or present hazardous (or dangerous) toxic, or radioactive wastes or other substances of concern which could potentially affect the Refuge.

5.9 DOE shall have responsibility for controlling access to the Refuge for those entering under the authority of DOE-RL, and shall keep the FWS Project leader for the Refuge informed regarding access and use needs for DOE-RL or DOE-RL approved activities.

5.10 DOE will work with FWS to identify, plan and seek funding for land surveys for the Monument and boundary marking as appropriate.

5.11 DOE will cooperate in the preparation of a CCP and accompanying NEPA documentation for the Monument.

5.12 DOE will, at no cost, provide the opportunity for FWS personnel and FWS-authorized representatives working on the Hanford Site to receive appropriate HAZWOPER, Radiation Worker I, and any other safety and first aid training necessary to access the site.

5.13 DOE-RL will designate a representative to work with Hanford Reach National Monument Federal Advisory Committee.

5.14 DOE will make the Hanford Cultural Resources Laboratory at the Pacific Northwest National Laboratory available to FWS as a repository and central clearinghouse for cultural resources.

5.15 DOE-RL will consult with FWS regarding any land use proposals which may affect the Refuge.

5.16 DOE will provide, as necessary, badging and dosimetry to FWS personnel.

5.17 DOE must approve all proposed land use changes or proposed construction sites.

5.18 DOE will consult with FWS on long-term management of the cultural, natural, and biological resources as part of integrated long-term stewardship planning for the Hanford Site.

5.19 DOE will share environmental and cultural resource information with FWS and designated contractor(s).

6.0 PROGRAM FUNDING:

6.1 DOE-RL and FWS will fund, on a basis proportionate to their respective use, continuing maintenance of Refuge facilities including roads.

6.2 FWS and/or its authorized representatives will fund any cultural or environmental mitigation required to allow construction and/or operations by the FWS and/or its authorized representatives on the Hanford Site.

6.3 DOE-RL and FWS will work together to determine funding needs for facility operations, improvements and facilities to enhance Monument operations and accommodate increased tribal and public access consistent with the CCP.

6.4 Any requirements for payment or obligations of funds by FWS or DOE-RL established by the terms of this MOU shall be subject to the availability of appropriated funds and other legal limitations.

6.5 Except as otherwise negotiated in separate funding agreements, each party shall be responsible for funding its responsibilities under this MOU.

6.6 DOE will provide FWS with existing and updated GIS data as available for lands and resources associated with management of the Refuge. Costs associated to provide information and underlying data available in FWS-usable format, if different than existing format, will be provided by FWS. In addition, FWS and DOE must evaluate the need to duplicate existing site capabilities and expertise and ensure controls are in place to preclude the generation of conflicting versions of GIS layers, environmental data, and assessment results and/or the release of outdated information as time proceeds.

7.0 INTERAGENCY INTEGRATED MANAGEMENT ARRANGEMENTS:

7.1 This MOU allows and encourages direct communication between DOE and FWS officials involved in managing the Refuge. Sharing of information regarding natural and cultural resources will be a priority. The parties will make available to each other existing GIS, historical surveys/studies, biological surveys, cultural surveys, contaminant related information, and other information necessary to appropriately manage and protect the Refuge resources. Each party will take actions necessary to assure confidentiality of all natural and cultural resource data where appropriate, as determined by each agency.

8.0 PUBLIC INFORMATION COORDINATION:

8.1 The agencies agree that prior to the release of any significant information regarding the Refuge or management thereof, such as a statement to the press, they shall consult together regarding the content of such a release. Each agency will identify a specific point of contact to coordinate the release of information to the public pertaining to the Refuge.

9.0 AMENDMENT AND TERMINATION:

9.1 This MOU may be amended by written agreement between the Manager, DOE-RL and the FWS Pacific Northwest Regional Director.

9.2 It is the intent of the Parties that this MOU shall remain in effect for twenty-five years unless terminated earlier as provided herein. This Permit shall be renewed automatically upon expiration of each effective period unless either party indicates a contrary intent.

9.3 With respect to the ALE, this MOU and the ALE permit shall be terminable upon the same conditions under which the June 1997 ALE permit may be terminated. With respect to the Wahluke Slope, this MOU and the Wahluke Slope permit shall be terminable upon written agreement of the FWS Regional Director and the DOE-RL manager.

9.4 The MOU may be terminated for cause if either party fails to abide by the terms and conditions of the MOU.

10.0 EFFECTIVE DATE AND EXTENSIONS:

10.1 This MOU shall become effective upon the latter date of signature of the parties. It shall remain in effect until terminated pursuant to Section 9.0 of this MOU.

11.0 OTHER PROVISIONS:

11.1 Nothing in this MOU will be deemed to establish any right or provide a basis for any action, either legal or equitable, by any person or class of persons challenging a government action or a failure to act.

11.2 All areas managed by the FWS within the Hanford Site will be managed as an overlay Refuge unit of the National Wildlife Refuge System unless otherwise noted by amending this agreement.

11.3 Additional land within the Hanford Site currently managed by DOE may also become part of the Refuge by amending this agreement.

11.4 Lands may be transferred back to DOE management in the event that FWS-managed lands become contaminated through DOE operations from groundwater movement, air deposition, or by other means. Particular portions of Refuge lands will be transferred back to DOE management upon request of DOE and 180 days notice.

11.5 Law enforcement, emergency planning, fire protection and emergency medical services shall be managed in accordance with existing and future agreements, permits, MOUs, and memoranda.

11.6 Nothing in this agreement shall be interpreted to impose upon DOE standards for environmental cleanup, or any other form of liability, which exceed or which are different from those which would be imposed in the absence of this agreement.

11.7 If required by DOE for safety or security buffer zone purposes, FWS shall impose use and occupancy restrictions as specified by DOE upon particular parcels of land.

U.S. Department of Energy
Manager, Richland Operations Office, WA

Signature: _____

Name: KEITH KLEIN

Date: June 14, 2001

U.S. Fish and Wildlife
Pacific Regional Director

Signature: _____

Name: ANNIE BADGLEY

Date: June 14, 2001

Appendix F – Refuge Permit, Attachment 1, Maps

Omitted, see Map Section for Monument maps.

Appendix F – Refuge Permit, Attachment 2, Hanford Site Operations and Contractors

DOE Richland Operations Office Contractors and Subcontractors

- Battelle Memorial Institute (Operates Pacific Northwest National Laboratory)
- Bechtel Hanford, Inc.
- CH2M Hill Hanford, Inc.
- Eberline Services Hanford, Inc.
- Benton County Sheriff
- Fluor Daniel Hanford, Inc.
- Babcock and Wilcox Hanford Company
- Numatec Hanford Corporation
- Waste Management Federal Services of Hanford, Inc.
- DynCorp Tri-Cities Services, Inc.
- Protection Technology Hanford
- Hanford Environmental Health Foundation
- Interstate Nuclear Services (operates off-site laundry for contaminated clothing)
- Johnson Controls, Inc. (operates steam producing boilers)

DOE Office of River Protection Contractors

- British Nuclear Fuels Limited, Inc.
- Lockheed Martin Hanford Corporation

Other Activities Onsite

- Bonneville Power Administration (Operates electrical substations and switching stations.)
- US Ecology, Inc. (Operates commercial radioactive waste disposal site.)
- Energy Northwest (Operates commercial nuclear power plant.)
- National Science Foundation (Operates Laser Interferometer Gravitational-Wave Observatory.)
- Kaiser Aluminum and Chemical Corporation (Operates commercial metal extrusion press.)
- Washington State University (Operates three laboratories.)

Appendix F – Refuge Permit, Attachment 3, Ongoing ALE Research, Studies, Projects, Activities and Users

Agency/Organization	Project	Contact
WSU Pullman	Insect Diversity	Richard Zack
WSU Tri-Cities	Insect Ecology	Lee Rogers
WSU Tri-Cities	Misc. M.S. Thesis Projects	Gene Schreckhise
WSU Tri-Cities	Rorripa Study	Sally Simmons
WSU-Agriculture	Biological Control Insects	Wyatt Cone, Keith Pike
WSU/PNNL	Sagebrush Physiology and Genetics	Jannelle Downs
DOE PASS Program	Joint Research	Karen Wieda
DOE/PNNL	Soil Moisture	Karin Hover
DOE/PNNL	LIGO Vibration	Alan Rohay
DOE/PNNL	NN20 Broad	Alan Rohay
DOE/PNNL	Ground Water Surveillance	Doug Hildebrand
DOE/PNNL	Ecosystem Monitoring Sampling	Larry Cadwell
DOE-HQ/PNNL	Global Climate	Jerry Stokes
DOE-HQ/PNNL	Global Climate	Harvey Bolton
TNC	Biotic Inventory	Curt Soper
USEPA	Pesticide Drift	Mike Marsh
WDFW	Avian Diversity/Habitat	Mathew VanderHaegen
WDFW	Sagebrush Restoration	Lisa Fitzner
WDFW	Understory Effects of Habitat	Lisa Fitzner
WDFW	CERCLA Restoration Site Monitor	J. McConnaughey
University of Washington	Earth Crust Small Scale Movement	Alan Rohay
National Seismic Network	Low Vibration	Alan Rohay

Agency/Organization	Project	Contact
PNNL	Utilities Operations	J. Massey
PNNL	ALE Facilities	C. Nelson
PNNL	Cultural Resource Reviews	Darby Stapp
PNNL	Operations Manager	B. Robertson
PNNL	Soil ET Lysimeters	Glendon Gee
Waste Management Federal Services of Hanford, Inc.	Ground Water Well Maintenance	M. Gardner
Waste Management Federal Services of Hanford, Inc.	Ground Water Well Sampling	D. Edwards
Waste Management Federal Services of Hanford, Inc.	Integrated Pest Management	R. Giddings
Washington Public Power Supply System	Emergency Alert Siren	Bill Flynn
DOE	Radio Site on Rattlesnake Mountain	Bill Spocich
Columbia Communications	Radio Site on Rattlesnake Mountain	Mike Gerdes
Motorola Network Services	Radio Site on Rattlesnake Mountain	Ron Kohler
Western Paging I	Radio Site on Rattlesnake Mountain	Bob Young
Tri-Cities Amateur Radio Club	Radio Site on Rattlesnake Mountain	Ernie Place
WA Department of Transportation	Gravel Stockpile along Highway 240	Elba Richards
Big Bend Alberta Company	Mineral Rights	Currently Undetermined

Agency/Organization	Project	Contact
Alliance of Advancement of Science through Astronomy Lawrence Berkeley Lab.	Electronic Access to Rattlesnake Observatory	Roy Gephardt
University of Washington University of California	Basic Research	Roy Gephardt
BHI/CERCLA	Vegetation Restoration	Ken Gano
U.S. Biological Service	Plant Growth Patterns/Stress	Steve Link
AWU Northwest	Ecology Studies	Kathy Lundgren
PNNL	Public Affairs Tours	K. Blasdel
PNNL	General Maintenance	R. Gooding, C. Rosscup
PNNL	Ecological Assessments Vegetation Restoration	C. Brandt, M. Sackschewsky
PNNL	Seismic Monitoring	Alan Rohay
PNNL	Climatological and Meteorological Research	D. Knight

Appendix F – Refuge Permit, Attachment 4, Point of Contact List

U.S. Fish and Wildlife Service Refuge Project Leader. . . . . Greg Hughes

Elements Associated with Managing the Monument Lands, DOE Point of Contact

Biological and Natural Resources; Radiation
Protection of the Public and Environment;
Existing Uses Coordination. . . . . Dana Ward
Industrial Mineral Resources Management. . . . . Jamie Zeisloft
Noxious Weed Control. . . . . John Hall
Signs, Markers, Boundary Survey; Utilities and Infrastructure. . . . . Steve Burnum
Emergency Planning and Preparedness. . . . . Judy Tokarz-Hames
Environmental Regulatory Compliance (hazardous waste, air, water). . . . . Cliff Clark
National Environmental Policy Act. . . . . Paul Dunigan
Cultural Resources. . . . . Dee Lloyd
Hanford Comprehensive Land Use Plan Environmental
Impact Statement; Visual and Aesthetics Management. . . . . Tom Ferns
Environmental Restoration; Contaminant Issues;
Natural Resource Trustee Council. . . . . Jamie Zeisloft
Emergency Services (Fire Control). . . . . Craig Christenson
Occupational Radiation Protection. . . . . Brenda Pangborn
Federal Advisory Committee; Public Information Releases. . . . . Marla Marvin
Native American Affairs. . . . . Kevin Clarke
Tourism/Visitation/Public Access. . . . . Mary Goldie
Payment in Lieu of Taxes. . . . . Ed Hiskes
Realty and Use Permits. . . . . Roger Jacob, Boyd Hathaway
Site Planning; Long-Term Stewardship. . . . . Jim Daily
Budget. . . . . Jim Peterson
Nuclear Safety Analysis. . . . . Mark Jackson
Aviation Safety. . . . . Gerry Bell

Appendix F – Refuge Permit, Attachment 5, List of Facilities

Space Science Laboratory
Storage Building
Pumphouse
Atmospheric Facility
Atmospheric Facility
Lysimeter Preparation Building
ALE Field Storage
ALE Laboratory I
ALE Headquarters
ALE Laboratory II
Pumphouse
Rattlesnake Mountain Lower Pumphouse
Fallout Laboratory
Storage Building
Fire Protection Pumphouse
Upper Pumphouse
NIKE Missile Silo
Rattlesnake Springs Research Facility
DOE Repeater Facility
Navy Mars Radio Building

Appendix G – Hanford Reach National Monument Federal Advisory Committee Members

The FAC was comprised of thirteen members, thirteen alternates, and one Designated Federal Officer from the FWS. Although the FAC charter was amended to include nineteen members, this was never implemented, and the charter expired with the initial member composition in use. At the time of the FAC charter expiring, the FAC members included:

State of Washington:
Member: Jeff Tayer, Washington Department of Fish and Wildlife
Alternate: Ron Skinnarland, Washington Department of Ecology

Native American:
Member: Vacant
Alternate: Rex Buck, Wanapum

County:
Member: Leo Bowman, Benton County (Commissioner)
Alternate: Frank Brock, Franklin County (Commissioner)

City:
Member: Vacant
Alternate: Bob Thompson, City of Richland (Mayor)

K-12 Education:
Member: Karen Wieda
Alternate: Royace Aikin

Economic Development:
Member: Jim Watts (Chair) Tri-Cities Industrial Development Council
Alternate: Harold Heacock, Tri-Cities Industrial Development Council

Irrigation/Public Utility Districts:
Member: Vacant
Alternate: Nancy Craig, Grant County Public Utilities District #5

Conservation/Environmental:
Member: Rick Leaumont, Lower Columbia Basin Audubon Society
Alternate: Mike Lilga, Lower Columbia Basin Audubon Society

Outdoor Recreation:
Member: Rich Steele, NW Conservation League
Alternate: Mike Wiemers, NW Conservation League

Public-At-Large:
Member: Kris Watkins
Alternate: Valora Loveland

Scientific/Academic:
Member: Michele Gerber
Alternate: Eric Gerber

Scientific/Academic:
Member: David Geist, Pacific Northwest National Laboratory
Alternate: Dennis Dauble, Pacific Northwest National Laboratory

Scientific/Academic:
Member: Gene Schreckhise, Washington State University
Alternate: Vacant

Designated Federal Officer: Greg Hughes, Project Leader, Hanford Reach National Monument

Appendix H – Appropriate Monument Uses

Public uses on national wildlife refuges are considered 'closed' until specifically opened. Opening such uses is a two-part process. First, the proposed use must be determined to be an "appropriate use" of the refuge. Second, if a use is found to be appropriate, then it must be found to be compatible with the purposes of the refuge (see Appendix I) in order to be allowed. Compatibility determinations do not need to be developed for uses found to be not appropriate.

Under the FWS Appropriate Refuges Uses policy (601 FW 1), there are nine categories of refuge uses and activities which are found to be appropriate or otherwise exempt from the requirement for evaluation of appropriateness. These are:

1) Situations where the FWS does not have adequate jurisdiction to prohibit a use.

2) The exercise of reserved rights, treaty rights by Native Americans, or other situations where legal mandates state FWS-NWRS must allow certain uses.

3) Refuge management activities, not including refuge management "economic" activities (see 603 FW 2.6 N.).

4) Wildlife-dependent public uses—hunting, fishing, wildlife observation and photography, and environmental education and interpretation.

5) The take of fish and wildlife regulated by a state (e.g., through fishing, hunting, and trapping).

6) Authorized military activities that directly benefit refuge purposes.

7) Uses which have already been described in a refuge CCP or step-down management plan approved after October 9, 1997.

8) Uses which contribute to fulfilling the NWRS mission, or refuge purpose(s), goals, or objectives which are described in a refuge management plan approved after October 9, 1997.

9) State fish and wildlife agency activities which have been documented to directly contribute to achievement of refuge purpose(s), goals, and the NWRS mission; are addressed in a CCP or formal agreement; or are approved under national policy.

This appendix provides the FWS's appropriateness review for uses identified by some portion of the public as being desirable on the Monument. With few exceptions (below), the refuge manager must decide if a new or existing use is appropriate. In assessing whether a secondary use is appropriate, the refuge manager must evaluate the following ten factors (the letters correspond to the evaluation criteria in the Appropriate Uses form):

a) Does the FWS have jurisdiction over the use? If the FWS does not have jurisdiction over the use or the area where the use would occur, then there is no authority to consider the use.

b) Does the use comply with all applicable laws and regulations? The proposed use must be consistent with all applicable laws and regulations (e.g., federal, state, tribal and local). Uses prohibited by law are not appropriate.

c) Is the use consistent with applicable Executive Orders and Department and FWS policies? If the proposed use conflicts with an applicable Executive Order or Department or Service policy, the use is not appropriate.

d) Is the use consistent with public safety? If the proposed use creates an unreasonable level of risk to visitors or staff, or if the use requires staff to take unusual safety precautions to assure the safety of the public or refuge staff, the use is not appropriate.

e) Is the use consistent with refuge goals and objectives in an approved management plan or other document? Refuge goals and objectives are designed to guide management toward achieving refuge purpose(s). Goals and objectives for the Monument are defined in Chapter 2 of the CCP.[193] If the proposed use, either itself or in combination with other uses or activities, conflicts with a refuge goal, objective, or management strategy, the use is generally not appropriate.

f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed? If the use was already considered and rejected as not appropriate, then it should not further unless circumstances or conditions have changed significantly.

g) For uses other than wildlife-dependent recreational uses, is the use manageable with available budget and staff? If a proposed use diverts management efforts or resources away from proper, reasonable management of a refuge activity or wildlife-dependent recreational use, the use is generally not appropriate.

h) Will the use be manageable in the future within existing resources? If the use would lead to recurring requests for the same or similar activities that will be difficult to manage in the future, then the use is not appropriate.

I) Does the use contribute to the public's understanding and appreciation of the refuge's natural or cultural resources, or is the use beneficial to those resources? If not, then the use will generally not be further considered.

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[193] Refuges may also rely on goals and objectives found in comprehensive management plans or refuge master plans developed prior to passage of the Improvement Act, as long as these goals and objectives comply with the tenets and directives of the Improvement Act.

j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality, compatible, wildlife-dependent recreation into the future? If not, the use is generally not further considered.

If an existing use is found to be not appropriate, the refuge manager must eliminate or modify the use as expeditiously as practicable. If a proposed new use is not appropriate, the refuge manager must deny the use (601 FW 1.3).

Rationale

As Monument staff developed the Appropriate Uses findings, it became apparent that the assumptions and ideas that went into the process should be documented. The following is not a full representation of the hours of discussions and research that went into the appropriateness use evaluation process, but it does identify the key concepts involved in the findings.

1) The most common or traditional application of the use was addressed. For example, geocaching typically involves the leaving or taking of an item as part of the activity. Participants in field dog trials in the area like to use horses. Etc. These common uses will be addressed individually below.

2) The answer to Decision Criteria E was, in all instances, "no." This was based on the fact that the Monument designation is a recent event, and as such, it has never had an "approved" management plan. However, the fact that the Monument does not yet have an approved management plan was not a factor in making appropriateness findings for the Monument.

3) Several activities were broken into different parts for the sake of clarity. For example, camping, when considered as a whole, was not an appropriate use of the Monument with the current resources available. However, limited camping along the river to ensure public safety is possible with existing or reasonably foreseeable resources. Splitting these activities into two different appropriate use analyses provided for a clear picture of what was appropriate and possible.

4) The analysis for biking on roads was limited to roads directly under the control, management and maintenance of the FWS. County and state roads (e.g., State Route 24), even though within the Monument, were not considered as part of the appropriateness evaluation as the FWS does not have jurisdiction over these roads.

5) Biking on specially constructed and/or designated trails was determined not be an appropriate use due to the Monument Proclamation and accompanying implementation paper from the White House. Those documents ". . . prohibits motorized and mechanized vehicle travel off road . . .." The FWS has interpreted this to include trails; that is, trail use

is considered an "off road" use. This is consistent with final rules established by the USFS on November 9, 2005 (FR 70, 216, pages 68263-91; 36 CFR Parts 212, 251, 261 and 295), whereby a road is defined as "a motor vehicle route over 50 inches wide" and a trail is "a route 50 inches or less in width or a route over 50 inches wide that is identified and managed as a trail." The FWS may dually designate some existing roads as trails, in which case, biking on the 'trail' would be allowed.

6) Camping—other than for floatboating—was defined as needing at least minimal facilities and maintenance, such as sanitation, fire protection, site hardening, garbage removal, and toilet pumping. The appropriate use analysis was based on these minimum facilities and not on specialized facilities, such as recreational vehicle hookups, showers, etc.

7) Floatboat camping was defined on a pack-it-in, pack-it-out basis with no open flames allowed. All camping would be at a minimum number of defined and hardened sites distributed through a lottery system.

8) The analysis for field dog trials was based on past activities on the Monument. These previous field dog trials involved camping, the use of horses, cooking, and overnight horse tie-ups.

9) As mentioned, geocaching was defined as the taking or leaving of objects, which is inconsistent with FWS policy.

10) Hang gliding is not consistent with airspace restrictions over the Hanford Site.

11) The cost to repair damage from cross-country horseback use (see the compatibility determination for horseback riding) was determined to be unmanageable with current staff and budgetary resources.

12) Since the use of the observatory on the Monument is not within the jurisdiction of the FWS at this time, it was not evaluated for appropriateness. Should jurisdiction change in the future, the use will be reassessed for its appropriateness. The FWS has addressed the observatory in a variety of sections throughout the CCP (e.g., 2.10.2.11 Objective 1-11: Restoration of Lithosol Habitat).

Finding of Appropriateness of a Use on the Monument[194]

Refuge Name: Hanford Reach National Monument

Use: Biking, FWS-Managed Public Roads

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?		✓
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[195]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?		✓
(h) Is the use manageable in the future with existing resources?		✓
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?		✓

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[194] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[195] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate ___ **Appropriate** X

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Use on the Monument[196]

Refuge Name: Hanford Reach National Monument

Use: Biking, Trails

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?		✓
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?	✓	
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[197]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?	✓	
(h) Is the use manageable in the future with existing resources?	✓	
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?		✓

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[196] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[197] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate X **Appropriate** ___

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Use on the Monument[198]

Refuge Name: Hanford Reach National Monument

Use: Camping, Floatboat

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?		✓
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[199]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?		✓
(h) Is the use manageable in the future with existing resources?		✓
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?		✓

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[198] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[199] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate ___ **Appropriate** X

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Use on the Monument[200]

Refuge Name: Hanford Reach National Monument

Use: Camping, Other Than Floatboating

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?		✓
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[201]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?	✓	
(h) Is the use manageable in the future with existing resources?	✓	
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?		✓

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[200] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[201] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate X **Appropriate** ___

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Use on the Monument[202]

Refuge Name: Hanford Reach National Monument

Use: Dog Walking

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?		✓
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[203]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?		✓
(h) Is the use manageable in the future with existing resources?		✓
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?	✓	

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[202] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[203] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate X **Appropriate** ___

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Use on the Monument[204]

Refuge Name: Hanford Reach National Monument

Use: Field Dog Trials

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?		✓
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[205]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?	✓	
(h) Is the use manageable in the future with existing resources?	✓	
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?	✓	
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?		✓

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[204] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[205] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate X **Appropriate** ___

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Use on the Monument[206]

Refuge Name: Hanford Reach National Monument

Use: Geocaching

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?	✓	
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?	✓	
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[207]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?		✓
(h) Is the use manageable in the future with existing resources?		✓
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?		✓

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[206] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[207] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate X **Appropriate** ___

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Use on the Monument[208]

Refuge Name: Hanford Reach National Monument

Use: Hang Gliding

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?	✓	
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?	✓	
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[209]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?		✓
(h) Is the use manageable in the future with existing resources?		✓
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?	✓	

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[208] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[209] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate X **Appropriate** ___

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Use on the Monument[210]

Refuge Name: Hanford Reach National Monument

Use: Foot Travel (Hiking, Jogging)

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?		✓
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[211]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?		✓
(h) Is the use manageable in the future with existing resources?		✓
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?		✓

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[210] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[211] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate ___ **Appropriate** X

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Use on the Monument[212]

Refuge Name: Hanford Reach National Monument

Use: Horseback Riding, Roads and Designated Trails

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?		✓
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[213]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?		✓
(h) Is the use manageable in the future with existing resources?		✓
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?		✓

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[212] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[213] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate ___ **Appropriate** X

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Use on the Monument[214]

Refuge Name: Hanford Reach National Monument

Use: Horseback Riding, Cross-country

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?		✓
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[215]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?	✓	
(h) Is the use manageable in the future with existing resources?	✓	
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?		✓

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[214] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[215] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate X **Appropriate** ___

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Finding of Appropriateness of a Use on the Monument[216]

Refuge Name: Hanford Reach National Monument

Use: Research and Management Studies

Decision Criteria	NO	YES
(a) Do we have jurisdiction over the use?		✓
(b) Does the use comply with applicable laws and regulations (federal, state, tribal and local)?		✓
(c) Is the use consistent with applicable Executive Orders and Departmental and FWS policies?		✓
(d) Is the use consistent with public safety?		✓
(e) Is the use consistent with goals and objectives in an approved management plan or other document?[217]	✓	
(f) Has an earlier documented analysis not denied the use, or is this the first time the use has been proposed?		✓
(g) Will this be manageable in the future with available budget and staff?		✓
(h) Is the use manageable in the future with existing resources?		✓
(I) Does the use contribute to the public's understanding and appreciation of the Monument's natural or cultural resources, or is the use beneficial to those resources?		✓
(j) Can the use be accommodated without impairing existing wildlife-dependent recreational uses or reducing the potential to provide quality (see Section 1.6D of 603 FW 1 for a description), compatible, wildlife-dependent recreation into the future?		✓

Where the FWS does not have jurisdiction over the use (i.e., "no" to (a)), there is no need to evaluate the use further as the FWS cannot control the use. Uses that are illegal, inconsistent with existing policy, or unsafe (i.e., "no" to (b), (c), or (d)) may not be found appropriate. If the answer is "no" to any of the other questions above (i.e., (e) - (j)), the FWS will ***generally*** not allow the use.

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[216] This form is not required for wildlife-dependent recreational uses, take regulated by the state of Washington, or uses already described in a CCP or step-down management plan approved after October 9, 1997.

[217] The Monument was created in June of 2000 and has never had a management plan. This CCP will be the Monument's first management plan, so this standard is not really applicable at this point.

If indicated, the Monument Manager has consulted with the state fish and wildlife agencies.

Yes ___ **No** X

When the Monument Manager finds the use appropriate based on sound professional judgement, the Monument Manager must justify the use in writing on an attached sheet and obtain the Refuge Supervisor's concurrence.

Based on an overall assessment of these factors, my summary conclusion is the proposed use is:

Not Appropriate ___ **Appropriate** X

Monument Project Leader: _____

(Signature and Date)

If found to be **Not Appropriate**, the Monument Manager does not need to sign concurrence if the use is a new use.

If an existing use is found **Not Appropriate** outside of the CCP process, the Refuge Supervisor must sign concurrence.

If found to be **Appropriate**, the Refuge Supervisor must sign concurrence.

Refuge Supervisor: _____

(Signature and Date)

A Compatibility Determination is required before the use may be allowed.

Appendix I – Compatibility Determinations

Compatibility determinations must be completed for all recreational uses, or other uses of the Monument by the public or other non-Monument entity. This includes actions the FWS might take associated with a particular recreational use or other general public use, including any economic activity (e.g., commercial guiding) proposed for the Monument. The Monument Manager and the FWS's Regional Chief must determine that the activity is a "compatible use." That is, it is a wildlife-dependent recreational use, or other use of the Monument that, based on sound professional judgment, will not materially interfere with, or detract from, the mission of the NWRS or the purposes of the Monument. The compatibility determination itself is simply the written determination by the Monument Manager and Regional Chief signifying that the use is or is not a compatible use.

In determining what is a compatible use, the Refuge Administration Act relies on the "sound professional judgment" of the person authorized to make the decision.[218] Compatibility determinations are inherently complex and require the Monument Manager to consider their field experiences and knowledge of the Monument's resources, particularly its biological resources, and make conclusions that are consistent with principles of sound fish and wildlife management and administration, available scientific information, and applicable laws.

The Monument Manager must also consider the extent to which available resources (funding, personnel and facilities) are adequate to develop, manage and maintain the proposed use so as to ensure compatibility. The Monument Manager must make reasonable efforts to ensure that the lack of resources is not an obstacle to permitting otherwise compatible wildlife-dependent recreational uses (hunting, fishing, wildlife observation and photography, and environmental education and interpretation). If reasonable efforts do not yield adequate resources to develop, manage and maintain the wildlife-dependent recreational use, the use will not be compatible because the FWS will lack the administrative means to ensure proper management of the public activity on the Monument.

Since permitting uses of the Monument is a determination vested by law to the FWS, under no circumstances (except emergency provisions necessary to protect the health and safety of the public or any fish or wildlife population) may a use be authorized which is not determined to be compatible with the purposes of the Monument and/or the NWRS.

On the pages that follow, seven compatibility determinations are completed for the Monument. Others will be completed as need dictates. It should be noted that the activities of foot travel and biking (see Appendix I, Appropriate Uses) are included in the compatibility determination for wildlife observation, photography, environmental education, and interpretation.

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[218] The Refuge Administration Act designates the Director of the FWS as the ultimate decision maker. The Director, in turn, delegates authority to make compatibility determinations through the Regional Director to the Monument Manager. Therefore, it is the Monument Manager who is required and authorized to exercise sound professional judgment.

Compatibility Determination – Camping For Floatboaters

Use

Camping for Floatboaters

Refuge Name

Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge (Monument)

Establishing and Acquisition Authorities

The Saddle Mountain National Wildlife Refuge (24,000 acres) was established on November 30, 1971, through a permit with the Department of Energy and under the authority of the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742(a)-754).

The Hanford Reach National Monument (195,000 acres), which includes the Saddle Mountain National Wildlife Refuge, was established on June 9, 2000, through Presidential Proclamation 7319 under the authority of the Antiquities Act of 1906.

Refuge Purposes

National wildlife refuges are established ". . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . ." (16 U.S.C. §742f(a)(4)) and also ". . . for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude . . ." (16 U.S.C. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

The Monument was established ". . . for the purpose of protecting the objects identified above [riparian, aquatic and upland shrub-steppe habitats; native plant and animal species; free-flowing, non-tidal stretch of the Columbia River; shrub-steppe ecosystems; breeding populations of birds; habitat for migratory birds; mammals; insect populations; geological and paleontological objects; Archaeological and historic information] . . ." (Monument Proclamation 7319, dated June 9, 2000).

National Wildlife Refuge System Mission

The mission of the National Wildlife Refuge System (NWRS) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use

While not one of the six wildlife dependent public uses listed or identified in the National Wildlife Refuge System Administration Act, as amended (1997), camping can facilitate wildlife observation and photography, but is not necessary to achieve it. Historically, camping has not been allowed on the Monument.

As proposed, camping would only be allowed at three to six established sites along the Hanford Reach of the Columbia River and would be limited to holders of special permits in order to provide for public safety. Traversing the entire Hanford Reach in one day is difficult to accomplish, especially by families or if the frequently strong winds in the area impede travel.

Availability of Resources

The following funding/annual costs would be required to administer and manage floatboat camping as described above.

Activity or Project	*One Time Expense*	*Recurring Expense*
Develop Camping Sites	$50,000	
Signs/Interpretive Panels	$5,000	
Maintenance of Facilities		$10,000
Law Enforcement		$5,000
Monitoring, Administration and Issuing of Permits		$6,000
Totals	**$55,000**	**$21,000**

Anticipated Impacts of the Use

Floatboating (i.e., the use of nonmotorized craft) tends to be less disturbing to most species of wildlife than motorized boating.[219] The effects of nonmotorized boating are anticipated to be similar to that of access for fishing, albeit more transitory in nature; please refer to the discussion of anticipated impacts under the Fishing Compatibility Determination.

The camp sites themselves would have minimal direct impact to the Monument. At most, six delineated sites would be established adjacent to the river that would be no more 400 square feet in order to accommodate two to three tents. Within this area, vegetation would be removed and the soil compacted (hardened). Of greater impact would be the presence of people in a time and place that has not previously seen people. Social trailing will impact soils and vegetation around the site. This could include an increased potential for erosion, soil compaction (Liddle 1975), reduced seed emergence (Cole and Landres 1995), alteration of vegetative structure and composition, and sediment loading (Cole and Marion 1988). Other impacts could result from littering, a failure to follow sanitation regulations (i.e., pack it in, pack it out), and an increased potential for fire.

Human activities at these points can result in direct effects on wildlife through harassment, a form of disturbance that can cause physiological effects, behavioral modifications, or death (Smith and Hunt 1995). Numerous studies have confirmed that the presence of people can cause a variety of disturbance reactions in wildlife, including flushing or displacement (Erwin 1989, Fraser et al 1985, Freddy 1986), heart rate increases (MacArthur et al 1982), altered foraging patterns (Burger and Gochfeld 1991), and even, in some cases, diminished reproductive success (Boyle and Samson 1985).[220] These studies and others have shown that the severity of the effects depends upon the distance to the disturbance and its duration, frequency, predictability and visibility to wildlife (Knight and Cole 1991).

On the Monument, birds are especially vulnerable and can be impacted from human activities when they are disturbed and flushed from feeding, resting, or nesting areas. Flushing, especially repetitive flushing, can strongly impact habitat use patterns of many birds species. Flushing from an area can cause birds to expend more energy, be deterred from using desirable habitat, affect resting or feeding patterns, increase exposure to predation, or cause abandonment of sites (Smith and Hunt 1995). Migratory birds are observed to be more sensitive than resident species to disturbance (Klein 1989). Herons and shorebirds were observed to be the most easily disturbed (when compared to gulls, terns and ducks) by human activity and flush to distant areas away from people (Burger 1981). A reduced number of shorebirds were found near people who were walking or jogging, and about 50% of flushed birds flew elsewhere (Burger 1981). In addition, the foraging time of sanderlings decreased, and

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[219] The U.S. Fish and Wildlife Service does not have jurisdiction over the surface water of the Columbia River and cannot control the activity of floatboating. The agency would only be able to control the associated camping.

[220] Based on this information, it is likely that horseback riding and bicycling would have similar impacts.

avoidance (e.g., running, flushing) increased as the number of humans within 300 feet increased at a coastal bay refuge on the Atlantic (Burger and Gochfeld 1991).

Nest predation for songbirds (Miller et al. 1998), raptors (Glinski 1976), colonial nesting species (Buckley and Buckley 1978), and waterfowl (Boyle and Samson 1985) tends to increase in areas more frequently visited by people. In addition, for many passerine species, primary song occurrence and consistency can be impacted by a single visitor (Gutzwiller et al. 1994). This could potentially limit the number of breeding pairs of certain passerine species, thus limiting production within Monument riparian habitats (Reijnen and Foppen 1994).

All of the above potential impacts could be exacerbated by the fact that the presence of people is for an extended period and for periods that have not seen visitors (i.e., overnight); this could also impact different species. In order to mitigate these potential impacts, the implementation of best management practices (e.g., seasonal closures during sensitive life cycles, establishment of sites away from sensitive areas) will be crucial to minimize impacts to natural and cultural resources.[221]

Public Review and Comment

This Compatibility Determination was prepared concurrent with the Monument's CCP/EIS. Open houses were held and written comments were solicited from the public during the scoping period for the Monument's CCP/EIS, during which time this activity solicited considerable interest. However, this Compatibility Determination was not included in the draft CCP/EIS and is being developed in response to comments received during the comment period for the draft CCP/EIS.

Determination

_____ The use is not compatible.

__X__ The use is compatible with the following stipulations.

[221] Best management practices are described in detail in Chapter 4 of the *Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement.*

Stipulations Necessary to Ensure Compatibility

- Monitoring will be conducted to insure that high-quality habitat for wildlife feeding, resting, breeding is maintained in the immediate vicinity of designated campsites.
- Camping will be limited to holders of permits issued by the U.S. Fish and Wildlife Service (FWS).
- Camping could be reduced or closed if significant negative impacts to Monument facilities or natural and cultural resources occurs.
- Use is limited to one night per permit holder.
- Participants will be restricted to the designated sites.
- Litter and human waste will be required to be packed out by users.
- No open flames will be allowed.
- All users will be required to acknowledge that they have read and agree to the conditions outlined in a camping brochure, which will be issued with the permit.
- Seasonal or other closures will be implemented, if necessary, to protect natural and cultural resources.

Justification

Floating the Hanford Reach in a nonmotorized boat offers a unique opportunity to experience the Monument and supports the priority public uses of wildlife observation, photography and environmental education. However, due to the length of the Hanford Reach and the limited number of access points and shuttle opportunities, traversing the entire stretch in one day is difficult, especially for families or in high winds. In order to provide this recreational opportunity while protecting public safety means that camping sites must be established. The opportunity to engage in several priority public uses provided through camping would outweigh any anticipated negative impacts associated with implementation of the program.

It should also be noted that, although the typical trip length covers all 46.5 miles of the Hanford Reach, camping would only be allowed at three to six campsites, covering a maximum area of 0.06 acres. Disturbance is anticipated to be higher for an eighth of a mile in each direction, which would cover an area of 60 acres (maximum), and some disturbance is anticipated up to a quarter mile in each

direction, covering an area of 230 acres (maximum).[222] Within the almost 30,000 acres of the River Corridor Unit and the 196,000 acres of the Monument itself, overall impacts would be minor, at most, especially as the impacts would be transitory and limited in time to the hours of camper activity. Given the scale of the activity, the stipulations outlined above, as well as the best management practices identified, potential impacts relative to wildlife/ human interactions will be minimal.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

__X__ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

_____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____ Categorical Exclusion without Environmental Action Statement.

_____ Categorical Exclusion and Environmental Action Statement.

_____ Environmental Assessment and Finding of No Significant Impact.

__X__ Environmental Impact Statement and Record of Decision.

References

Boyle, S.A., and F.B. Samson. 1985. Effects of non-consumptive recreation on wildlife: A review. Wildlife Society Bulletin 13:110-116.

Buckley, P.A., and F.G. Buckley. 1976. Guidelines for protection and management of colonially nesting waterbirds. North Atlantic Regional Office, National Park Service, Boston, Massachusetts. 52 pages.

Burger, J. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation 21:231-241.

[222] This would likely be an even smaller area as campsites would be located fairly close to each other, thereby having overlapping areas of impact, although the final siting of campsites will be dependent in resource needs.

Burger, J., and M. Gochfeld. 1991. Human activity influence and diurnal and nocturnal foraging of sanderlings (*Calidris alba*). Condor 93: 259-265.

Cole, D.N., and P.B. Landres. 1995. Indirect effects of recreation on wildlife. Pages 183-201 *in* Wildlife and Recreationists: Coexistence Through Management and Research (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Washington, District of Columbia. 372 pages.

Cole, D.N., and J.L. Marion. 1988. Recreation impacts in some riparian forests of the eastern United States. Environmental Management 12:99-107.

Erwin, R.M. 1989. Responses to human intruders by birds nesting in colonies: Experimental results and management guidelines. Colonial Waterbirds 12:104-108.

Fraser, J.D., L.D. Frenzel, and J.E. Mathisen. 1985. The impact of human activities on breeding bald eagles in north-central Minnesota. Journal of Wildlife Management 49:585-592.

Freddy, D.J. 1986. Responses of adult mule deer to human harassment during winter. Pages 286 *in* Proceedings II. Issues and Technology in the Management of Impacted Western Wildlife: Proceedings of a National Symposium (R.D. Comer, T.G. Baumann, P. Davis, J.W. Monarch, J. Todd, S. VanGytenbeek, D. Wills, and J. Woodling, editors). Thorne Ecological Institute, Boulder, Colorado.

Glinski, R.L. 1976. Birdwatching etiquette: The need for a developing philosophy. American Bird 30(3):655-657.

Gutzwiller, K.J., R.T. Wiedenmann, K.L. Clements, and S.H. Anderson. 1994. Effects on human intrusion on song occurrence and singing consistency in subalpine birds. Auk 111:28-37.

Klein, M. 1989. Effects of high levels of human visitation on foraging waterbirds at J.N. "Ding" Darling National Wildlife Refuge, Sanibel, Florida. Masters thesis. University of Florida, Gainesville, Florida.

Knight, R.L., and D.N. Cole. 1991. Wildlife responses to recreationists. *In* Wildlife and Recreationists (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Covelo, California.

Liddle, M.J. 1975. A selective review of the ecological effects on human trampling on natural ecosystems. Biological Conservation 7:17-36.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

Reijnen, R., and R. Foppen. 1994. The effects of car traffic on breeding bird populations in woodland. Evidence of reduced habitat quality for willow warbler (*Pylloscopus trochilus*) breeding close to a highway. Journal of Applied Ecology 31: 85-94.

Smith, L., and J.D. Hunt. 1995. Nature tourism: Impacts and management. Pages 203-219 *in* Wildlife and Recreationists: Coexistence Through Management and Research (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Washington, District of Columbia.

Signatures

Monument Project Leader: _____
(Signature and Date)

Refuge Supervisor: _____
(Signature and Date)

Regional Chief: _____
(Signature and Date)

Compatibility Determination – Fishing

Use

Fishing

Refuge Name

Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge (Monument)

Establishing and Acquisition Authorities

The Saddle Mountain National Wildlife Refuge (24,000 acres) was established on November 30, 1971, through a permit with the Department of Energy and under the authority of the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742(a)-754).

The Hanford Reach National Monument (195,000 acres), which includes the Saddle Mountain National Wildlife Refuge, was established on June 9, 2000, through Presidential Proclamation 7319 under the authority of the Antiquities Act of 1906.

Refuge Purposes

National wildlife refuges are established ". . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . ." (16 U.S.C. §742f(a)(4)) and also ". . . for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude . . ." (16 U.S.C. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

The Monument was established ". . . for the purpose of protecting the objects identified above [riparian, aquatic and upland shrub-steppe habitats; native plant and animal species; free-flowing, non-tidal stretch of the Columbia River; shrub-steppe ecosystems; breeding populations of birds; habitat for migratory birds; mammals; insect populations; geological and paleontological objects; Archaeological and historic information] . . ." (Monument Proclamation 7319, dated June 9, 2000).

National Wildlife Refuge System Mission

The mission of the National Wildlife Refuge System (NWRS) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use

In the NWRS Improvement Act, the United States Congress declared fishing one of six wildlife-dependent public uses of the NWRS. If determined compatible, fishing would become a priority public use for the Monument. Currently, on FWS-administered Monument lands, recreational bank fishing occurs on the east bank of the Columbia River north of the WDFW Ringold Fish Hatchery.[223] Bank fishing areas are accessed from one of eight existing parking lots; anglers walk cross-country or on user-created trails from between 1/10 mile to more than 1/4 mile to the river shore.[224] Additional user-created trails follow the shoreline in some areas.[225]

Fish caught by Monument visitors include Chinook and chum salmon (seasonally), sturgeon, and resident game fish, including catfish and bass. Although the U.S. Fish and Wildlife Service (FWS) does not closely monitor all fishing on the Monument, we anticipate that use will increase over the next fifteen years.

Availability of Resources

The Monument is open for many public uses other than fishing, including hunting, environmental education and interpretation, wildlife photography, and wildlife observation. The same facilities used for these activities are also useful for fishing. However, access trails, parking lots, signs and other facilities are inadequate, as are staff resources, to enforce regulations and maintain these facilities. The costs outlined in the table below would be required to administer and manage fishing on the Monument.

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[223] Primary jurisdiction for bank fishing below the mean high water mark lies with the state of Washington and primary jurisdiction for public activities within the easement associated with the WB-10 Ponds and wasteways lies with the Bureau of Reclamation. See the following footnote regarding fishing from the river.

[224] Boat anglers can access the river from improved boat launches in Richland, a hardened launch near the White Bluffs townsite, or primitive boat launches (i.e., launch over the bank) at the Ringold Fish Hatchery or Parking Lot 7 on the Monument. Fishing from the river is controlled by the state of Washington.

[225] The Monument would also investigate fishing opportunities for disabled users.

Activity or Project	One Time Expense	Recurring Expense
Law Enforcement		$5,000
Development/Maintenance of Parking & Trails	$10,000	$500
Placement and Maintenance of Signs	$2,000	$500
Outreach, Education, Monitoring	$3,000	$2,000
Development/Maintenance of Accessible Sites	$50,000	$5,000
Totals	***$65,000***	***$13,000***

Anticipated Impacts of the Use

Fishing as a solitary and stationary activity tends to be less disturbing to wildlife than hunting or motorized boating (Tuite et al. 1983). However, there would be disturbance of birds and other wildlife using the open waters where fishing would occur. Fishing activities may influence the composition of bird communities, as well as distribution, abundance, and productivity of waterbirds (Tydeman 1977, Bouffard 1982, Bell and Austin 1985, Bordignon 1985, Edwards and Bell 1985, and Cooke 1987). Anglers often fish in shallow, sheltered bays and creeks that birds prefer, negatively impacting distribution and abundance of waterfowl, grebes, and coots (Cooke 1987). Increases in anglers and associated shoreline activity discouraged waterfowl from using otherwise suitable habitat (Jahn and Hunt 1964). In Britain, anglers displaced waterfowl from their preferred feeding and roosting areas and caused wigeon, green-winged teal, pochard, and mallard to depart from a reservoir prematurely (Jahn and Hunt 1964). Anglers influenced the numbers, behavior, and diurnal distribution of avian scavengers present at sites in Washington, when compared to non-fishing days (Knight et al. 1991). Shoreline activities, such as human noise, would cause some birds to flush and go elsewhere.

Bank fishing allows the anglers direct access to the river, bays and sloughs. Waterbird and waterfowl use of these areas varies seasonally, as does angler presence. Waterfowl are prevalent on the river in the winter, especially when surrounding wetlands freeze, but angler presence is little or none, as is disturbance to waterfowl (see the Hunting Compatibility Determination for impacts to waterfowl). Bald eagle roost sites occur within the bank fishing area, but eagles are more common in winter months when angler presence is low. The nesting period identified in the Bald Eagle Recovery Plan identifies January 1 as the beginning of the nesting season when special protective measures should begin (FWS 1986). As most bank fishing activity takes place outside of bald eagle nesting habitat, adverse impacts are not anticipated. Bank fishing occurs in a slough near a heron rookery near one of the parking areas along the Ringold River Road. Access to the banks of this slough, however, is difficult, and most bank fishing occurs at the opposite end of the slough, away from the rookery. Washington State requires a minimum 900-foot buffer zone to protect colonies from human disturbances (WDFW 2001). Based on the literature, we would expect there to be some disturbance to the rookery during its seasonal use.

In addition, trampling of vegetation and deposition of sewage or other chemicals are expected to commonly occur (Liddle and Scorgie 1980). Disturbance and destruction of riparian vegetation, bank stability, water quality, and littering may result from high levels of bank fishing activities.

By its nature, fishing results in the intentional take of individual fish. Catch and release fishing can also harm individual fish, killing them or reducing their likelihood of long-term survival. Although creel and fishing activity censuses have not been made in this particular area, it is estimated that use will increase and that the WDFW will continue to monitor harvest by anglers and routinely adjust regulations to ensure that overall populations of game species remain healthy into the future. The number of people fishing and any potential impacts will be monitored and access points, areas open/closed to fishing, and seasonal/temporary closures will be considered in coordination with the WDFW.

It is well recognized that fishing can give many people a deeper appreciation of fish and wildlife and a better understanding of the importance of conserving habitat, which ultimately contributes to the NWRS mission. Furthermore, when determined compatible, fishing is one of the six priority public uses on the NWRS.

Public Review and Comment

This Compatibility Determination was prepared concurrent with the Monument's CCP/EIS. Open houses were held and written comments were solicited from the public during the scoping period for the Monument's CCP/EIS. Public review and comment were solicited during the draft CCP/EIS comment period.

Determination

_____ The use is not compatible.

__X__ The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

- Monitoring will be conducted to ensure that high-quality habitat for feeding, resting, breeding and thermal protection for waterfowl, waterbirds and other wildlife species is maintained.

- The Monument will provide information on bank fishing and access at appropriate sites and through printed brochures. Information will also include current migratory bird and Monument regulations, as well as maps of closed areas.

- Monument officers will enforce any closed areas and use restrictions.

- All fishing on the Monument would require an appropriate state license and tag and all fishing will be consistent with applicable state regulations.

The Monument will monitor and evaluate the fishing program and users to determine if objectives are being met.

Justification

When determined compatible, fishing is one of the six priority public uses of the NWRS. Providing a quality fishing program contributes to achieving one of the Monument's goals. This program as described was determined to be compatible with the Monument purposes even though jurisdiction where most of the bank fishing would occur (below the mean high water level) lies with the state of Washington. Sufficient restrictions will be placed on fishing to ensure that an adequate amount of high-quality feeding, breeding and resting habitat would be available for migratory birds in relatively undisturbed areas (sanctuaries). Based on monitoring, bank fishing activity may need to be confined to designated areas.

In addition, the majority of waterfowl and bald eagle use near bank fishing areas occurs in the winter and spring months, although a few birds arrive as early as September and October. Since the majority of fishing activity occurs in the spring, summer and fall (through mid-October), disturbance to waterfowl species and eagles is expected to be minimal.

It is anticipated that wildlife, primarily waterbirds, will find sufficient food resources and resting places such that their abundance and use of the Monument will not be measurably lessened, fishing pressure will not cause fish stocks (i.e., forage) to decline, the physiological condition and production of waterfowl and other waterbirds will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

__X__ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

_____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____ Categorical Exclusion without Environmental Action Statement.

_____ Categorical Exclusion and Environmental Action Statement.

_____ Environmental Assessment and Finding of No Significant Impact.

__X__ Environmental Impact Statement and Record of Decision.

References

Bell, D.V., and L.W. Austin. 1985. The game-fishing season and its effects on overwintering wildfowl. Biological Conservation 33:65-80.

Bordignon, L. 1985. Effetti del disturbo antropico su una popolazione di germano reale *Anas platyrhynchos*. (Effects of human disturbance on a population of mallard *Anas platyrhynchos*). Avocetta 9:87-88.

Bouffard, S. 1982. Wildlife values versus human recreation: Ruby Lake National Wildlife Refuge. Transactions of the North American Wildlife and Natural Resources Conference 47:553-558.

Cooke, A.S. 1987. Disturbance by anglers of birds at Grafham Water. ITE Symposium 19:15-22.

Edwards, R.W., and D.V. Bell. 1985. Fishing in troubled waters. New Science 1446, 7 March:19-21.

Jahn, L.R., and R.A. Hunt. 1964. Duck and coot ecology and management in Wisconsin. Wisconsin Conservation Dept. Technical Bulletin Number 33. 212 pages.

Knight, R.L., D.P. Anderson, and N.V. Marr. 1991. Responses of an avian scavenging guild to anglers. Biological Conservation 56:195-205.

Liddle, M.J., and H.R.A. Scorgie. 1980. The effects of recreation on freshwater plants and animals: A review. Biological Conservation 17:183-206.

Tuite, C.H., M. Owen, and D. Paynther. 1983. Interaction between wildfowl and recreation at Llangorse Lake and Talybont Reservoir, South Wales. Wildfowl 34:48-63.

Tydeman, C.F. 1977. The importance of the close fishing season to breeding bird communities. Journal of Environmental Management 5:289-296.

U.S. Fish and Wildlife Service. 1986. Pacific Bald Eagle Recovery Plan. U.S. Fish and Wildlife Service. Portland, Oregon. 160 pages.

Washington Department of Fish and Wildlife. 2001. Priority species and habitats list. Available at www.wa.gov/wdfw/hab/phsvert.htm#birds.

Signatures

Monument Project Leader: _____
(Signature and Date)

Refuge Supervisor: _____
(Signature and Date)

Regional Chief: _____
(Signature and Date)

Compatibility Determination – Horseback Riding

Use

Horseback Riding

Refuge Name

Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge (Monument)

Establishing and Acquisition Authorities

The Saddle Mountain National Wildlife Refuge (24,000 acres) was established on November 30, 1971, through a permit with the Department of Energy and under the authority of the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742(a)-754).

The Hanford Reach National Monument (195,000 acres), which includes the Saddle Mountain National Wildlife Refuge, was established on June 9, 2000, through Presidential Proclamation 7319 under the authority of the Antiquities Act of 1906.

Refuge Purposes

National wildlife refuges are established ". . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . ." (16 U.S.C. §742f(a)(4)) and also ". . . for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude . . ." (16 U.S.C. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

The Monument was established ". . . for the purpose of protecting the objects identified above [riparian, aquatic and upland shrub-steppe habitats; native plant and animal species; free-flowing, non-tidal stretch of the Columbia River; shrub-steppe ecosystems; breeding populations of birds; habitat for migratory birds; mammals; insect populations; geological and paleontological objects; Archaeological and historic information] . . ." (Monument Proclamation 7319, dated June 9, 2000).

National Wildlife Refuge System Mission

The mission of the National Wildlife Refuge System (NWRS) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use

While not one of the six wildlife dependent public uses listed or identified in the National Wildlife Refuge System Administration Act, as amended (1997), horseback riding is an existing use on the Monument that can facilitate wildlife observation, but is not necessary to achieve it. Historically, horseback riding (on roads and cross-country) has occurred on the Ringold, Saddle Mountain, and Wahluke Units.

As proposed, horseback riding would only be allowed on roads open to vehicular travel, designated administrative roads, and designated trails on the Ringold, Saddle Mountain, and Wahluke Units. Presently, most use occurs in the spring and fall months, and it is anticipated that use patterns would be similar if horseback riding is designated as a compatible activity. Currently the Monument has no hard numbers on how many user days can be attributed to this activity; however, use appears to occur only seasonally and infrequently.

Availability of Resources

Costs to appropriately develop horseback riding, included signing, required maintenance and rehabilitation, monitoring, and parking lot improvements, would be moderate. The direct costs for road maintenance would be minimal, with road maintenance and monitoring for other public use activities covering all costs. Base funding is available to cover staff costs.

Activity or Project	One Time Expense	Recurring Expense
Development and Accessibility Improvements	$25,000	$5,000
Maintenance		$25,000
Program Operations/Monitoring		$15,000
Totals	***$25,000***	***$45,000***

Anticipated Impacts of the Use

Impacts related to horseback riding range from exotic plant seed dispersal (Beck 1993, Hammitt and Cole 1987) in horse coats, soil compaction and erosion (Bainbridge 1974, Hendee et al. 1990, Hammitt and Cole 1987), stream sedimentation (Wilson and Seney 1994), trail widening (Whitaker 1978), vegetation trampling (Nagy and Scotter 1974, Weaver and Dale 1978, Whitaker 1978), aesthetic concerns relative to horse manure (Lee 1975), and direct wildlife disturbance (Owen 1973), to direct and indirect conflicts with other recreationists. Exotic plants can also be spread to new sites through forage (e.g., hay brought in to feed horses, which contains seeds of exotic plants) and manure (Beck 1993).

Exotic plant establishment is further facilitated by increased trail disturbance, as many exotic plants gain a competitive advantage in highly disturbed sites. This soil disturbance is often created through soil compaction.[226] Additionally, hoof action tends to dig up and puncture the soil surface (McQuaid-Cook 1978), which causes greater sediment loss than any other form of recreational trail use (Seney and Wilson 1991) and increases the potential for disturbance-tolerant vegetation (e.g., exotic plant) establishment. Vegetation impacts can be much more pronounced than from that of hikers, who tend to flatten vegetation while horses tend to churn up soil, thus cutting plants off at the rootstalk (Whitaker 1978). This can increase the spread of previously established exotics by providing loose, disturbed soil for germination and spreading reproductive plant structures. This impact initially increases exotic plant encroachment with light to moderate trail use and eventually lowers species richness values to near zero with heavy impacts (Hendee et al. 1990).

Trail widening is also a consideration as horses tend to walk on the down slope sides of trails (Whitson 1974). Anticipated results of a wider trail include a much wider area of disturbance and ongoing trail maintenance problems.

Possible biological impacts of horseback riding are disturbance to wildlife and habitat. Wildlife can be affected through the sight and sound of recreationists (Boyle and Sampson 1985). Some of the effects of disturbance to wildlife from recreational activities include changes in foraging behavior; reduction of productivity; abandonment or alteration of breeding territories; alteration of animal distribution; alteration of flight behavior; energy depletion; and disruption of nest and brood rearing attentiveness (Klein 1989, Knight and Skagen 1988).

Wildlife disturbance relative to horseback riding has been poorly studied, with most references using other activities such as hiking and cross-country skiing to infer horseback riding impacts. Only one study identified disturbance tolerance of waterfowl to horseback riders and found that horseback riders could approach geese up to a distance of 150 feet. This is compared to suggested hiking trail distances of 250 feet (Miller et al. 1998) and boat buffers ranging from 250 to 900 feet (depending on type of

[226] Horse hooves can produce as much as 1,500 pounds per square inch of pressure exerted on the soil surface with each step (Hendee et al.1990).

boat, whether motorized, and species impacted; Burger et al. 1999). The 150-foot approach distance offered by Owen (1973) is consistent with observations suggesting that horseback wildlife observers can approach wildlife at closer distances than through other forms of travel. Many wildlife species appear to be habituated to livestock and thus are less likely to flee when approached through this method. However, any form of approach is expected to cause some disturbance, which will vary according to the species affected and the type, level, frequency and duration of disturbance, as well as the time of day or year that it occurs.

In addition to direct impacts to wildlife, habitat can be affected through vegetation trampling, soil compaction and erosion (Cole 1983, 1990). Public use activities can also have adverse impacts on vegetation and soil conditions. Impacts from vegetation trampling can lower species richness, decrease ground cover and density of plant species, increase species diversity through an increase in weedy annuals, and induce changes in species composition (Grabherr 1983, Bright 1986, Bonanno 1992).

The extent of impacts from horseback riding varies. Horseback riding in the spring may contribute to short-term, albeit moderate to severe, disturbances of ground nesting birds. At other times of the year, wildlife would likely not experience significant impacts from disturbance. Impacts to native vegetation would occur from horses as they moved over the landscape and could be extensive depending on the amount of use and the time of year. Noxious weeds could be spread further into shrub-steppe habitat from either on-site weed sources or from horse droppings; vegetation maintenance (noxious weeds and native plants) along roads and trails would be less problematic than treating new or managing existing weed sources out on the landscape. Overall, disturbances along trails and roads and out on the landscape will result in minor impacts to resident wildlife but may have long-term impacts such as noxious weed spread and infestation.

Public Review and Comment

This Compatibility Determination was prepared concurrent with the Monument's CCP/EIS. Open houses were held and written comments were solicited from the public during the scoping period for the Monument's CCP/EIS. Public review and comment were solicited during the draft CCP/EIS comment period.

Determination

_____ The use is not compatible.

__X__ The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

At present, horseback riding on the Monument is unmonitored, and the impacts to wildlife and associated habitat are unknown. However, use is relatively low, and most occurs during cooler months when wildlife is not as active or when disturbance is not as likely to be detrimental (i.e., during breeding or nesting seasons). However, as stated by the anticipated impacts described in the previous section, any increased or unrestricted horseback riding could lead to impacts on wildlife resources through exotic seed encroachment, vegetative trampling, erosion, and wildlife disturbance. These impacts would be cumulative with associated impacts from other public use opportunities. Therefore, in order to ensure the compatibility of this use, the following stipulations would be necessary.

- Horseback riding must be restricted to certain areas (e.g., roads open to vehicular travel, administrative roads, dedicated or multi-use trails). In these areas, anticipated impacts are not believed to exceed those already induced by vehicles and foot travel associated with other public use activities.

- Any horseback riding area would be subject to seasonal closures based on the presence of sensitive wildlife populations.

- Horse trailers would be restricted to designated parking areas listed in the Monument brochure and posted on site.

- Horseback riding would be a day-use only.

- Designated horseback riding areas would be signed at both ends and at regular intervals throughout the length of the road/trail. Riders would be required to ride single-file.

- A maximum number of riders per party, day, or season will be established through a step down plan.

- A system to monitor the level of use and vegetation damage and impact along roadsides, designated parking areas, and trails would need to be established.

- The activity could be reduced or closed with the finding of significant negative impacts to Monument facilities or natural and cultural resources.

Justification

While not listed as a primary, wildlife-dependent recreational use under the National Wildlife Refuge System Administration Act, as amended, horseback riding is believed to be a compatible public use under the stipulations outlined in this compatibility determination. The primary reasons for this determination include:

1) Wildlife observation can be an element of horseback riding.

2) Horseback riding allows the U.S. Fish and Wildlife Service (FWS) to reach a target audience that would not be reachable through any other opportunity; horseback riders are potential partners and a potential source of support for the Monument.

3) Impacts associated with horseback riding are not believed to exceed impacts already caused by other public use activities in select areas.

It is understood from the summary of anticipated impacts that many elements of the horseback riding program have the potential to detract from the FWS's ability to achieve Monument purposes. These impacts will be monitored and if they, or any as yet not considered impacts are discovered, this compatibility determination would be reevaluated.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

__X__ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

_____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____ Categorical Exclusion without Environmental Action Statement.

_____ Categorical Exclusion and Environmental Action Statement.

_____ Environmental Assessment and Finding of No Significant Impact.

__X__ Environmental Impact Statement and Record of Decision.

References

Bainbridge, D.A. 1974. Trail management. Ecological Society of America Bulletin 55:8-10.

Beck, K.G. 1993. How do weeds affect us all. Proceedings of the Eighth Grazing Lands Forum. Washington, District of Columbia. December 2, 1993, pages 5-13.

Bonanno, S.E. 1992. Vegetation of a Lake Ontario dune barrier, Oswego and Jefferson Counties, New York, under high and low recreation pressure. Master's thesis. Syracuse State University, New York. 88 pages.

Boyle S.A., and F.B. Samson. 1985. Effects of non-consumptive recreation on wildlife: A review. Wildlife Society Bulletin 13:110-116.

Bright, J.A. 1986. Hiker impact on herbaceous vegetation along trails in evergreen woodland of central Texas. Biological Conservation 36:53-69.

Burger, J., B. Harrington, J. Rodgers, and H. Smith. 1999. Minimum recommended set-back (RS) distances for various disturbances approaching directly towards waterbirds to prevent flushing.

Cole, D.N. 1983. Campsite conditions in the Bob Marshall Wilderness, Montana. Research Paper INT-312. U.S. Department of Agriculture, Forest Service, Intermountain Forestry and Range Experimental Station. 18 pages.

Cole, D.N. 1990. Ecological impacts of wilderness recreation and their management. Pages 425-466 *in* Wilderness Management (J.C. Hendee, G.H. Stankey, and R.C. Lucas, editors). North American Press, Golden, Colorado.

Grabherr, G. 1983. Damage to vegetation by recreation in the Austrian and German Alps. Pages 74-91 *in* The Ecological Impacts of Outdoor Recreation on Mountain Areas in Europe and North America (N.G. Bayfield and G.C. Barrow, editors). Report 9. 203 pages.

Hammitt, W.E., and D.N. Cole. 1987. Wildland Recreation: Ecology and Management. John Wiley and Sons, New York, New York. 341 pages.

Hendee, J.C., G.H. Stankey, and R.C. Lucas. 1990. Wilderness Management. North American Press, Golden, Colorado.

Klein, M.L. 1989. Effects of high levels of human visitation on foraging waterbirds at J.N. "Ding" Darling National Wildlife Refuge, Sanibel, Florida. Final Report to the U.S. Fish and Wildlife Service. 103 pages.

Knight, R.L., and S.K. Skagen. 1988. Effects of recreational disturbance on birds of prey: A review. Pages 355-359 *in* Proceedings of the Southwest Raptor Management Symposium Workshop. National Wildlife Federation, Washington, District of Columbia.

Lee, R.G. 1975. The management of human components in the Yosemite National Park ecosystem. Yosemite National Park, California. 134 pages.

McQuaid-Cook, J. 1978. Effects of hikers and horses on mountain trails. Journal of Environmental Management 6:209-212.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

Nagy, J.A.S., and G.W. Scotter. 1974. A quantitative assessment of the effects of human and horse trampling on natural areas, Waterton Lakes National Park. Canadian Wildlife Service, Edmonton, Alberta, Canada. 145 pages.

Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130.

Weaver, T., and D. Dale. 1978. Trampling effects of hikers, motorcycles, and horses in meadows and forests. Journal of Applied Ecology 15:451-457.

Whitson, P.D. 1974. The impact of human use upon the Chisos Basin and adjacent lands. National Park Service.

Whittaker, P.L. 1978. Comparison of surface impact by hiking and horseback riding in the Great Smoky Mountain National Park. National Park Service Management Report 24.

Wilson, J.P., and J.P. Seney. 1994. Erosional impact of hikers, horses, motorcycles, and off-road bicycles on mountain trails in Montana. Mountain Research and Development 14(1): 77-88.

Signatures

Monument Project Leader: _____
(Signature and Date)

Refuge Supervisor: _____
(Signature and Date)

Regional Chief: _____
(Signature and Date)

Compatibility Determination – Hunting

Use

Hunting (Big Game, Waterfowl, and Upland Game Birds)

Refuge Name

Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge (Monument)

Establishing and Acquisition Authorities

The Saddle Mountain National Wildlife Refuge (24,000 acres) was established on November 30, 1971, through a permit with the Department of Energy and under the authority of the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742(a)-754).

The Hanford Reach National Monument (195,000 acres), which includes the Saddle Mountain National Wildlife Refuge, was established on June 9, 2000, through Presidential Proclamation 7319 under the authority of the Antiquities Act of 1906.

Refuge Purposes

National wildlife refuges are established ". . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . ." (16 U.S.C. §742f(a)(4)) and also ". . . for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude . . ." (16 U.S.C. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

The Monument was established ". . . for the purpose of protecting the objects identified above [riparian, aquatic and upland shrub-steppe habitats; native plant and animal species; free-flowing, non-tidal stretch of the Columbia River; shrub-steppe ecosystems; breeding populations of birds; habitat for migratory birds; mammals; insect populations; geological and paleontological objects; Archaeological and historic information] . . ." (Monument Proclamation 7319, dated June 9, 2000).

National Wildlife Refuge System Mission

In the NWRS Improvement Act, the United States Congress declared hunting one of six wildlife-dependent public uses of the NWRS. If determined compatible, hunting would become a priority public use for the Monument.

Description of Use

Hunting on the Ringold, Saddle Mountain and Wahluke Units, shorelines of the Columbia River Islands between river miles 343-351, and shorelines of the Columbia River Corridor[227]

The U.S. Fish and Wildlife Service (FWS) proposes to allow hunting of resident game and migratory waterfowl within Washington Department of Fish and Wildlife (WDFW) established seasons, bag limits, and species sanctuaries. Hunting on these areas for specific species generally begins September first and ends on the third weekend in January. The longest continuous species-specific hunting seasons during this time are waterfowl (second weekend in October to the third weekend in January) and upland birds (October-January); the shortest seasons are dove (first two weeks of September) and deer and elk (selected seven- to thirty-day periods in September, October and November/December, depending on the area and weapon used).

Species That Can Be Hunted On The Monument[228]

- California Quail
- Chukar
- Gray (Hungarian) Partridge
- Mourning Dove
- Ring-necked Pheasant
- Snipe
- Coot
- Ducks (All Species)
- Geese (Brant, Canada, Snow)
- Deer (White-tailed and Mule)
- Elk

[227] Currently, hunting of differing species is allowed in what would be the north shore of Columbia River Corridor Unit (east of the fence marking the Saddle Mountain National Wildlife Refuge), Ringold Unit, Saddle Mountain Unit, and eastern half of the Wahluke Unit.

[228] In accordance with Washington State hunting regulations and subject to certain restrictions as noted elsewhere. For example, waterfowl hunting is not allowed within 1/4-mile of the Columbia River between the Vernita Bridge and the old Hanford town site wooden (tower) powering. Please refer to the WDFW hunting regulations for full details. Species not identified here cannot be hunted.

Hunting as a Population Control Measure

As one of several measures proposed to control wildlife population numbers in the event of overpopulation, hunting of the target species by the public at-large or by identified groups could be implemented. At this time, the only wildlife population creating socio-economic concerns is the Rattlesnake Hills Elk Herd; hunting to address those concerns is included in this Compatibility Determination. Elk population-control hunting on the Rattlesnake Unit is included in Alternative C of the CCP/EIS.

Under the potential action, the FWS and WDFW would conduct a heavily regulated elk hunt on the Rattlesnake Unit.[229] This potential action was developed in response to the WDFW's request for assistance in cooperative management of the Rattlesnake Hills Elk Herd (see Chapter 3 of the CCP/EIS, Section 3.21.2, for a description of the elk herd).[230] The potential regulated elk hunt would be part of a three-tiered approach to elk management.[231]

Availability of Resources

The Monument requires additional staff and funding to administer the current hunting program. All or portions of the (new) Columbia River Corridor, Ringold, Saddle Mountain, and Wahluke Units have been open to hunting (by the state of Washington) from 1971-1999; these areas have remained

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[229] The DOE has determined that hunting in the Rattlesnake Unit is not consistent with its current mission. As the mission of the DOE changes, or as the current ownership situation changes, hunting may be desirable and possible for elk population management.

[230] The Rattlesnake Hills Elk Herd population objective is equal to or less than 350 elk (WDFW 2002). The current population estimate is approximately 639 elk, based on 2007 surveys.

[231] The initial tier would include a state-regulated, limited-permit, modern-firearms hunt with a maximum of ten permits issued per designated hunting period. The number of permits per hunting period, number and length of hunt periods, and types of animals to be taken (cow, spike, bull, etc.) would be determined by the FWS in consultation with the WDFW annually, based on harvest data from proceeding years and winter aerial survey results.

If the regulated population control hunts on the Rattlesnake Unit—in combination with landowner access permits issued to private landowners by the WDFW, special permits, and the general elk hunting season—did not reduce herd numbers to management goals, then the FWS could proceed to a second-tier action. This would involve a trapping and relocation of elk in a quantity and composition (i.e., bull, spike, cow, calf) at least sufficient to meet management goals.

If management goals could not be met due to lack of funding, herd health issues, and/or a lack of release sites for captured animals, then the Monument could proceed to a third-tier action. This third tier would involve a management cull (elk removed by qualified FWS/WDFW personnel).

Any of these actions can be used in combination to control populations. As the final two tiers are an FWS-authorized management activity, they are not subject to a compatibility determination.

open to hunting since the Monument was established. Access trails, parking lots, signs and other facilities are inadequate, as well as are staff resources, to enforce regulations and maintain these facilities. Funding associated with facilities (roads, parking areas, signs, etc.) maintenance are included in other refuge programs requiring the same support.

Position & GS Level	Involvement	FTE	Recurring Expense
Project Leader/Deputy Project Leader (GS 13/14)	Oversight Coordination with the WDFW; Program Management	0.05	$9,000
Wildlife Biologist (GS-11)	Elk Monitoring; Reporting; Hunt Plan Updates; Coordination; Program Management	0.23	$17,750
Law Enforcement (GS-09)	Coordination with WDFW Law Enforcement; Field Monitoring of Hunters	0.33	$21,000
Recreation Planner (GS-11)	Outreach; Briefings	0.20	$18,000
Total Annual FTEs and Cost (Not Including Elk Population Control)		***0.81***	***$65,750***

Anticipated Impacts of the Use

Hunting has given many people a deeper appreciation of wildlife and a better understanding of the importance of wildlife and habitat conservation, which ultimately contributes to the NWRS mission. Furthermore, a goal of the Monument is to provide opportunities for quality wildlife-dependent recreation. By law, hunting is one of the six priority public uses of the NWRS.

Hunting, by its nature, results in the intentional take of individual animals, as well as wounding and disturbance (DeLong 2002). It can also alter behavior (e.g., foraging time), population structure, and distribution patterns of wildlife (Owens 1977, Raveling 1979, White-Robinson 1982, Thomas 1983, Bartelt 1987, Madsen 1985, and Cole and Knight 1990).

Harvest data are reported by hunters to WDFW and season and bag limits are adjusted accordingly to ensure that overall populations of game species remain healthy into the future. While hunter use of these areas has not been closely monitored, we would expect hunter numbers to increase over the next fifteen years. Impacts will be monitored, and, if necessary, additional measures would be developed in coordination with WDFW to protect Monument resources.

Ringold, Saddle Mountain and Wahluke Units

There will be over 67,000 acres available for hunting in these units.[232] Even though there is the potential of having hunters on either the Wahluke or Saddle Mountain Units, or both, every day of the week from September through January, they are dispersed across the landscape (upland bird and big game hunting), more concentrated where target species are more likely to occur (waterfowl hunting), and/or more populous on weekends (any species) and opening and closing days of specific seasons (deer hunting). Additionally, access into the majority of both units is from peripheral roads and parking areas, with access to more remote areas by foot only. While hunting in these units may affect non-target species through disturbance and shooting, there will be areas where little or no disturbance occurs.

Shorelines of the Columbia River Corridor and Islands Between River Miles 343-351

All activities below the mean high water level are regulated by the state of Washington.

Shoreline hunting allows the hunters direct access to the river, bays and sloughs and islands. Access to Columbia river shorelines would be by foot or boat. Land access would be from Parking Lots 1-7 and hunters would either hike cross-country or on established trails to the shoreline. Waterbird and waterfowl use of these areas varies seasonally, as does hunter presence. Waterfowl are prevalent on the river in the winter, especially when surrounding wetlands freeze. Bald eagles roost sites occur within the hunting area, with eagles more common in winter months. The nesting period identified in the Bald Eagle Recovery Plan identifies January 1 as the beginning of the nesting season when special protective measures should begin (FWS 1986). With a waterfowl hunting sanctuary located upstream of the wooden powering crossing at the old Hanford Townsite, hunting areas along the Hanford Reach have very little overlap with bald eagle nesting habitat. Heron rookeries occur along the river corridor. Based on the literature there may be some disturbance to rookeries during the early part of the hunting season as young birds could still be in the vicinity. In the middle to later part of the hunting season, no disturbance is anticipated.

Islands within the Hanford Reach are characterized by significant cultural resources. Access to islands above the mean high water mark has the potential to adversely impact cultural resources. No access will be permitted above the mean high water mark.

Rattlesnake Unit

There would be approximately 42,000 acres (52% of the Rattlesnake Unit) available for elk population control hunting. At no time would all of the hunting area have hunters on it. Depending on where the elk are located and the time of year hunting occurs, it is anticipated that less than 25% of the 42,000

[232] Areas in the current Saddle Mountain National Wildlife Refuge (west end of the Wahluke Unit) cannot be opened to any public use until released by the Department of Energy from safety buffer restrictions.

acres would have reoccurring hunting. A maximum of ten hunters will be allowed to use the Monument in any one day. Because of the open nature of the landscape, larger numbers of hunters could impact elk distribution and behavior with subsequent reduced elk harvest rates. Hunting periods would only be implemented when there is a high likelihood of harvesting elk. For these reasons and those listed below, it is anticipated that there will be none or very little hunting on the Rattlesnake Unit in either the early or late parts of the hunting season. It is likely that more effort will be expended in controlled hunting during the winter months (December-February) to maximize elk harvest and minimize any impacts.

In addition to the death of individual elk, some short-duration disturbance is expected to the elk herd. However, as noted above, the Monument's primary purpose in implementing this action is to assist the WDFW in controlling the population of the Rattlesnake Hills Elk Herd.[233] Controlling the numbers of elk also may help to maintain the biological integrity, diversity and environmental health of the Monument as a whole if numbers were to become too great for the forage available.

Hunting may affect other species in the hunting area, including mule deer, coyotes and various bird species. Elk hunters can be expected to disturb other species by their movements and shooting activities in the field. Even though there is the potential of having hunters on the Rattlesnake Unit from September-April, the limited acreage open to hunt would limit the disturbance factor. Nearby resting and feeding areas would be available for use by other refuge species that are disturbed. These species would likely move to other areas of the unit which are less accessible to the hunters or are not designated hunting areas. Due to the limited hunting areas, effects to vegetation would be localized and are anticipated to be minor.

Effects to other public uses are expected to be minimal due to the location of the hunt, which would be on the interior of the Rattlesnake Unit, which currently is otherwise closed to public use. Some noise from the firearms may be experienced by the public driving along State Route 240, but this is unlikely as most hunting will occur within the interior of the unit, far removed from public roads. The public traveling on State Route 240 may occasionally observe elk or other wildlife species flushed into the open due to hunter activity. Again, due to the limited hunt area and distance from public roads, all effects are expected to be minor and of short duration.

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[233] Options for controlling the size of the elk herd are limited due to state of Washington concerns regarding relocation of animals, limited funds for moving elk, and social tolerances for a government cull. For detailed information concerning a description of affected habitats and wildlife and the environmental consequences of the proposed action, the reader may reference Chapters 3 and 4 of the EIS.

Public Review and Comment

This Compatibility Determination was prepared concurrent with the Monument's CCP/EIS. Open houses were held and written comments were solicited from the public during the scoping period for the Monument's CCP/EIS. Public review and comment were solicited during the draft CCP/EIS comment period.

Determination

_____ The use is not compatible.

__X__ The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

Monument hunting programs will be designed to provide high-quality experiences. A quality hunt experience means that: 1) hunters are safe; 2) hunters exhibit high standards of ethical behavior; 3) hunters are provided with uncrowded conditions; 4) hunters have reasonable harvest opportunities; 5) hunters are clear on which areas are open and closed to hunting; and 6) minimal conflicts occur between hunters and other visitors, especially those engaging in other wildlife-dependent priority public uses. The seven-day-per-week recreational hunting program proposed on the Columbia River Corridor, Ringold, Saddle Mountain and Wahluke and Units, and the potential limited-entry, population-control elk hunt on the Rattlesnake Unit, would include the following management actions and/or restrictions to reduce impacts:

- The existing WDFW waterfowl sanctuary on the Columbia River (from the Vernita Bridge downstream to the wooden power lines, a locally known landscape feature) will be maintained.

- A sanctuary from hunting on the Rattlesnake (except for the potential population control elk hunt) and western end of the Wahluke Units will be maintained.

- Sufficient escape, feeding and resting habitat for wildlife in both open and closed areas will be provided.

- Periodic biological and social monitoring—and evaluation of hunting programs, including feedback from users—will be conducted to determine if objectives are being met.

- All hunting on the Monument would require the appropriate state license and tag and would occur consistent with applicable state regulations.

- Waterfowl hunting would be allowed at the WB-10 Ponds, along the shoreline of the Columbia River between Parking Lots 1 and 7, and below the mean high water level on islands between river miles 343-351.[234]

- Only non-toxic shot is allowed for upland birds and migratory waterfowl.

- Per Department of Energy (DOE) restrictions, no centerfire rifles are allowed for big game hunting, and only shotguns, muzzleloaders, and archery are allowed for taking elk or deer on these units.

- Hunters will use existing open roads and parking areas to access hunting sites, and all hunting will be conducted on foot.

- Hunter compliance with current migratory bird, upland and big game hunting and Monument regulations would be achieved through a combination of printed information (WDFW and Monument), signs, outreach efforts, and enforcement of regulations by FWS, WDFW or other law enforcement officers.

- Camping, overnight use, and fires are prohibited.

- Construction of pit blinds is not permitted.

Stipulations Specific to the Rattlesnake Unit

- Population-control hunting will be by permit only.

- Only modern firearms can be used, with safety zones/no access zones established near roads, facilities, sensitive habitats and research areas.

- Any hunt must be coordinated with ongoing FWS and DOE research, monitoring, management, and education activities and hunts can be suspended at any time.

- Hunting activities will take place in the interior of the Rattlesnake Unit to minimize/eliminate movement towards public roads and Central Hanford.

- A maximum of ten hunters will be allowed to use the Monument in any one day, with one hunting period consisting of one month (Monday through Friday only).

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[234] Primary jurisdiction below the mean high water mark along Columbia River shorelines within the Monument lies with the state of Washington. Primary jurisdiction within the easement associated with the WB-10 Ponds, Saddle Mountain Lake, and irrigation return wasteways is administered by the Bureau of Reclamation.

- One person per permitted hunter will be allowed to assist the hunter during the hunt.
- Additional help may be allowed to retrieve an elk.
- Timing will generally coincide with hunting seasons established by the WDFW.
- The WDFW will publish the hunting dates, number of permits to be issued, and other regulations in the Washington State's Big Game Hunting pamphlet. This information may also be obtained by contacting the Monument headquarters.
- All elk population control hunters must attend an FWS-led orientation each year prior to hunting. The orientation would cover rules and regulations specific to the population control hunt and to Rattlesnake Unit access in general. Orientation material would be designed to facilitate a successful hunt while minimizing impacts to sensitive resources on the Rattlesnake Unit.
- Hunters must sign in and out each day they hunt.
- Hunters must report success/failure and any hit-but-not-retrieved animals when they sign out each day.
- Hunting is on Mondays through Fridays only.
- Initial hunts may utilize Native Americans and the Advanced Hunter Education Program to provide for tribal use and help minimize the chances of missed shots and impacts on other species.
- Hunters are only allowed to operate motorized vehicles on designated roads and parking areas.
- No camping is allowed.
- No open fires or flames are allowed.

Justification

When determined compatible, hunting is one of the six priority public uses of the NWRS. National wildlife refuge hunting programs are designed to provide high-quality experiences. In general, hunting on national wildlife refuges should be superior to that available on other private or public lands, which may require special restrictions (Refuge Manual 8). Measures are often used to ensure quality, including limited hunt days and shell limits and using buffers for public use trails, eliminating the need for seasonal trail closures.

Providing a quality hunting program contributes to achieving one of the Monument's goals. The limited hunt program is proposed on the Monument to provide a quality hunting experience that meets Monument guidelines and policies. This program as described was determined to be compatible, in view of the potential impacts that hunting can have on the FWS's ability to achieve Monument purposes and goals.

It is anticipated that an adequate amount of quality, non-hunted and closed habitat would be available to both hunted and non-hunted wildlife because: 1) some high wildlife use areas will remain closed; and 2) some high wildlife use areas open to hunting will be hunted infrequently or not at all due to the walking distance required. A program will be implemented to monitor wildlife populations numbers and habitats in both open and closed areas.

It is anticipated that wildlife populations will find sufficient food resources and resting places such that their abundance and use of the Monument will not be measurably lessened from hunting activities. The relatively limited number of individuals expected to be removed from wildlife populations due to hunting will not cause wildlife populations to materially decline, the physiological condition and production of hunted species will not be impaired, their behavior and normal activity patterns will not be altered dramatically, and their overall welfare will not be negatively impacted.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

_____ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

_X_ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____ Categorical Exclusion without Environmental Action Statement.

_____ Categorical Exclusion and Environmental Action Statement.

_____ Environmental Assessment and Finding of No Significant Impact.

_X_ Environmental Impact Statement and Record of Decision.

References

Bartelt, G.A. 1987. Effects of disturbance and hunting on the behavior of Canada goose family groups in east central Wisconsin. Journal of Wildlife Management 51:517-522.

Cole, D.N., and R.L. Knight. 1990. Impacts of recreation on biodiversity in wilderness. Utah State University, Logan, Utah.

DeLong, A.K. 2002. Managing visitor use and disturbance of waterbirds – A literature review of impacts and mitigation measures. Prepared for Stillwater National Wildlife Refuge. Appendix L (114 pages) *in* Stillwater National Wildlife Refuge Complex Final Environmental Impact Statement for the Comprehensive Conservation Plan and Boundary Revision (Volume II). Department of the Interior, Fish and Wildlife Service, Region 1, Portland, Oregon. Available at www.fws.gov/stillwater/litreview.

Korschgen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Liddle, M.J., and H.R.A. Scorgie. 1980. The effects of recreation on freshwater plants and animals: A review. Biological Conservation 17:183-206.

Madsen, J. 1985. Impact of disturbance on field utilization of pink-footed geese in West Jutland, Denmark. Biological Conservation 33:53-63.

Owens, N.W. 1977. Responses of wintering brant geese to human disturbance. Wildfowl 28:5-14.

Raveling, D.G. 1979. The annual cycle of body composition of Canada geese with special reference to control of reproduction. Auk 96:234-252.

Thomas, V.G. 1983. Spring migration: The prelude to goose reproduction and a review of its implication. Pages 73-81 *in* Fourth Western Hemispheric Waterfowl and Waterbird Symposium (H. Boyd, editor). Canadian Wildlife Service, Ottawa, Canada.

White-Robinson, R. 1982. Inland and salt marsh feeding of wintering brent geese in Essex. Wildfowl 33:113-118.

Wolder, M. 1993. Disturbance of wintering northern pintails at Sacramento National Wildlife Refuge, California. M.S. Thesis. Humboldt State University, Arcata, California. 62 pages.

U.S. Fish and Wildlife Service. 1986. Pacific bald eagle recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 160 pages.

Washington Department of Fish and Wildlife. 2001. Priority species and habitats list. Available at www.wa.gov/wdfw/hab/phsvert.htm#birds.

Signatures

Monument Project Leader: _____
(Signature and Date)

Refuge Supervisor: _____
(Signature and Date)

Regional Chief: _____
(Signature and Date)

Compatibility Determination – Research & Management Studies

Use

Research and Management Studies

Refuge Name

Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge (Monument)

Establishing and Acquisition Authorities

The Saddle Mountain National Wildlife Refuge (24,000 acres) was established on November 30, 1971, through a permit with the Department of Energy and under the authority of the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742(a)-754).

The Hanford Reach National Monument (195,000 acres), which includes the Saddle Mountain National Wildlife Refuge, was established on June 9, 2000, through Presidential Proclamation 7319 under the authority of the Antiquities Act of 1906.

Refuge Purposes

National wildlife refuges are established ". . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . ." (16 U.S.C. §742f(a)(4)) and also ". . . for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude . . ." (16 U.S.C. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

The Monument was established ". . . for the purpose of protecting the objects identified above [riparian, aquatic and upland shrub-steppe habitats; native plant and animal species; free-flowing, non-tidal stretch of the Columbia River; shrub-steppe ecosystems; breeding populations of birds; habitat for migratory birds; mammals; insect populations; geological and paleontological objects; Archaeological and historic information] . . ." (Monument Proclamation 7319, dated June 9, 2000).

National Wildlife Refuge System Mission

The mission of the National Wildlife Refuge System (NWRS) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use

Two provisions of the National Wildlife Refuge Improvement Act are to "maintain biological integrity, diversity and environmental health" and to conduct "inventory and monitoring." Refuge plans and actions based on research and monitoring provide an informed approach to habitat, wildlife, and public use programs. Research on fish, wildlife, habitat and visitor use is an existing use on the Monument and is conducted by independent researchers and partnering agencies. Some research is used to address basic wildlife conservation questions, such as survival of federally listed endangered and threatened juvenile salmon stocks in the Columbia River System. Other research is more specific to Monument management and resources and is used in an adaptive way to refine habitat, wildlife and public use management programs.

The U.S. Fish and Wildlife Service (FWS) receives several proposals each year to conduct research on the Monument. Research applicants are required to submit a proposal that outlines:

1) The objectives of the study;

2) A justification for the study;

3) A detailed methodology and schedule;

4) The potential impacts on wildlife or its habitat, including disturbance (short- and long-term), injury, or mortality (including a description of measures the researcher will take to reduce disturbance or impacts);

5) The research personnel required;

6) Costs to the FWS, if any; and

7) A time line for submitting progress reports and final products (i.e., reports, theses, dissertations, publications).

Research proposals are reviewed by Monument staff. If the proposal is approved, a Special Use Permit(s) is/are issued by the Project Leader. Evaluation criteria and specific provisions for approval of studies includes, but is not limited to, the following list. Future research proposals will also be

subject to these criteria and provisions. This would also apply to any properties acquired in the future within the approved boundary of the Monument.

- Research that contributes to specific Monument management issues is given a higher priority over other research requests.
- Research that conflicts with other ongoing research, monitoring, or management programs will not be granted.
- Research projects that can be accomplished off the Monument are less likely to be approved.
- Research which causes undue disturbance or is intrusive is not likely to be granted.
- The level and type of disturbance will be carefully evaluated when considering a request. Strategies to minimize disturbance through study design, including location, timing, scope, number of permittees, study methods, number of study sites, etc, will be encouraged.
- If staffing or logistics make it impossible for the Monument to monitor the researcher, the permit is likely to be denied.
- If the activity is in a sensitive area, the research request may be denied, depending on the specific circumstances.
- The length of the project will be considered and agreed upon before approval.
- Projects will be reviewed annually.

Special Use Permits would be issued for monitoring and investigations which contribute to the enhancement, protection, preservation, management of native plant and wildlife populations and their habitats, public use, and other important resources, especially as they relate to Monument lands and management activities. Other proposals (e.g., physics research) would be subject to even stricter considerations of the potential impacts to wildlife and its habitats, geological resources, cultural resources, aesthetics and visitor use and enjoyment.

Availability of Resources

The following funding would be required to administer and manage research activities as described above. No special equipment, facilities, or improvements are anticipated. Current budget allocations are sufficient to administer and manage this use.

Activity or Project	*One Time Expense*	*Recurring Expense*
Administration (Evaluation of Applications, Management of Permits, Oversight)		$3,000
Monitoring		$5,000
Totals		**$8,000**

Anticipated Impacts of the Use

Use of the Monument to conduct research will generally benefit public use, plant populations, fish, wildlife and habitat and contribute to the recovery of listed threatened and endangered species. Research investigations would be used to assist in managing Monument habitats to aid in recovery efforts and long-term habitat viability. Specific restoration and habitat management questions would be addressed through research investigations, such as the burrowing owl and pygmy rabbit studies currently being conducted. Additionally, research investigations would address public use impacts on natural resources or conflicts among public uses.

An expected short-term effect of monitoring and research investigations is that Monument management activities would be modified to improve public use and habitat and wildlife populations as a result of new information. Expected long-term and cumulative effects include a growing body of science-based data and knowledge as new/continued monitoring and new/continued research compliments and expands upon previous investigations. This body of data and information would contribute towards the best Monument management possible.

Direct damage or alteration to the habitat from researchers would be minor due to the research proposal evaluation process, Monument monitoring, and stipulations imposed through the Special Use Permit. However, some increase in invasive plants is possible from ground disturbance and/or transportation of source seed on research equipment and personnel. Likewise, there would be the localized and temporary effects resulting in direct impacts of vegetation trampling, collecting of soil and plant samples, or trapping and handling of wildlife. Other potential, but localized and temporary, effects would include wildlife disturbance, which is expected with some research activities, especially where researchers are entering sanctuaries or sensitive islands with colonial nesting birds. Researcher disturbance could result in altering wildlife behavior. However, most effects would be short-term. Only the minimum of samples (e.g., water, soils, vegetative litter, plants, macroinvertebrates) required for identification and/or experimentation and statistical analysis would be permitted. Captured animals would be handled, marked and released in a humane manner with full consideration to animal welfare.

Few long-term and/or secondary effects should be encountered as the evaluation of research proposals would ensure only those with adequate safeguards to avoid/minimize impacts are allowed. Those research activities with potential impacts would be mitigated/minimized through the implementation

of sufficient restrictions on the Special Use Permit, study design, and researcher activities. Monitoring by Monument staff should also avoid or alleviate impacts. There likely will be no cumulative effects associated with other on-going research and management studies.

Public Review and Comment

This Compatibility Determination was prepared concurrent with the Monument's CCP/EIS. Open houses were held and written comments were solicited from the public during the scoping period for the Monument's CCP/EIS. Public review and comment were solicited during the draft CCP/EIS comment period.

Determination

_____ The use is not compatible.

__X__ The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

If proposed research methods are evaluated and determined to have potential adverse impacts on wildlife or habitat, then the manager will determine the utility and need of such research to conservation and management of wildlife and habitat. If the need is demonstrated by the research permittee, and accepted by the refuge, then measures to minimize potential impacts (e.g., reduce the numbers of researchers entering an area, restrict research in specified areas) will be developed and included as part of the study design and included on the special use permit. Other stipulations and provisions include:

- The criteria for evaluating a research proposal, outlined in the Description of Use section above, will be used when determining whether a proposed study will be approved on the Monument.

- Special use permits will contain specific terms and conditions that the researcher(s) must follow relative to activity, location, duration, seasonality, etc., to ensure continued compatibility. All refuge rules and regulations (CFR 50) must be followed, unless otherwise exempted in writing by Monument management.

- Sensitive wildlife habitat areas will be avoided unless sufficient protection from research activities (i.e., disturbance, collection, capture and handling) is implemented to limit the area and/or wildlife potentially impacted by the proposed research.

- When and where needed, some areas may be temporarily/seasonally closed to researchers; research can be permitted to resume when impacts to wildlife and habitat are no longer a concern.

- Research activities will be modified to avoid harm to sensitive wildlife and habitat when unforeseen impacts arise, such as a wildfire altering landscape conditions or large declines in a population.

- At any time, Monument staff may accompany the researchers to determine potential impacts.

- Removal of all research equipment is required at the end of the study. Failure to remove research "paraphernalia" will result in a principal investigator not being permitted to conduct future scientific studies on refuge/monument lands.

- The FWS receives a copy of the raw data after the study is completed based upon a final report or published paper.

- For long-term ecological study, status reports at regular reporting intervals are required that present preliminary findings and any issues associated with project implementation. The schedule for interim reports also should be presented in the study proposal.

- Sampling equipment will be cleaned before use on the refuges as well as when transported between study sites to eliminate or reduce the spread of invasive species.

Monument staff will monitor researcher activities for compliance with conditions outlined on the Special Use Permit. A Monument manager may determine that previously approved research and Special Use Permits be terminated:

1) If the researcher is out of compliance with permit conditions;

2) To ensure wildlife and habitat protection; and/or

3) To protect visitor and public safety.

Justification

The Monument was created under the provisions of the Antiquities Act of 1906. Under the Antiquities Act, national monuments can be created for one of two reasons: 1) to protect 'antiquities,' as the title implies; or 2) to provide opportunities for research. The Monument was created under the latter provision. As such, there is an expectation that the Monument provide for research. This is in keeping with the long-standing use of the Hanford Nuclear Site (including the Monument) for research. Under Department of Energy (DOE) management, the Fitzner-Eberhardt Arid Lands Ecology Area (ALE)

was/is designated a Research Natural Area (in 1971 via an agreement between the Departments of Energy and Interior) and a National Environmental Research Park (in 1977 by the U.S. Energy Research and Development Administration, a precursor to the DOE). Over the years and under DOE permit, researchers from prestigious institutions like Battelle and the Pacific Northwest National Laboratory and universities like California-Irvine, California Institute of Technology, Idaho, Massachusetts Institute of Technology, Oregon State, Washington, Washington State, and many others have used what are now Monument lands to advance science.

Monitoring and research investigations are also an important component of adaptive management. Standardized monitoring would be used to ensure data compatibility for comparisons from across the landscape.

Natural resource inventories, monitoring and research are not only provisions of the National Wildlife Refuge Improvement Act, but they are necessary tools to maintain biological integrity, diversity and environmental health, which are also key provisions of the act. Inventories, monitoring and research are intended to improve habitat, wildlife populations, biological integrity, diversity and environmental health, and to monitor public use impacts. Monitoring and research will directly benefit and support Monument goals, objectives and management plans and activities, as well as contribute to recovery of endangered/threatened species.

Wildlife-dependent public uses (wildlife viewing and photography, environmental education and interpretation, fishing and hunting) would also benefit as a result of increased biodiversity, wildlife and native plant populations. Monument staff would ensure research projects contribute to the enhancement, protection, preservation and management of wildlife populations and their habitats, thereby helping the Monument fulfill the purposes for which it was established, the mission of the NWRS, and the need to maintain ecological integrity.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

_____ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

__X__ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____ Categorical Exclusion without Environmental Action Statement.

_____ Categorical Exclusion and Environmental Action Statement.

_____ Environmental Assessment and Finding of No Significant Impact.

__X__ Environmental Impact Statement and Record of Decision.

Signatures

Monument Project Leader: _____
(Signature and Date)

Refuge Supervisor: _____
(Signature and Date)

Regional Chief: _____
(Signature and Date)

Compatibility Determination – Interpretation, Environmental Education, Wildlife Observation & Photography

Use

Interpretation, Environmental Education, Wildlife Observation, and Photography[235]

Refuge Name

Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge (Monument)

Establishing and Acquisition Authorities

The Saddle Mountain National Wildlife Refuge (24,000 acres) was established on November 30, 1971, through a permit with the Department of Energy and under the authority of the Fish and Wildlife Act of 1956, as amended (16 U.S.C. 742(a)-754).

The Hanford Reach National Monument (195,000 acres), which includes the Saddle Mountain National Wildlife Refuge, was established on June 9, 2000, through Presidential Proclamation 7319 under the authority of the Antiquities Act of 1906.

Refuge Purposes

National wildlife refuges are established ". . . for the development, advancement, management, conservation, and protection of fish and wildlife resources . . ." (16 U.S.C. §742f(a)(4)) and also ". . . for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude . . ." (16 U.S.C. §42f(b)(1); Fish and Wildlife Act of 1956, 16 U.S.C. §742(a)-754, as amended).

The Monument was established ". . . for the purpose of protecting the objects identified above [riparian, aquatic and upland shrub-steppe habitats; native plant and animal species; free-flowing, non-tidal stretch of the Columbia River; shrub-steppe ecosystems; breeding populations of birds; habitat for migratory birds; mammals; insect populations; geological and paleontological objects; Archaeological and historic information] . . ." (Monument Proclamation 7319, dated June 9, 2000).

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[235] This includes the means of access, such as hiking, horseback riding on trails, bicycling on existing roads open to the public, canoeing, etc.

National Wildlife Refuge System Mission

The mission of the National Wildlife Refuge System (NWRS) is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Description of Use

In the NWRS Improvement Act, the United States Congress declared wildlife observation and photography, and environmental education and interpretation as four of six wildlife-dependent public uses of the NWRS. If determined compatible, these four uses would become priority public uses for the Monument. Currently, none of these programs are officially established, but over 20,000 (estimated) people per year participate in these activities on the Monument.

Under the preferred alternative, up to fifteen interpretive sites, four interpretive trails, and eight wildlife observation sites are proposed. Some sites and trails may only be open seasonally to both protect sensitive resources and to take advantage of specific interpretive, viewing, and photographic opportunities (e.g., elk on the Rattlesnake Unit). Other sites and trails will be open year-round but monitored to address any negative impacts. Interpretive points, trails, observation sites, signs, kiosks, etc., will focus on Monument wildlife and habitats, historic features, cultural resources and traditions, restoration, management, geologic resources, and the other special values of the Monument. Since there are currently very limited facilities to support these uses on the Monument, we expect wildlife observation and photography and interpretation to increase over the next fifteen years as facilities are developed.

In support of these activities, cross-country hiking will be allowed in the Ringold, Saddle Mountain, and Wahluke Units. Parking areas will be available that will also serve a trail system to be created.[236] Interpretive panels/informational signs will be installed where needed and appropriate. Interpretive and educational opportunities could be self-guided or lead by Monument staff or docent.

Currently, there is a minimal environmental education program at the Monument. However, existing staff have been able to serve approximately 1,000 students per year through classroom talks and tours or field days on the Monument. With a full-time environmental education staff, more than 5,000 students a year could participate in the Monument's environmental education program. The proposed environmental education program is designed to provide effective resources, tools and training for teaching multi-disciplinary topics related to the Monument such as science, natural and cultural history, conservation, writing and others. Educators would attend a teacher orientation and then

[236] Trails could be created fresh, or they could be established on existing administrative roads.

design, schedule and run their own field trips on the Monument. Monument staff would provide teacher training, site-specific curricula, materials and activities, and field trip assistance where possible to enhance learning in an outdoor setting. Students and teachers could participate in restoration and monitoring activities through one-time activities or more long-term monitoring studies. Staff would work with students and educators to foster an understanding of, and appreciation for, resource management and the human impacts on wildlife and habitats. Active participation in resource protection would be encouraged.

Availability of Resources

The following funding/annual costs would be required to administer and manage wildlife observation, photography, interpretation and environmental education activities as described above.

Activity or Project	*One Time Expense*	*Recurring Expense*
Develop Trails	$25-50,000	
Signs/Interpretive Panels	$15,000	
Maintenance of Trails, Parking Areas, Other		$75,000
Law Enforcement		$45,000
Monitoring & Administration		$30,000
Totals	**$40-65,000**	**$150,000**

Anticipated Impacts of the Use

The maintenance of trails and parking areas will impact soils, vegetation and, in some instances, hydrology around the site. This could include an increased potential for erosion, soil compaction (Liddle 1975), reduced seed emergence (Cole and Landres 1995), alteration of vegetative structure and composition, and sediment loading (Cole and Marion 1988). However, where possible, existing administrative roads (many maintained seasonally as firebreaks) and facilities will be used. In addition, most parking lots and access trails will be relatively small in size. These factors are coupled with best management practices, to minimize impacts to natural and cultural resources.[237] In areas where new trails or access points are established, best management practices (e.g., seasonal closures during sensitive life cycles, routing of trails away from sensitive areas) would negate or minimize impacts.

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[237] Best management practices are described in detail in Chapter 4 of the *Hanford Reach National Monument Comprehensive Conservation Plan and Environmental Impact Statement*.

Human activities on trails and at other access points, as well as cross-country hiking, can result in direct effects on wildlife through harassment, a form of disturbance that can cause physiological effects, behavioral modifications, or death (Smith and Hunt 1995). Numerous studies have confirmed that people on foot can cause a variety of disturbance reactions in wildlife, including flushing or displacement (Erwin 1989, Fraser et al 1985, Freddy 1986), heart rate increases (MacArthur et al 1982), altered foraging patterns (Burger and Gochfeld 1991), and even, in some cases, diminished reproductive success (Boyle and Samson 1985).[238] These studies and others have shown that the severity of the effects depends upon the distance to the disturbance and its duration, frequency, predictability and visibility to wildlife (Knight and Cole 1991).

On the Monument, birds are especially vulnerable and can be impacted from human activities when they are disturbed and flushed from feeding, resting, or nesting areas. Flushing, especially repetitive flushing, can strongly impact habitat use patterns of many birds species. Flushing from an area can cause birds to expend more energy, be deterred from using desirable habitat, affect resting or feeding patterns, increase exposure to predation, or cause abandonment of sites (Smith and Hunt 1995). Migratory birds are observed to be more sensitive than resident species to disturbance (Klein 1989). Herons and shorebirds were observed to be the most easily disturbed (when compared to gulls, terns and ducks) by human activity and flush to distant areas away from people (Burger 1981). A reduced number of shorebirds were found near people who were walking or jogging, and about 50% of flushed birds flew elsewhere (Burger 1981). In addition, the foraging time of sanderlings decreased, and avoidance (e.g., running, flushing) increased as the number of humans within 300 feet increased at a coastal bay refuge on the Atlantic (Burger and Gochfeld 1991).

Nest predation for songbirds (Miller et al. 1998), raptors (Glinski 1976), colonial nesting species (Buckley and Buckley 1978), and waterfowl (Boyle and Samson 1985) tends to increase in areas more frequently visited by people. In addition, for many passerine species, primary song occurrence and consistency can be impacted by a single visitor (Gutzwiller et al. 1994). This could potentially limit the number of breeding pairs of certain passerine species, thus limiting production within Monument riparian habitats (Reijnen and Foppen 1994).

Of the wildlife observation techniques proposed, wildlife photographers tend to have the largest disturbance impacts (Klein 1993, Morton 1995, Dobb 1998). While wildlife observers frequently stop to view species, wildlife photographers are more likely to approach wildlife (Klein 1993). Even slow approach by wildlife photographers tends to have behavioral consequences to wildlife species (Klein 1993). Other compounding factors include the potential for photographers to remain close to wildlife for extended periods of time in an attempt to habituate the wildlife subject to their presence (Dobb 1998) and the tendency of casual photographers, with low-power lenses, to get much closer to their subjects than other activities would require (Morton 1995), including wandering off trails. This usually results in increased disturbance to wildlife and habitat, including trampling of plants. Visitor

[238] Based on this information, it is likely that horseback riding and bicycling would have similar impacts.

education programs, monitoring, and law enforcement, coupled with best management practices for facility design would minimize impacts.

The environmental education program would use many existing public facilities, or ones created for other purposes (e.g., parking areas for anglers), including parking areas, trails, interpretive sites, and wildlife observation accommodations. This would help to minimize impacts. Additionally, this activity is considered to be of minor impact due to the stipulations imposed below and through best management practices.

Public Review and Comment

This Compatibility Determination was prepared concurrent with the Monument's CCP/EIS. Open houses were held and written comments were solicited from the public during the scoping period for the Monument's CCP/EIS. Public review and comment were solicited during the draft CCP/EIS comment period.

Determination

_____ The use is not compatible.

__X__ The use is compatible with the following stipulations.

Stipulations Necessary to Ensure Compatibility

- Monitoring will be conducted to insure that high-quality habitat for wildlife feeding, resting, breeding is maintained
- A system to monitor the level of use and vegetation damage and impact along roadsides, designated parking areas, and trails would need to be established.
- Any of these activities could be reduced or closed with the finding of significant negative impacts to Monument facilities or natural and cultural resources.
- Limits will be established for the total number of environmental education groups permitted per day.
- Participants will be restricted to designated trails, sites or facilities as determined by Monument staff. Times and periods of use will also be provided.

- Education groups must provide a sufficient number of adults to supervise the group, as determined by Monument staff.

- Students involved in restoration and monitoring projects must receive some form of training (activity and project-specific) prior to commencement of the activity. This is to ensure their safety while out in the field and to minimize wildlife and habitat disturbance.

- Collection of samples for study (i.e., plants, soils) will be restricted to study areas, and samples must be used on site. Collection will be of materials needed to enhance hands-on learning and investigation and will be designed as part of structured activities and lessons, guided by teachers, and monitored by Monument staff. These activities are an integral part of the education program design and philosophy and their impacts are considered minimal.

Justification

When determined compatible, wildlife observation, photography and environmental education and interpretation become priority public uses of the Monument. Providing opportunities for these activities would contribute toward fulfilling provisions of the National Wildlife Refuge System Administration Act, as amended in 1997, and one of the goals of the Monument. Wildlife observation, photography and interpretation would provide an excellent forum for allowing public access and increasing understanding of Monument resources. The educational possibilities provided by these opportunities would outweigh any anticipated negative impacts associated with implementation of the program. The stipulations outlined above, as well as the best management practices identified, would minimize potential impacts relative to wildlife/ human interactions.

To assist in interpretation and environmental education, the Monument's environmental education program would provide a diversity of environmental education opportunities to students and teachers. These include: 1) facilities, materials and training; 2) access to a variety of Monument habitats; and 3) the ability to observe wildlife and conduct hands-on exploration. The program is intended to foster a better understanding of Monument ecosystems and wildlife resources, and in turn build a public that is more knowledgeable about, and involved in, resource stewardship.

Mandatory 10- or 15-year Re-evaluation Date

Provide month and year for "allowed" uses only.

__X__ Mandatory 15-year re-evaluation date (for wildlife-dependent public uses).

_____ Mandatory 10-year re-evaluation date (for all uses other than wildlife-dependent public uses).

NEPA Compliance for Refuge Use Decision

_____ Categorical Exclusion without Environmental Action Statement.

_____ Categorical Exclusion and Environmental Action Statement.

_____ Environmental Assessment and Finding of No Significant Impact.

__X__ Environmental Impact Statement and Record of Decision.

References

Boyle, S.A., and F.B. Samson. 1985. Effects of non-consumptive recreation on wildlife: A review. Wildlife Society Bulletin 13:110-116.

Buckley, P.A., and F.G. Buckley. 1976. Guidelines for protection and management of colonially nesting waterbirds. North Atlantic Regional Office, National Park Service, Boston, Massachusetts. 52 pages.

Burger, J. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation 21:231-241.

Burger, J., and M. Gochfeld. 1991. Human activity influence and diurnal and nocturnal foraging of sanderlings (*Calidris alba*). Condor 93: 259-265.

Cole, D.N., and P.B. Landres. 1995. Indirect effects of recreation on wildlife. Pages 183-201 *in* Wildlife and Recreationists: Coexistence Through Management and Research (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Washington, District of Columbia. 372 pages.

Cole, D.N., and J.L. Marion. 1988. Recreation impacts in some riparian forests of the eastern United States. Environmental Management 12:99-107.

Dobb, E. 1998. Reality check: The debate behind the lens. Audubon: January-February.

Erwin, R.M. 1989. Responses to human intruders by birds nesting in colonies: Experimental results and management guidelines. Colonial Waterbirds 12:104-108.

Fraser, J.D., L.D. Frenzel, and J.E. Mathisen. 1985. The impact of human activities on breeding bald eagles in north-central Minnesota. Journal of Wildlife Management 49:585-592.

Freddy, D.J. 1986. Responses of adult mule deer to human harassment during winter. Pages 286 *in* Proceedings II. Issues and Technology in the Management of Impacted Western Wildlife:

Proceedings of a National Symposium (R.D. Comer, T.G. Baumann, P. Davis, J.W. Monarch, J. Todd, S. VanGytenbeek, D. Wills, and J. Woodling, editors). Thorne Ecological Institute, Boulder, Colorado.

Glinski, R.L. 1976. Birdwatching etiquette: The need for a developing philosophy. American Bird 30(3):655-657.

Gutzwiller, K.J., R.T. Wiedenmann, K.L. Clements, and S.H. Anderson. 1994. Effects on human intrusion on song occurrence and singing consistency in subalpine birds. Auk 111:28-37.

Klein, M. 1989. Effects of high levels of human visitation on foraging waterbirds at J.N. "Ding" Darling National Wildlife Refuge, Sanibel, Florida. Masters thesis. University of Florida, Gainesville, Florida.

Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. Wildlife Society Bulletin 21:31-39.

Knight, R.L., and D.N. Cole. 1991. Wildlife responses to recreationists. *In* Wildlife and Recreationists (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Covelo, California.

Liddle, M.J. 1975. A selective review of the ecological effects on human trampling on natural ecosystems. Biological Conservation 7:17-36.

MacArthur, R.A., V. Geist, and R.H. Johnston. 1982. Cardiac and behavioral responses of mountain sheep to human disturbance. Journal of Wildlife Management 46:351-358.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Applications 8:162-169.

Morton, J.M. 1995. Management of human disturbance and its effects on waterfowl. Pages F59-F86 *in* Waterfowl Habitat Restoration, Enhancement and Management in the Atlantic Flyway (W.R. Whitman, T. Strange, L. Widjeskog, R. Whittemore, P. Kehoe, and L. Roberts, editors). Third Edition of the Environmental Manage Committee, Atlantic Flyway Council Technical Section, and the Delaware Division of Fish and Wildlife, Dover, Delaware. 1,114 pages.

Reijnen, R., and R. Foppen. 1994. The effects of car traffic on breeding bird populations in woodland. Evidence of reduced habitat quality for willow warbler (*Pylloscopus trochilus*) breeding close to a highway. Journal of Applied Ecology 31: 85-94.

Servheen, C.W. (editor). 1980. Proceedings of the Washington bald eagle symposium. Seattle, Washington.

Smith, L., and J.D. Hunt. 1995. Nature tourism: Impacts and management. Pages 203-219 *in* Wildlife and Recreationists: Coexistence Through Management and Research (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Washington, District of Columbia.

Signatures

Monument Project Leader: _____

(Signature and Date)

Refuge Supervisor: _____

(Signature and Date)

Regional Chief: _____

(Signature and Date)

Appendix J – Common and Scientific Names Of Plants and Animals Identified in the Hanford Reach National Monument Comprehensive Conservation Plan

Plants

Common Name	*Scientific Name*
Ammannia, Scarlet	*Ammannia robusta*
Baby's Breath	*Gypsophila paniculata*
Balsamroot, Arrowleaf	*Balsamorhiza sagittata*
Balsamroot, Carey's	*Balsamorhiza careyana*
Balsamroot, Rosy	*Balsamorhiza rosea*
Bindweed, Field	*Convolvulus arvensis*
Biscuitroot, Canby's (aka Canby's Desert Parsley)	*Lomatium canbyi*
Biscuitroot, Cous (aka Cous Desert Parsley)	*Lomatium cous*
Biscuitroot, Geyer's (aka Geyer's Desert Parsley)	*Lomatium geyeri*
Biscuitroot, Gray's (aka Gray's Desert Parsley)	*Lomatium grayi*
Bitterbrush, Antelope	*Purshia tridentata*
Bitterroot, Oregon	*Lewisia rediviva*
Bladderpod, White Bluffs	*Physaria tuplashensis*
Bluegrass, Bulbous	*Poa bulbosa*
Bluegrass, Cusick's	*Poa cusickii*
Bluegrass, Sandberg's	*Poa secunda*
Brome, Downy	*Bromus tectorum*
Buckwheat, Douglas'	*Eriogonum douglasii*
Buckwheat, Rock	*Eriogonum sphaerocephalum*
Buckwheat, Snow	*Eriogonum niveum*
Buckwheat, Thymeleaf	*Eriogonum thymoides*
Buckwheat, Umtanum Desert	*Eriogonum codium*
Bulrush, Alkali (aka Seacoast Bulrush)	*Scirpus maritimus*
Bulrush, Hardstem (aka Tule)	*Scirpus acutus*
Bulrush, Softstem (aka Tule, aka California Bulrush)	*Scirpus validus*
Chervil, Bur	*Anthriscus scandicina*
Bush, Indigo (aka False Indigo)	*Amorpha fruticosa*
Cactus, Hedgehog	*Pediocactus nigrispinus*
Calyptridium, Rosy	*Calyptridium roseum*
Camelthorn	*Alhagi maurorum*

Canarygrass, Reed. . . . . *Phalaris arundinacea*
Cattail, Broadleaf (aka Common Cattail). . . . . *Typha latifolia*
Cattail, Common (aka Broadleaf Cattail). . . . . *Typha latifolia*
Celery, Indian. . . . . *Lomatium nudicaule*
Chaffweed. . . . . *Centunculus minimus*
Cheatgrass. . . . . *Bromus tectorum*
Chokecherry, Common (aka Western Chokecherry). . . . . *Prunus virginiana*
Cliffbrake, Smooth. . . . . *Pellaea glabella simplex*
Combseed, Bristly. . . . . *Pectocarya setosa*
Combseed, Winged. . . . . *Pectocarya penicillata*
Cottonwood, Black. . . . . *Populus trichocarpa*
Cottonwood, Plains. . . . . *Populus deltoides*
Crazyweed, Wanapum. . . . . *Oxytropis campestris*
Cryptantha, Desert (aka Miner's Candle). . . . . *Cryptantha scoparia*
Cryptantha, Gray. . . . . *Cryptantha leucophaea*
Cryptantha, Snake River. . . . . *Cryptantha spiculifera* (*C. interrupta*)
Currant, Golden. . . . . *Ribes aureum*
Daisy, Piper's. . . . . *Erigeron piperianus*
Dock, Sand (aka Winged Dock). . . . . *Rumex venosus*
Dodder, Desert. . . . . *Cuscuta denticulata*
Dropseed, Sand. . . . . *Sporobolus cryptandrus*
Duckweed. . . . . *Lemna minor*
Eatonella, White. . . . . *Eatonella nivea*
Elderberry, Blue. . . . . *Sambucus cerulea*
Elm, Siberian. . . . . *Ulmus pumila*
Evening-primrose, Desert. . . . . *Oenothera caespitosa* ssp. *caespitosa*
Evening-primrose, Dwarf. . . . . *Camissonia* (*Oenothera*) *pygmaea*
Evening-primrose, Small-flowered. . . . . *Camissonia* (*Oenothera*) *minor*
Fescue, Idaho. . . . . *Festuca idahoensis*
Flatsedge, Shining (aka Slender Flatsedge). . . . . *Cyperus bipartitus (rivularis)*
Flatsedge, Slender (aka Shining Flatsedge). . . . . *Cyperus bipartitus (rivularis)*
Gilia, Great Basin. . . . . *Gilia leptomeria*
Goldentop, Western. . . . . *Euthamia occidentalis*
Grasses (See also Bluegrass, Saltgrass, Johnsongrass, Canarygrass)
Grass, Large Barnyard. . . . . *Echinochloa crus-galli*
Grass, Horsetail (aka Field Horsetail, Common Horsetail). . . . . *Equisetum arvense*
Grass, Needle-and-thread. . . . . *Hesperostipa comata*
Greasewood, Black. . . . . *Sarcobatus vermiculatus*
Gumweed, Curlycup. . . . . *Grindelia squarrosa*
Helleborine, Giant. . . . . *Epipactis gigantea*
Hemicarpha, Small-flowered. . . . . *Lipocarpha* (*Hemicarpha*) *aristulata*
Hemp, Indian. . . . . *Apocynum cannabinum*
Hopsage, Spiny. . . . . *Grayia spinosa*

Horsetail, Field (aka Horsetail Grass, Common Horsetail). . . . . *Equisetum arvense*
Huckleberry, Red.. . . . . *Vaccinium parvifolium*
Johnsongrass. . . . . *Sorghum halepense*
Junegrass, Prairie.. . . . . *Koeleria cristata*
Knapweed, Diffuse. . . . . *Centaurea diffusa*
Knapweed, Russian. . . . . *Centaurea repens*
Knapweed, Spotted. . . . . *Centaurea biebersteinii*
Kochia, Forage. . . . . *Bassia prostrata*
Lilaeopsis, Western. . . . . *Lilaeopsis occidentalis*
Locust, Black. . . . . *Robinia psuedo-acacia*
Loeflingia. . . . . *Loeflingia squarrosa* var. *squarrosa*
Loosestrife, Purple.. . . . . *Lythrum salicaria*
Lupine, Low. . . . . *Lupinus pusillus*
Lupine, Prairie.. . . . . *Lupinus lepidus*
Lupine, Rock.. . . . . *Lupinus saxosus*
Lupine, Silky.. . . . . *Lupinus sericeus*
Lupine, Spurred.. . . . . *Lupinus laxiflorus*
Lupine, Sulphur.. . . . . *Lupinus sulphureus*
Lupine, Velvet.. . . . . *Lupinus leucophyllus*
Milfoil, Eurasian. . . . . *Myriophyllum spicatum*
Milkvetch, Basalt (aka Rattlesnake Mountain Milkvetch).. . . *Astragalus conjunctus* var. *rickardii*
Milkvetch, Columbia.. . . . . *Astragalus columbianus*
Milkvetch, Crouching. . . . . *Astragalus succumbens*
Milkvetch, Geyer's. . . . . *Astragalus geyeri*
Milkvetch, Medic. . . . . *Astragalus speirocarpus*
Milkvetch, Rattlesnake Mountain (aka Basalt Milkvetch).. . . *Astragalus conjunctus* var. *rickardii*
Milkvetch, Stalked-pod. . . . . *Astragalus sclerocarpus*
Milkvetch, Yakima. . . . . *Astragalus reventiformis*
Monkeyflower, Suksdorf's.. . . . . *Mimulus suksdorfii*
Mousetail. . . . . *Myosurus clavicaulis*
Mudwort, Owyhee (aka Southern Mudwort). . . . . *Limosella acaulis*
Mudwort, Southern (aka Owyhee Mudwort). . . . . *Limosella acaulis*
Mugwort, Columbia River.. . . . . *Artemesia lindleyana*
Mulberry, White. . . . . *Morus alba*
Mullein, Common. . . . . *Verbascum thapsus*
Nama, Small-flowered.. . . . . *Nama densum* var. *parviflorum*
Nutsedge, Yellow (aka Yellow Flatsedge). . . . . *Cyperus esculentus*
Olive, Russian.. . . . . *Elaeagnus angustifolia*
Onion, Robinson's.. . . . . *Allium robinsonii*
Onion, Scilla (aka Squill Onion). . . . . *Allium scilloides*
Paintbrush, Annual. . . . . *Castilleja exilis*
Parrotfeather (aka Parrot Feather Water Milfoil).. . . . . *Myriophyllum aquaticum*
Parsley, Canby's Desert.. . . . . *Lomatium canbyi*

Parsley, Cous Desert. . . . . *Lomatium cous*
Parsley, Geyer's Desert. . . . . *Lomatium geyeri*
Parsley, Gorman's Desert. . . . . *Lomatium gormanii*
Parsley, Gray's Desert. . . . . *Lomatium grayi*
Parsley, Hoover's Desert. . . . . *Lomatium tuberosum*
Pectocarya, Bristly. . . . . *Pectocarya setosa*
Pepperweed, Perennial (aka Broadleaf Pepperweed). . . . . *Lepidium latifolium*
Penstemon, Fuzzytongue. . . . . *Penstemon eriantherus whitedii*
Phragmites (See Reed, Common). . . . . *Phragmites australis*
Pimpernel, False. . . . . *Lindernia dubia anagallidea*
Poplar, Common (aka White Poplar, Silver Poplar). . . . . *Populus alba*
Rabbitbrush, Green. . . . . *Chrysothamnus viscidiflorus*
Rabbitbrush, Grey. . . . . *Ericameria nauseosus*
Ragweed, Bur. . . . . *Ambrosia acanthicarpa*
Reed, Common. . . . . *Phragmites australis*
Ricegrass, Indian. . . . . *Achnatherum hymenoides*
Rye, Winter. . . . . *Secale cereale*
Sage, Grayball. . . . . *Salvia dorrii*
Sagebrush, Big. . . . . *Artemisia tridentata* var. *wyomingensis*
Sagebrush, Pacific (aka Sagewort). . . . . *Artemisia campestris*
Sagebrush, Stiff. . . . . *Artemisia rigida*
Sagebrush, Three-tip. . . . . *Artemisia tripartita*
Sagewort (aka Pacific Sagebrush). . . . . *Artemisia campestris*
Salt Cedar (aka Tamarisk). . . . . *Tamarix parviflora*
Saltgrass, Alkali. . . . . *Distichlis stricta*
Saltsage. . . . . *Atriplex nuttallii* var. *falcata*
Sandbur. . . . . *Cenchrus longispinus*
Sandwort, Annual. . . . . *Minuartia pusilla* var. *pusilla*
Sandwort, Thompson's. . . . . *Eremogone franklinii* var. *thompsonii*
Scurfpea, Dune. . . . . *Psoralea lanceolata*
Sedge, Awned halfchaff. . . . . *Lipocarpha aristulata*
Sedge, Porcupine. . . . . *Carex hystericina*
Serviceberry. . . . . *Amelanchier alnifolia*
Skeletonweed, Rush. . . . . *Chondrilla juncea*
Smartweed (aka Water Pepper). . . . . *Polygonum hydropiper*
Soapberry. . . . . *Shepherdia canadensis*
Sowthistle, Perennial. . . . . *Sonchus arvensis*
Spikerush, Beaked (aka Needle Spikerush). . . . . *Eleocharis rostellata*
Spikerush, Common. . . . . *Eleocharis palustis*
Spikerush, Needle (aka Beaked Spikerush). . . . . *Eleocharis rostellata*
Spurge, Leafy. . . . . *Euphorbia esula*
Starthistle, Yellow. . . . . *Centaurea solstitialis*
Swainsonpea, Alkali. . . . . *Sphaerophysa salsula*

Sycamore, American. . . . . *Platanus occidentalis*
Tamarisk (aka Salt Cedar). . . . . *Tamarix parviflora*
Thimbleberry.. . . . . *Rubus parviflorus*
Thistle, Bull.. . . . . *Cirsium vulgare*
Thistle, Canada. . . . . *Cirsium arvense*
Thistle, Musk. . . . . *Carduus nutans*
Thistle, Russian. . . . . *Salsola kali*
Thistle, Scotch.. . . . . *Onopordum acanthium*
Toadflax, Dalmatian. . . . . *Linaria dalmatica*
Tobacco, Coyote. . . . . *Nicotiana attenuata*
Toothcup, Lowland. . . . . *Rotala ramosior*
Tule (See Hardstem and Softstem Bulrush). . . . . *Scirpus acutus*, *Scirpus validus*
Velvetleaf. . . . . *Abutilon theophrasti*
Vine, Puncture.. . . . . *Tribulus terrestris*
Waterweed, Canadian. . . . . *Elodea canadensis*
Wheatgrass, Bluebunch. . . . . *Pseudoroegnaria spicata*
Wheatgrass, Crested. . . . . *Agropyron cristatum*
Wheatgrass, Thickspike. . . . . *Agropyron dasytachyum*
Whitetop. . . . . *Cardaria draba*
Wildrye, Giant.. . . . . *Elymus cinereus*
Wildrye, Medusahead. . . . . *Taeniatherum caputmedusa*
Willow, Narrowleaf (aka Coyote Willow). . . . . *Salix exigua*
Willow, Peachleaf. . . . . *Salix amygdaloides*
Willow-herb, Hairy. . . . . *Epilobium hirsutum*
Winterfat.. . . . . *Eurotia lanata*
Wort, Canadian St. John's . . . . . *Hypericum majus*
Yarrow. . . . . *Achillea millefolium*
Yellow-bell (aka Yellow Fritillary). . . . . *Fritillaria pudica*
Yellowcress, Columbia (aka Persistentsepal Yellowcress). . . . . *Rorippa columbiae*
Yellowcress, Persistentsepal (aka Columbia Yellowcress). . . . . *Rorippa columbiae*

Animals

Common Name. . . . . *Scientific Name*

Antelope, Pronghorn. . . . . *Antilocapra americana*
Badger, American. . . . . *Taxidea taxus*
Bass, Largemouth. . . . . *Micropterus salmoides*
Bass, Smallmouth. . . . . *Micropterus dolomieui*
Bat, Silver-haired.. . . . . *Lasionycteris noctivagans*
Bat, Pallid. . . . . *Antrozous pallida*
Beaver, American. . . . . *Castor canadensis*

Beetle, Columbia River Tiger. . . . . *Cicindela columbica*
Beetle, Darkling. . . . . *Eleodes hispilabris*
Blackbird, Red-winged. . . . . *Ageliaus phoeniceus*
Blackbird, Yellow-headed. . . . . *Xanthocephalus xanthocephalus*
Bobcat. . . . . *Lynx rufus*
Bullfrog. . . . . *Rana catesbeiana*
Bullhead, Brown. . . . . *Ictalurus nebulosus*
Bunting, Lazuli. . . . . *Passerina amoena*
Carp, Common. . . . . *Cyprinus carpio*
Catfish, Blue. . . . . *Ictalurus furcatus*
Catfish, Channel. . . . . *Ictalurus punctatus*
Chat, Yellow-breasted. . . . . *Icteria virens*
Chukar. . . . . *Alectoris chukar*
Coot, American. . . . . *Fulica americana*
Cormorant, Double-crested. . . . . *Phalacrocorax auritus*
Cougar. . . . . *Felis concolor*
Coyote. . . . . *Canis latrans*
Crane, Sandhill. . . . . *Grus canadensis*
Crappie, Black. . . . . *Pomoxis nigromaculatus*
Crow, American. . . . . *Corvus brachyrhynchos*
Curlew, Long-billed. . . . . *Numenius americanus*
Dace, Leopard. . . . . *Rhinichthys flacatus*
Deer, Mule. . . . . *Odocoileus hemionus*
Deer, White-tailed. . . . . *Odocoileus virginianus*
Dove, Mourning. . . . . *Zenaida macroura*
Duck, American Merganser. . . . . *Mergus serrator*
Duck, Bufflehead. . . . . *Bucephala albeola*
Duck, Canvasback. . . . . *Aythya valisineria*
Duck, Gadwall. . . . . *Anas strepera*
Duck, Common Goldeneye. . . . . *Bucephala clangula*
Duck, Green-winged Teal. . . . . *Anas crecca*
Duck, Mallard. . . . . *Anas platyrhynchos*
Duck, Northern Pintail. . . . . *Anas acuta*
Eagle, Bald. . . . . *Haliaeetus leucocephalus*
Eagle, Golden. . . . . *Aquila chrysaetos*
Earworm, Corn. . . . . *Helicoverpa* (=*Heliothis*) *zea*
Egret, Great. . . . . *Ardea alba*
Elk, Rocky Mountain. . . . . *Cervus elaphus*
Falcon, Peregrine. . . . . *Falco peregrinus*
Falcon, Prairie. . . . . *Falco mexicanus*
Flicker, Northern. . . . . *Colaptes auratus*
Fox, Red. . . . . *Vulpes vulpes*
Frog, Pacific Tree. . . . . *Hyla regilla*

Goose, Canada. . . . . *Branta canadensis*
Goshawk, Northern. . . . . *Accipter gentilis*
Grebe, Western. . . . . *Aechmorus occidentalis*
Ground squirrel, Townsend's. . . . . *Spermophilus townsendii*
Ground squirrel, Washington. . . . . *Spermophilus (Citellus) washingtoni*
Grouse, Western Sage. . . . . *Centrocercus urophasianus phaios*
Gull, California. . . . . *Larus californicus*
Gull, Ring-billed. . . . . *Larus delawarensis*
Hairstreak, Sheridan's Green. . . . . *Callophyrys sheridanii neoperplexa*
Harrier, Northern. . . . . *Circus cyaneus*
Hawk, Ferruginous. . . . . *Buteo regalis*
Hawk, Red-tailed. . . . . *Buteo jamaicensis*
Hawk, Rough-legged. . . . . *Buteo lagopus*
Hawk, Sharp-shinned. . . . . *Accipiter striatus*
Hawk, Swainson's. . . . . *Buteo swainsoni*
Heron, Black-crowned Night. . . . . *Nycticorax nycticorax*
Heron, Great blue. . . . . *Ardea herodias*
Jackrabbit, Black-tailed. . . . . *Lepus californicus*
Jackrabbit, White-tailed. . . . . *Lepus townsendii*
Junco, Dark-eyed. . . . . *Junco hyemalis*
Kestrel, American. . . . . *Falco sparverius*
Killdeer. . . . . Charadrius vociferus
Kingbird, Eastern. . . . . *Tyrannus tyrannus*
Kingbird, Western. . . . . *Tyrannus verticalis*
Kinglet, Golden-crowned. . . . . *Regulus satrapa*
Kinglet, Ruby-crowned. . . . . *Regulus calendula*
Lamprey, Pacific. . . . . *Entosphenus tridentatus*
Lamprey, River. . . . . *Lampetra ayresi*
Lark, Horned. . . . . *Eremophila alpestris*
Lark, Meadow . . . . . *Sturnella neglecta*
Limpet, Giant Columbia River (aka Shortface lanx). . . . . *Fisherola* (*Lanx*) *nuttalli*
Lizard, Northern Sagebrush. . . . . *Sceloporus graciosus*
Lizard, Short-horned. . . . . *Phrynosoma douglassii*
Lizard, Side-blotched. . . . . *Uta stansburiana*
Loon, Common. . . . . *Gavia immer*
Looper, Alfalfa. . . . . *Autographa californica*
Looper, Celery. . . . . *Syngrapha falcifera*
Magpie, Black-billed. . . . . *Pica hudsonia*
Merlin. . . . . *Falco columbarius*
Mink. . . . . *Mustela vison*
Minnow, Northern Pike. . . . . *Ptychocheilus oregonensis*
Mouse, Deer. . . . . *Peromyscus maniculatus*
Mouse, Great Basin Pocket. . . . . *Perognathus parvus*

Mouse, Western Harvest. . . . . *Riethrodontonomys megalotis*
Muskie, Tiger. . . . . *Esox lucius* X *Esox masquinongy*
Muskrat. . . . . *Ondatra zibethica*
Myotis, California. . . . . *Myotis californicus*
Myotis, Western small-footed. . . . . *Myotis leibii*
Night-heron, Black-crowned. . . . . *Nycticorax nycticorax*
Oriole, Bullock's. . . . . *Icterus bullockii*
Oriole, Northern. . . . . *Icterus galbula*
Otter, River. . . . . *Lutra canadensis*
Owl, Barn. . . . . *Tyto alba*
Owl, Burrowing. . . . . *Athene cunicularia*
Owl, Flammulated. . . . . *Otus flammeolus*
Owl, Great-horned. . . . . *Bubo virginianus*
Owl, Long-eared. . . . . *Asio otus*
Owl, Short-eared. . . . . *Asio flammeus*
Partridge, Gray (aka Hungarian Partridge). . . . . *Perdix perdix*
Peewee, Western wood. . . . . *Contopus sordidulus*
Pelican, White. . . . . *Pelecanus erythrorhynchos*
Perch, Yellow. . . . . *Perca flavescens*
Pheasant, Ring-necked. . . . . *Phasianus colchicus*
Phoebe, Say's. . . . . *Sayornis saya*
Pipistrelle, Western. . . . . *Pipistrellus hesperus*
Porcupine, Common. . . . . *Erithizon dorsatum*
Quail, California. . . . . *Callipepla californica*
Rabbit, Mountain Cottontail. . . . . *Sylvilagus nutalli*
Rabbit, Pygmy. . . . . *Brachylagus (Sylvilagus) idahoensis*
Raccoon. . . . . *Procyon lotor*
Racer, Western Yellow-bellied. . . . . *Coluber constrictor*
Rat, Norway. . . . . *Rattus norvegicus*
Rat, Ord's Kangaroo. . . . . *Dipodomys ordii*
Rattlesnake, Pacific. . . . . *Crotalus viridis*
Robin, American. . . . . *Turdus migratorius*
Salmon, Chinook. . . . . *Oncorhynchus tshawytscha*
Salmon, Sockeye. . . . . *Oncorhynchus nerka*
Salamander, Tiger. . . . . *Ambystoma tigrinum*
Sandroller. . . . . *Percopsis transmontana*
Sculpin, Prickly. . . . . *Cottus asper*
Sheep, Rocky Mountain Bighorn. . . . . *Ovis canadensis canadensis*
Shiner, Redside. . . . . *Richardsonius balteatus*
Shrew, Merriam's. . . . . *Sorex merriami*
Shrike, Loggerhead. . . . . *Lanius ludovicianus*
Skunk, Striped. . . . . *Mephitis mephitis*
Snail, Columbia Pebble. . . . . *Fluminicola fuscus*

Snail, Giant Columbia River Spire. . . . . *Fluminicola* (*Lithoglyphus*) *columbiana*
Snake, Great Basin Gopher. . . . . *Pituophis melanoleucus* (= *catenifer*)
Snake, Night. . . . . *Hypsiglena torquata*
Snake, Striped Whip. . . . . *Masticophis taeniatus*
Solitaire, Townsend's. . . . . *Myadestes townsendi*
Sparrow, Brewer's . . . . . *Spizella breweri*
Sparrow, Grasshopper. . . . . *Ammodramus savannarum*
Sparrow, Sage. . . . . *Amphispiza belli*
Sparrow, Song. . . . . *Melospiza melodia*
Sparrow, White-crowned. . . . . *Zonotrichia leucophrys*
Sparrow, Vesper. . . . . *Pooecetes gramineus*
Starling, European. . . . . *Sturnus vulgaris*
Steelhead. . . . . *Oncorhynchus mykiss*
Sturgeon, White. . . . . *Acipenser transmontanus*
Sucker, Largescale. . . . . *Catostomus macrocheilus*
Sucker, Mountain. . . . . *Catastomus platyrhynchus*
Swallow, Bank. . . . . *Riparia riparia*
Swallow, Cliff. . . . . *Petrochelidon pyrrhonota*
Swallow, Rough-winged. . . . . *Stelgidopteryx serripennis*
Tern, Forster's. . . . . *Sterna forsteri*
Thrasher, Sage. . . . . *Oreoscoptes montanus*
Toad, Great Basin Spadefoot. . . . . *Scaphiopus intermontanus*
Toad, Woodhouse's. . . . . *Bufo woodhousei*
Trout, Bull. . . . . *Salvelinus confluentus*
Vireo, Warbling. . . . . *Vireo gilvus*
Vole, Sagebrush. . . . . *Lagurus (Lemmiscus) curtatus*
Walleye. . . . . *Stizostedion vitreum*
Warbler, MacGillivray's. . . . . *Oporornis tolmiei*
Warbler, Orange-crowned. . . . . *Vermivora celata*
Warbler, Wilson's. . . . . *Wilsonia pusilla*
Warbler, Yellow. . . . . *Dendroica petechia*
Warbler, Yellow-rumped. . . . . *Dendroica coronata*
Weasel, Long-tailed. . . . . *Mustela frenata*
Whipsnake, Striped. . . . . *Masticophis taeniatus*
Whitefish, Mountain. . . . . *Prosopium williamsoni*
Woodpecker, Downy. . . . . *Picoides pubescens*
Woodpecker, Lewis'. . . . . *Melanerpes lewisii*

Appendix K – Common Vascular Plants On the Monument[239]

A. Shrub-Steppe Species	Scientific Name
Shrubs	
Big sagebrush	*Artemisia tridentata* var. *wyomingensis*
Bitterbrush	*Purshia tridentate*
Gray rabbitbrush	*Ericameria nauseosus*
Green rabbitbrush	*Chrysothamnus viscidiflorus*
Snow buckwheat	*Eriogonum niveum*
Spiny hopsage	*Grayia (Atriplex) spinosa*
Threetip sagebrush	*Artemisia tripartita*
Perennial Grasses	
Bluebunch wheatgrass	*Pseudoroegneria spicata*
Bottlebrush squirreltail	*Sitanion hystrix*
Crested wheatgrass	*Agropyron desertorum (cristatum)*[(a)]
Indian ricegrass	*Achnatherum hymenoides*
Needle-and-thread grass	*Hesperostipa comata*
Prairie junegrass	*Koeleria cristata*
Sand dropseed	*Sporobolus cryptandrus*
Sandberg's bluegrass	*Poa secunda*
Thickspike wheatgrass	*Agropyron dasytachyum*
Biennial/Perennial Forbs	
Bastard toad flax	*Comandra umbellata*
Buckwheat milkvetch	*Astragalus caricinus*
Carey's balsamroot	*Balsamorhiza careyana*
Cusick's sunflower	*Helianthus cusickii*
Cutleaf ladysfoot mustard	*Thelypodium laciniatum*
Douglas' clusterlily	*Brodiaea douglasii*
Dune scurfpea	*Psoralea lanceolata*
Franklin's sandwort	*Arenaria franklinii*
Gray's desert parsley	*Lomatium grayi*
Hoary aster	*Machaeranthera canescens*
Hoary false yarrow	*Chaenactis douglasii*
Longleaf phlox	*Phlox longifolia*
Munro's globemallow	*Sphaeralcea munroana*

[239] Taxonomy follows Hitchcock and Cronquist 1973. See Sackschewsky and Downs (2001) for a complete listing of Hanford Site vascular plants.

Pale evening primrose	*Oenothera pallida*
Rough wallflower	*Erysimum asperum*
Sand beardtongue	*Penstemon acuminatus*
Slender hawksbeard	*Crepis atrabarba*
Stalked-pod milkvetch	*Astragalus sclerocarpus*
Threadleaf fleabane	*Erigeron filifolius*
Turpentine spring parsley	*Cymopteris terebinthinus*
Winged dock	*Rumex venosus*
Yarrow	*Achillea millefolium*
Yellow bell	*Fritillaria pudica*
Yellow salsify	*Tragopogon dubius*[(a)]

Annual Forbs

Annual Jacob's ladder	*Polemonium micranthum*
Blue mustard	*Chorispora tenella*[(a)]
Bur ragweed	*Ambrosia acanthicarpa*
Clasping pepperweed	*Lepidium perfoliatum*
Indian wheat	*Plantago patagonica*
Jagged chickweed	*Holosteum umbellatum*[(a)]
Jim Hill's tumblemustard	*Sisymbrium altissimum*[(a)]
Matted cryptantha	*Cryptantha circumscissa*
Pink microsteris	*Microsteris gracilis*
Prickly lettuce	*Lactuca serriola*[(a)]
Russian thistle (tumbleweed)	*Salsola kali*[(a)]
Spring whitlowgrass	*Draba verna*[(a)]
Storksbill	*Erodium cicutarium*[(a)]
Tall willowherb	*Epilobium paniculatum*
Tarweed fiddleneck	*Amsinckia lycopsoides*
Threadleaf scorpion weed	*Phacelia linearis*
Western tansymustard	*Descurainia pinnata*
White cupseed	*Plectritis macrocera*
Whitestem stickleaf	*Mentzelia albicaulis*
Winged cryptantha	*Cryptantha pterocarya*

Annual Grasses

Cheatgrass	*Bromus tectorum*[(a)]
Slender sixweeks	*Festuca octoflora*
Small sixweeks	*Festuca microstachys*

B. Riparian Species

Trees and Shrubs

Black cottonwood	*Populus trichocarpa*
Black locust	*Robinia pseudo-acacia*[(a)]
Coyote willow	*Salix exigua*

Peach, apricot, cherry	*Prunus* spp.
Peachleaf willow	*Salix amygdaloides*[(a)]
Willow	*Salix* spp.
White mulberry	*Morus alba*[(a)]

Perennial Grasses and Forbs

Bentgrass	*Agrostis* spp.[(b)]
Blanket flower	*Gaillardia aristata*
Bulrushes	*Scirpus* spp.[(b)]
Cattail	*Typha latifolia*[(b)]
Columbia River gumweed	*Grindelia columbiana*
Dogbane	*Apocynum cannabinum*
Hairy golden aster	*Heterotheca villosa*
Heartweed	*Polygonum persicaria*
Horsetails	*Equisetum* spp.
Horseweed tickseed	*Coreopsis atkinsoniana*
Lovegrass	*Eragrostis* spp.[(b)]
Lupine	*Lupinus* spp.
Meadow foxtail	*Alopecurus aequalis*[(b)]
Pacific sage	*Artemisia campestris*
Prairie sagebrush	*Artemisia ludoviciana*
Reed canary grass	*Phalaris arundinacea*[(a,b)]
Rushes	*Juncus* spp.
Russian knapweed	*Centaurea repens*[(a)]
Sedge	*Carex* spp.[(b)]
Water speedwell	*Veronica anagallis-aquatica*
Western goldenrod	*Solidago occidentalis*
Wild onion	*Allium* spp.
Wiregrass spikerush	*Eleocharis* spp.[(b)]

C. Aquatic Vascular Species

Canadian waterweed	*Elodea canadensis*
Duckweed	*Lemna minor*
Pondweed	*Potamogeton* spp.
Spiked water milfoil	*Myriophyllum spicatum*
Watercress	*Rorippa nasturtium-aquaticum*

Notes:

(a) Introduced

(b) Perennial grasses and graminoids

Appendix L – Summary of Plant Communities

Vegetation Group	Vegetation Community	Acres
Bitterbrush Communities		
Bitterbrush / Native Bunchgrass	Bitterbrush / Bunchgrass Mosaic	1.00
Bitterbrush / Native Bunchgrass	Bitterbrush / Indian Ricegrass	4,817.40
Bitterbrush / Native Bunchgrass	Bitterbrush / Needle-and-Thread Grass	476.77
Bitterbrush / Sandberg's Bluegrass and/or Exotic Grass	Bitterbrush / Sandberg's Bluegrass - Cheatgrass	3,023.08
	Total	8,318.25
Black Greasewood / Native Bunchgrass	Black Greasewood / Alkali Saltgrass	298.80
Bunchgrass Communities		
Disturbed	Disturbed	667.64
Native Bunchgrass	Bluebunch Wheatgrass	31,249.73
Native Bunchgrass	Bluebunch Wheatgrass - Needle-and-Thread Grass	129.57
Native Bunchgrass	Bunchgrass - Cheatgrass	3,232.26
Native Bunchgrass	Bunchgrass Mosaic	3,290.06
Native Bunchgrass	Indian Ricegrass	814.05
Native Bunchgrass	Needle-and-Thread Grass	7,277.54
Native Bunchgrass	Sand Dropseed	599.84
	Total	47,260.68
Non Shrub-Steppe	Non Shrub-Steppe	4,842.98
Old Agricultural Fields	Old Agricultural Fields	1,897.49
Purple Sage / Sandberg's Bluegrass and/or Exotic Grass	Purple Sage / Sandberg's Bluegrass - Cheatgrass	167.51
Rabbitbrush Communities		
Rabbitbrush / Native Bunchgrass	Rabbitbrush / Bunchgrass	97.73
Rabbitbrush / Native Bunchgrass	Rabbitbrush / Needle-and-Thread Grass	241.59
Rabbitbrush / Native Bunchgrass	Rabbitbrush / Sand Dropseed	7.72
Rabbitbrush / Sandberg's Bluegrass and/or Exotic Grass	Rabbitbrush / Cheatgrass	123.72
Rabbitbrush / Sandberg's Bluegrass and/or Exotic Grass	Rabbitbrush / Sandberg's Bluegrass	664.70
Rabbitbrush - Snowy Buckwheat / Native Bunchgrass	Rabbitbrush - Snow Buckwheat / Bunchgrass Mosaic	410.82
Rabbitbrush / Native Bunchgrass	Rabbitbrush / Bunchgrass	189.45
Rabbitbrush / Native Bunchgrass	Rabbitbrush / Indian Rice Grass	2,602.03
Rabbitbrush / Sandberg's Bluegrass and/or Exotic Grass	Rabbitbrush / Sandberg's Bluegrass	3,434.14
	Total	7771.90

Riparian	Riparian	1,145.78
Riverine	Riverine Wetlands and Associated Deepwater Habitats	131.09
Rock Buckwheat / Native Bunchgrass	Rock Buckwheat / Bunchgrass Mosaic	2.90
Sandberg's Bluegrass Communities		
Sandberg's Bluegrass and/or Exotic Grass	Crested Wheatgrass	2,506.27
Sandberg's Bluegrass and/or Exotic Grass	Sandberg's Bluegrass - Cheatgrass	45,432.41
	Total	47,938.68
Snowy Buckwheat Communities		
Snowy Buckwheat - Bitterbush / Native Bunchgrass	Snow Buckwheat - Bitterbrush / Bunchgrass Mosaic	21.87
Snowy Buckwheat / Native Bunchgrass	Snow Buckwheat / Indian Ricegrass	1,366.35
	Total	1,388.22
Spiny Hopsage Communities		
Spiny Hopsage / Sandberg's Bluegrass and/or Exotic Grass	Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass	1,955.72
Spiny Hopsage / Sandberg's Bluegrass and/or Exotic Grass	Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass	12.94
	Total	1,968.66
Stiff Sagebrush Communities		
Stiff Sagebrush / Native Bunchgrass	Stiff Sagebrush / Bluebunch Wheatgrass	496.94
Stiff Sagebrush / Sandberg's Bluegrass	Stiff Sagebrush / Sandberg's Bluegrass	436.20
	Total	933.14
Threetip Sagebrush / Native Bunchgrass	Threetip Sagebrush / Bunchgrass Mosaic	10,488.59
Thymeleaf Buckwheat / Sandberg's Bluegrass	Thymeleaf Buckwheat / Sandberg's Bluegrass	230.54
Winter Fat Communities		
Winterfat / Native Bunchgrass	Winterfat / Bluebunch Wheatgrass	7.03
Winterfat / Native Bunchgrass	Winterfat / Bunchgrass Mosaic	1,105.02
Winterfat / Native Bunchgrass	Winterfat / Needle-and-Thread Grass	256.66
Winterfat / Sandberg's Bluegrass and/or Exotic Grass	Winterfat / Sandberg's Bluegrass - Cheatgrass	996.55
	Total	2,365.26
Wyoming Big Sagebrush Communities		
Wyoming Big Sagebrush / Sandberg's Bluegrass and/or Exotic Grass	Big Sagebrush / Sandberg's Bluegrass - Cheatgrass	26,972.87
Wyoming Big Sagebrush - Bitterbrush / Native Bunchgrass	Big Sagebrush - Bitterbrush / Bunchgrass Mosaic	1,765.34
Wyoming Big Sagebrush - Spiny Hopsage / Native Bunchgrass	Big Sagebrush - Spiny Hopsage / Bunchgrass Mosaic	2.51
Wyoming Big Sagebrush - Spiny Hopsage / Sandberg's Bluegrass, Exotic Grass	Big Sagebrush - Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass	310.61
Wyoming Big Sagebrush / Native Bunchgrass	Big Sagebrush / Alkali Saltgrass	12.99

Wyoming Big Sagebrush / Native Bunchgrass	Big Sagebrush / Bluebunch Wheatgrass	603.62
Wyoming Big Sagebrush / Native Bunchgrass	Big Sagebrush / Giant Wildrye	3.71
Wyoming Big Sagebrush / Native Bunchgrass	Big Sagebrush / Indian Ricegrass	1,573.22
Wyoming Big Sagebrush / Native Bunchgrass	Big Sagebrush / Needle-and-Thread Grass	1,288.32
Wyoming Big Sagebrush / Native Bunchgrass	Big Sagebrush / Bluebunch Wheatgrass	39.24
Wyoming Big Sagebrush / Native Bunchgrass	Big Sagebrush / Bunchgrass Mosaic	703.04
Wyoming Big Sagebrush / Native Bunchgrass	Big Sagebrush / Needle-and-Thread Grass	54.62
Wyoming Big Sagebrush / Native Bunchgrass	Big Sagebrush / Sand Dropseed	62.12
Wyoming Big Sagebrush / Sandberg's Bluegrass and/or Exotic Grass	Big Sagebrush / Crested Wheatgrass	13.69
Wyoming Big Sagebrush / Sandberg's Bluegrass and/or Exotic Grass	Big Sagebrush / Sandberg's Bluegrass - Cheatgrass	6,657.44
Wyoming Big Sagebrush - Spiny Hopsage / Sandberg's Bluegrass, Exotic Grass	Big Sagebrush - Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass	5,766.24
	Total	45,829.57

Appendix M – Plant Communities By Management Unit

Rattlesnake Unit Plant Communities

Big Sagebrush / Bluebunch Wheatgrass		196.03
Big Sagebrush / Needle-and-Thread Grass		12.14
Big Sagebrush - Spiny Hopsage / Bunchgrass Mosaic		2.51
Big Sagebrush - Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass		914.29
Big Sagebrush / Bluebunch Wheatgrass		39.24
Big Sagebrush / Bunchgrass Mosaic		483.50
Big Sagebrush / Crested Wheatgrass		13.69
Big Sagebrush / Needle-and-Thread Grass		8.51
Big Sagebrush / Sandberg's Bluegrass - Cheatgrass		5,918.01
Bitterbrush / Bunchgrass Mosaic		0.00
Black Greasewood / Alkali Saltgrass		298.80
Bluebunch Wheatgrass		30,258.55
Bluebunch Wheatgrass - Needle-and-Thread Grass		129.57
Bunchgrass - Cheatgrass		3,223.17
Bunchgrass Mosaic		3,290.06
Disturbed		39.54
Needle-and-Thread Grass		644.09
Non Shrub-Steppe		80.76
Old Agricultural Fields		939.71
Rabbitbrush / Bunchgrass		0.79
Riparian		44.04
Rock Buckwheat / Bunchgrass Mosaic		2.90
Sandberg's Bluegrass - Cheatgrass		22,081.72
Stiff Sagebrush / Bluebunch Wheatgrass		137.82
Stiff Sagebrush / Sandberg's Bluegrass		119.69
Threetip Sagebrush / Bunchgrass Mosaic		10,488.59
Thymeleaf Buckwheat / Sandberg's Bluegrass		230.54
Winterfat / Bluebunch Wheatgrass		7.03
Winterfat / Bunchgrass Mosaic		1,105.02
Winterfat / Needle-and-Thread Grass		256.66
	Total	80,966.95

Saddle Mountain Plant Communities

Big Sagebrush / Bluebunch Wheatgrass	332.45
Big Sagebrush / Needle-and-Thread Grass	12.03
Big Sagebrush - Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass	1,823.81
Big Sagebrush / Sandberg's Bluegrass - Cheatgrass	8,242.52
Bluebunch Wheatgrass	752.78
Crested Wheatgrass	2,433.38
Needle-and-Thread Grass	6.79
Non Shrub-Steppe	558.16
Rabbitbrush / Sandberg's Bluegrass	156.32
Sandberg's Bluegrass - Cheatgrass	8,538.95
Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass	322.66

Stiff Sagebrush / Bluebunch Wheatgrass		359.12
Stiff Sagebrush / Sandberg's Bluegrass		316.51
Winterfat / Sandberg's Bluegrass - Cheatgrass		179.90
	Total	24,035.37

Columbia River Corridor Plant Communities

Big Sagebrush / Alkali Saltgrass	12.99
Big Sagebrush / Bluebunch Wheatgrass	28.12
Big Sagebrush / Giant Wildrye	3.71
Big Sagebrush / Indian Ricegrass	68.99
Big Sagebrush - Bitterbrush / Bunchgrass Mosaic	1,765.34
Big Sagebrush - Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass	141.21
Big Sagebrush / Bunchgrass Mosaic	219.54
Big Sagebrush / Needle-and-Thread Grass	46.10
Big Sagebrush / Sand Dropseed	62.12
Big Sagebrush / Sandberg's Bluegrass - Cheatgrass	1,124.24
Bitterbrush / Indian Ricegrass	3,303.88
Bitterbrush / Needle-and-Thread Grass	232.43
Bitterbrush / Sandberg's Bluegrass - Cheatgrass	29.94
Bluebunch Wheatgrass	13.47
Bunchgrass - Cheatgrass	9.09
Crested Wheatgrass	7.41
Disturbed	628.09
Indian Ricegrass	136.03
Needle-and-Thread Grass	333.43
Non Shrub-steppe	649.80
Old Agricultural Fields	957.79
Purple Sage / Sandberg's bluegrass - cheatgrass	20.31
Rabbitbrush - Snow Buckwheat / Bunchgrass Mosaic	410.82
Rabbitbrush / Bunchgrass	286.39
Rabbitbrush / Cheatgrass	123.72
Rabbitbrush / Indian Rice Grass	711.54
Rabbitbrush / Needle-and-Thread Grass	241.59
Rabbitbrush / Sand Dropseed	7.72
Rabbitbrush / Sandberg's Bluegrass	1,114.93
Riparian	886.18
Riverine Wetlands and Associated Deepwater Habitats	131.09
Sand Dropseed	396.36
Sandberg's Bluegrass - Cheatgrass	2,863.27
Snow Buckwheat - Bitterbrush / Bunchgrass Mosaic	21.87
Snow Buckwheat / Indian Ricegrass	194.98
Spiny hopsage / Sandberg's Bluegrass - Cheatgrass	167.00
Winterfat / Sandberg's Bluegrass - Cheatgrass	72.16
Total	17,423.65

Ringold Unit Plant Communities

Big Sagebrush / Bluebunch Wheatgrass	0.04
Big Sagebrush - Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass	5.42
Big Sagebrush / Sandberg's Bluegrass - Cheatgrass	2.62
Bluebunch Wheatgrass	0.87
Crested Wheatgrass	63.50
Indian Ricegrass	12.80

Needle-and-Thread Grass		787.86
Non Shrub-steppe		148.02
Purple Sage / Sandberg's Bluegrass - Cheatgrass		0.05
Rabbitbrush / Indian Rice Grass		17.76
Rabbitbrush / Sandberg's Bluegrass		95.08
Riparian		72.72
Sand Dropseed		198.08
Sandberg's Bluegrass - Cheatgrass		1,441.60
Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass		19.48
Winterfat / Sandberg's Bluegrass - Cheatgrass		11.69
	Total	2,877.58

Wahluke Unit Plant Communities

Big Sagebrush / Bluebunch Wheatgrass		46.98
Big Sagebrush / Indian Ricegrass		1,504.23
Big Sagebrush / Needle-and-Thread Grass		1,264.16
Big Sagebrush - Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass		3,192.13
Big Sagebrush / Sandberg's Bluegrass - Cheatgrass		18,342.93
Bitterbrush / Indian Ricegrass		1,513.53
Bitterbrush / Needle-and-Thread Grass		244.34
Bitterbrush / Sandberg's Bluegrass - Cheatgrass		2,993.14
Bluebunch Wheatgrass		224.05
Crested Wheatgrass		1.99
Indian Ricegrass		665.22
Needle-and-Thread Grass		5,505.36
Non Shrub-Steppe		3,406.83
Purple Sage / Sandberg's Bluegrass - Cheatgrass		147.16
Rabbitbrush / Indian Rice Grass		1,872.72
Rabbitbrush / Sandberg's Bluegrass		2,732.52
Riparian		142.85
Sand Dropseed		5.40
Sandberg's Bluegrass - Cheatgrass		10,506.86
Snow Buckwheat / Indian Ricegrass		1,171.37
Spiny Hopsage / Sandberg's Bluegrass - Cheatgrass		1,459.52
Winterfat / Sandberg's Bluegrass - Cheatgrass		732.81
	Total	57,676.10

Appendix N – Reptiles and Amphibians On the Monument

Common Name	Scientific Name
Reptiles	
Common garter snake	*Thamnophis sirtalis*
Great Basin gopher snake	*Pituophis melanoleucus* (= *catenifer*)
Night snake[(c)]	*Hypsiglena torquata*
Northern sagebrush lizard[(a)]	*Sceloporus graciosus*
Painted turtle	*Chrysemys picta*
Short-horned lizard	*Phrynosoma douglassii*
Side-blotched lizard	*Uta stansburiana*
Striped whipsnake[(b)]	*Masticophis taeniatus*
Rocky Mountain rubber boa	*Charina bottae*
Western rattlesnake	*Crotalus viridis*
Western terrestrial garter snake	*Thamnophis elegans*
Western yellow-bellied racer	*Coluber constrictor*
Amphibians	
Bullfrog	*Rana catesbeiana*
Great Basin spadefoot	*Scaphiopus intermontanus*
Pacific treefrog	*Hyla regilla*
Tiger salamander[(c)]	*Ambystoma tigrinum*
Woodhouse's toad[(c)]	*Bufo woodhousei*

(a) Federal Species of Concern.
(b) State Candidate species.
(c) State monitor species.

Appendix O – Fish in Monument Waters

Common Name	Scientific Name
American shad	*Alosa sapidissima*
Black bullhead	*Ameiurus melas*
Black crappie	*Pomoxis nigromaculatus*
Blue catfish	*Ictalurus furcatus*
Bluegill	*Lepomis macrochirus*
Bridgelip sucker	*Catostomus columbianus*
Brown bullhead	*Ictalurus nebulosus*
Burbot	*Lota lota*
Carp	*Cyprinus carpio*
Channel catfish	*Ictalurus punctatus*
Chinook salmon	*Oncorhynchus tshawytscha*
Chiselmouth	*Acrocheilus alutaceus*
Coho salmon	*Oncorhynchus kisutch*
Cutthroat trout	*Oncorhynchus clarki*
Dolly Varden	*Salvelinus malma*
Lake whitefish	*Coregonus clupeaformis*
Largemouth bass	*Micropterus salmoides*
Largescale sucker	*Catostomus macrocheilus*
Leopard dace	*Rhinichthys falcatus*
Longnose dace	*Rhinichthys cataractae*
Mottled sculpin	*Cottus bairdi*
Mountain sucker	*Catostomus platyrhynchus*
Mountain whitefish	*Prosopium williamsoni*
Northern pikeminnow (aka squawfish)	*Ptychocheilus oregonensis*
Pacific lamprey	*Entosphenus tridentatus*
Peamouth	*Mylocheilus caurinus*
Paiute sculpin	*Cottus beldingi*
Prickly sculpin	*Cottus asper*
Pumpkinseed	*Lepomis gibbosus*
Rainbow trout (steelhead)	*Oncorhynchus mykiss*
Redside shiner	*Richardsonius balteatus*
Reticulate sculpin	*Cottus perplexus*
River lamprey	*Lampetra ayresi*
Sandroller	*Percopsis transmontana*
Smallmouth bass	*Micropterus dolomieui*
Sockeye salmon	*Oncorhynchus nerka*
Speckled dace	*Rhinichthys osculus*
Tench	*Tinca tinca*
Threespine stickleback	*Gasterosteus aculeatus*
Torrent sculpin	*Cottus rotheus*
Walleye	*Stizostedion vitreum*
White crappie	*Pomoxis annularis*
White sturgeon	*Acipenser transmontanus*
Yellow perch	*Perca flavescens*
Yellow bullhead	*Ameiuruss natalis*

Appendix P – Birds on the Monument

Hawks	*Sp*	*S*	*F*	*W*	*Habitat*
Cooper's hawk	U		U	U	Mt, Rip
Ferruginous hawk*	U	U	R		Ca, Pp
Northern goshawk			Ca	Ca	Rip
Northern harrier*	Fc	Fc	Fc	Fc	Gr, M, Shb
Red-tailed hawk*	Fc	Fc	Fc	Fc	Pp, Rip
Rough-legged hawk	Fc		Fc	Fc	Gr, Mt, Pp
Sharp-shinned hawk	Fc		Fc	U	Mt, Rip
Swainson's hawk*	Fc	Fc			Mt, Rip

Falcons	*Sp*	*S*	*F*	*W*	*Habitat*
American kestrel*	Fc	Fc	Fc	U	Pp, Rip
Gyrfalcon			R	R	Fly
Merlin	U		U	U	Mt, Rip
Peregrine falcon	U	R	U	U	L, Riv
Prairie falcon*	U	U	U	U	L, Riv

Ospreys, Kites, & Eagles	*Sp*	*S*	*F*	*W*	*Habitat*
Bald eagle**	U		Fc	Fc	Riv
Golden eagle	U	Ca	U	U	Ca, Mt, Pp
Osprey*	U	U	U		Riv

Vultures	*Sp*	*S*	*F*	*W*	*Habitat*
Turkey vulture	Ca	Ca	Ca		Fly

Owls	*Sp*	*S*	*F*	*W*	*Habitat*
Barn owl*	U	U	U	U	Rip
Burrowing owl*	U	U	Ca		Gr, Shb
Great horned owl*	U	U	U	U	Ca, Rip
Long-eared owl*	U	U	U	U	Rip
Northern saw-whet owl				R	Rip
Short-eared owl*	U	U	U	U	Gr, Shb

Geese & Swans	*Sp*	*S*	*F*	*W*	*Habitat*
Tundra swan	Ca		U	Ca	L, Riv
Canada goose*	A	C	A	A	L, Riv
Greater white-fronted goose	Ca		Ca	Ca	L, Riv
Snow goose	Ca		Ca	Ca	L, Riv

Ducks	*Sp*	*S*	*F*	*W*	*Habitat*
American wigeon*	A	U	A	A	L, Riv
Barrow's goldeneye			U	U	Riv
Blue-winged teal*	Fc	Fc			L
Bufflehead			C	C	L, Riv
Canvasback*	U		U	U	L, Riv
Cinnamon teal*	Fc	Fc			L
Common goldeneye			C	C	L, Riv

Common merganser	C	Fc	A	A	L, Riv
Eurasian wigeon	Ca		Ca	Ca	L, Riv
Gadwall*	Fc	Ca	Fc	Fc	L, Riv
Greater scaup	Fc		Fc	U	Riv
Green-winged teal*	C	U	C	C	L, Riv
Harlequin duck				R	Riv
Hooded merganser			U	U	L
Lesser scaup*	Fc		Fc	U	L, Riv
Long-tailed duck			R	R	Riv
Mallard*	A	C	A	A	L, Riv
Northern pintail*	C	Fc	C	Fc	L, Riv
Northern shoveler*	C	U	C	Fc	L, Riv
Red-breasted merganser	R		Ca	Ca	Riv
Redhead*	Fc	Fc	Fc	Fc	L, Riv
Ring-necked duck	Fc		Fc	Fc	L, Riv
Ruddy duck*	Fc	U	Fc	U	L, Riv
Surf scoter			R		Riv
White-winged scoter			R		Riv
Wood duck	U	U	U	U	L

Loons	*Sp*	*S*	*F*	*W*	*Habitat*
Common loon	Fc	R	Fc	Fc	Riv
Pacific loon			U	U	Riv
Red-throated loon			R	R	Riv

Grebes	*Sp*	*S*	*F*	*W*	*Habitat*
Clark's grebe	U	U	U		L, Riv
Eared grebe*	Ca		Ca	Ca	L, Riv
Horned grebe	Fc		Fc	Fc	Riv
Pied-billed grebe*	Fc	Fc	Fc	Fc	L, Riv
Red-necked grebe	U		U	U	Riv
Western grebe*	Fc	U	Fc	U	Riv

Gulls	*Sp*	*S*	*F*	*W*	*Habitat*
Bonaparte's gull			Fc		Riv
California gull*	C	C	C	C	L, Riv
Franklin's gull			Ca		Riv
Glaucous-winged gull	Fc		Fc	Fc	Riv
Herring gull	Fc		Fc	Fc	L, Riv
Mew gull				R	Riv
Ring-billed gull	C	C	C	C	L, Riv
Thayer's Gull				R	Riv

Jaegers	*Sp*	*S*	*F*	*W*	*Habitat*
Long-tailed jaeger	R		R		Riv
Parasitic jaeger	R		R		Riv

Terns	*Sp*	*S*	*F*	*W*	*Habitat*
Black tern*	Ca		U		L, Riv
Caspian tern	Fc	Fc			Riv
Forster's tern*	Fc	Fc			Riv

Plovers	*Sp*	*S*	*F*	*W*	*Habitat*
American golden plover			R		Riv
Black-bellied plover			U		Riv
Killdeer*	Fc	Fc	C	U	L, Riv
Lesser golden plover			R		Riv
Semi-palmated plover	U		U		L, Riv

Shorebirds	*Sp*	*S*	*F*	*W*	*Habitat*
Baird's sandpiper			U		Riv
Dunlin	Fc		Fc	U	L, Riv
Greater yellowlegs	Fc		Fc		L, Riv
Least sandpiper	U		U		L, Riv
Lesser yellowlegs	U		Fc		L, Riv
Long-billed curlew*	Fc	Fc			Gr, M
Long-billed dowitcher	Fc		Fc		L, Riv
Marbled godwit			R		Riv
Pectoral sandpiper	R	R	R		Riv
Semi-palmated sandpiper			U		Riv
Short-billed dowitcher	R		R		L
Solitary sandpiper	Ca		U		L
Spotted sandpiper*	C	C			L, Riv
Stilt sandpiper		R	R		Riv
Western sandpiper	U		Fc		L, Riv

Stilts & Avocets	*Sp*	*S*	*F*	*W*	*Habitat*
American avocet*	U				L, Riv
Black-necked stilt*	Ca				L

Phalaropes	*Sp*	*S*	*F*	*W*	*Habitat*
Red-necked phalarope	U		U		L
Wilson's phalarope	U		U		L

Snipes	*Sp*	*S*	*F*	*W*	*Habitat*
Common snipe*	Fc	U	Fc	U	L, M, Riv

Pelicans & Cormorants	*Sp*	*S*	*F*	*W*	*Habitat*
American white pelican	C	Fc	C	Fc	Riv
Double-crested cormorant*	C	C	C	C	L, Riv

Cranes	*Sp*	*S*	*F*	*W*	*Habitat*
Sandhill crane	A		A		Fly

Bitterns, Herons & Egrets	*Sp*	*S*	*F*	*W*	*Habitat*
American bittern*	R				M
Black-crowned night heron*	C	C	C	Fc	L
Great blue heron*	Fc	Fc	Fc	Fc	L, Riv
Great egret*	U	U	U		L, Riv

Rails	*Sp*	*S*	*F*	*W*	*Habitat*
American coot*	A	A	A	A	L
Sora*	Ca		Ca		M
Virginia rail*	Fc	Fc	Fc	Fc	M

Gallinaceous Birds	*Sp*	*S*	*F*	*W*	*Habitat*
California quail*	Fc	Fc	Fc	Fc	Shb, Rip
Chukar*	C	C	C	C	Ca, Gr
Gray partridge*	Fc	Fc	Fc	Fc	Gr, Shb
Ring-necked pheasant*	Fc	Fc	Fc	Fc	Shb

Doves	*Sp*	*S*	*F*	*W*	*Habitat*
Mourning dove*	Fc	Fc	Fc	U	Rip, Shb
Rock dove*	Fc	Fc	Fc	Fc	Rip, Shb

Goatsuckers	*Sp*	*S*	*F*	*W*	*Habitat*
Common nighthawk*		Co			Gr, Rip, Shb
Common poorwill*	Fc	Fc			Ca

Kingfishers	*Sp*	*S*	*F*	*W*	*Habitat*
Belted kingfisher*	Fc	Fc	Fc	U	L, Riv

Woodpeckers	*Sp*	*S*	*F*	*W*	*Habitat*
Downy woodpecker	U	U	U	U	Rip
Hairy woodpecker				R	Rip
Lewis' woodpecker	U	R	U		Mt, Rip
Northern flicker*	Fc	Fc	Fc	Fc	Rip
Red-naped sapsucker	Ca		Ca		Rip

Hummingbirds	*Sp*	*S*	*F*	*W*	*Habitat*
Black-chinned hummingbird			R		Rip
Calliope hummingbird	U		U		Rip
Rufous hummingbird	U		U		Rip

Swifts	*Sp*	*S*	*F*		
Vaux's swift	Ca		Ca		Fly, Mt
White-throated swift	U	U			Ca, Fly

Swallows	*Sp*	*S*	*F*	*W*	*Habitat*
Bank swallow*	A	A			Ca, Rip, Riv
Barn swallow*	A	A	A		Fa, Mt, Rip
Cliff swallow*	A	A			Ca, Fa
Northern rough-winged swallow*	U	U			M, Riv
Tree swallow	Fc		U		Riv
Violet-green swallow*	Fc	Fc			Ca

Flycatchers	*Sp*	*S*	*F*	*W*	*Habitat*
Dusky flycatcher	Fc	R	Ca		Rip
Eastern kingbird*	Fc	Fc			Rip
Gray flycatcher	Ca		Ca		Rip
Hammond's flycatcher	Fc		Fc		Rip
Olive-sided flycatcher	Ca		Ca		Rip
Pacific-slope flycatcher	Fc		Fc		Rip
Say's phoebe*	Fc	Fc		R	Ca, Rip
Western kingbird*	C	C			Rip
Western wood pewee*	Fc	Fc			Rip
Willow flycatcher	U		U		Rip

Larks	*Sp*	*S*	*F*	*W*	*Habitat*
Horned lark*	A	A	A	A	Gr, Mt

Jays, Magpies & Crows	*Sp*	*S*	*F*	*W*	*Habitat*
American crow	C	C	C	C	Rip, Riv
Black-billed magpie*	C	C	C	C	Rip, Shb
Common raven*	Fc	Fc	Fc	Fc	Mt, Rip, Shb

Chickadees & Titmice	*Sp*	*S*	*F*	*W*	*Habitat*
Black-capped chickadee	R	R			Rip

Nuthatches	*Sp*	*S*	*F*	*W*	*Habitat*
Red-breasted nuthatch	Ca		Ca		Mt, Rip

Creepers	*Sp*	*S*	*F*	*W*	*Habitat*
Brown creeper	Ca		Ca		Rip

Waxwings	*Sp*	*S*	*F*	*W*	*Habitat*
Bohemian waxwing				U	Rip
Cedar waxwing	U	U	U		Rip

Wrens	*Sp*	*S*	*F*	*W*	*Habitat*
Bewick's wren*	U	U	U	U	Rip
Canyon wren*	R		Ca	Ca	Ca, Mt, Rip
House wren*	Fc	Fc			Rip
Marsh wren*	C	C	U	U	M
Rock wren*	Fc	Fc	Ca		Ca, Mt
Winter wren	U		U	U	Rip

Kinglets, Bluebirds, Thrushes	*Sp*	*S*	*F*	*W*	*Habitat*
American robin*	A	C	A	A	Rip
Golden-crowned kinglet	C		A		Mt, Rip
Hermit thrush	Fc		Fc		Rip
Mountain bluebird	Fc		Fc		Mt
Ruby-crowned kinglet	A		A		Rip
Swainson's thrush	R		R		Rip
Townsend's solitaire	Fc		Fc		Mt, Rip
Varied thrush	U		Fc	U	Mt, Rip
Western bluebird	R		Ca		Mt, Shb

Mockingbirds & Thrashers	*Sp*	*S*	*F*	*W*	*Habitat*
Gray catbird	Ca		Ca		Rip
Sage thrasher*	U	U	Ca		Shb

Wagtails & Pipits	*Sp*	*S*	*F*	*W*	*Habitat*
American pipit	Fc		A		Fly, Mt, Riv

Shrikes	*Sp*	*S*	*F*	*W*	*Habitat*
Loggerhead shrike*	Fc	Fc	U	Ca	Rip, Shb
Northern shrike			Fc	Fc	Rip, Shb

Starlings & Mynas	*Sp*	*S*	*F*	*W*	*Habitat*
European starling*	A	A	A	A	Ca, Fa, Rip

Vireos	*Sp*	*S*	*F*	*W*	*Habitat*
Cassin's vireo	Fc		U		Rip
Warbling vireo	Fc		C		Rip

Warblers	*Sp*	*S*	*F*	*W*	*Habitat*
Common yellowthroat*	U		U		M
MacGillivray's warbler	U		U		Rip
Nashville warbler	Fc		Fc		Rip
Orange-crowned warbler	Fc		Fc		Rip
Townsend's warbler	C		U		Rip
Yellow warbler*	Fc		Fc		Rip
Yellow-breasted chat*	U	U			Rip
Yellow-rumped warbler	C	Ca	A	Fc	Rip
Wilson's warbler*	A		Fc		Rip

Tanagers	*Sp*	*S*	*F*	*W*	*Habitat*
Western tanager	U		U		Rip

Meadowlarks & Orioles	*Sp*	*S*	*F*	*W*	*Habitat*
Bullock's oriole*	C	C			Rip
Western meadowlark*	A	A	Fc	Fc	Gr, Shb

Blackbirds	*Sp*	*S*	*F*	*W*	*Habitat*
Brewer's blackbird*	C	C			Fa, Rip
Brown-headed cowbird*	Fc	Fc			Rip, Shb
Red-winged blackbird*	A	A	C	A	M, Rip
Yellow-headed blackbird*	C	C			M

Towhees, Sparrows & Buntings	*Sp*	*S*	*F*	*W*	*Habitat*
American tree sparrow			Fc	Fc	Rip
Black-throated sparrow			R		Shb
Brewer's sparrow*	A	A			Shb
Chipping sparrow	U		U		Mt, Rip, Shb
Dark-eyed junco	A		A	A	Mt, Rip
Fox sparrow	U		U		Rip
Grasshopper sparrow*	A	A			Gr
Golden-crowned sparrow	Fc		Fc		Rip
Harris sparrow				R	M, Rip, Shb
Lapland longspur			R	R	Gr, Mt
Lark sparrow*	Fc	Fc			Rip, Shb
Lazuli bunting*	Fc	Fc			Rip
Lincoln's sparrow	U		U		Rip
Sage sparrow*	A	A			Shb
Savannah sparrow*	A		A		Gr, Shb
Snow bunting			U	U	Mt
Song sparrow*	C	C	C	C	M, Rip
Spotted towhee	Fc	Ca	Fc		Rip
Vesper sparrow*	A	A			Gr
White-crowned sparrow	A		A	A	M, Rip, Shb

Finches	*Sp*	*S*	*F*	*W*	*Habitat*
American goldfinch*	A	Fc	A	A	M, Rip, Shb
Black-headed grosbeak*	U	U			Rip
Cassin's finch	Ca			Ca	Rip
Common redpoll				R	Shb
Evening grosbeak	R				Rip
Gray-crowned rosy-finch	U		U	U	Ca, Mt
House finch	Fc	Ca	C	C	Rip
Pine siskin	Ca	Ca	Ca	R	Rip
Red crossbill	R			R	Mt, Rip

Old World Sparrows	*Sp*	*S*	*F*	*W*	*Habitat*
House sparrow*	C	C	C	C	Fa

Season Symbols
- Sp - Spring, March through May
- S - Summer, June through August
- F - Fall, September through November
- W - Winter, December through February

Habitat Symbols
- Ca - canyons, rock outcroppings, talus slopes
- Fa - facilities
- Fly - flyover
- Gr - grasslands
- L - lakes
- M - marshes
- Mt - mountains
- Pp - power poles
- Rip - riparian
- Riv - rivers & streams
- Shb - shrubs

Abundance Symbols
- A - abundant, seen in abundance in the appropriate season and habitat
- C - common, seen in moderate numbers in the appropriate season and habitat
- Ca - casual, not recorded every year
- Fc - fairly common, observed daily but in small numbers
- U - uncommon, see annually but not daily
- R - rare, known to be present but not every year, less than 10 observations
- * - birds known to nest locally
- ** - indicates a threatened or endangered species

Accidentals

American redstart	Blackpoll warbler	Purple finch
Anna's hummingbird	Brant	Red-eyed vireo
Arctic tern	Cattle egret	Sage grouse
Ash-throated flycatcher	Chestnut-sided warbler	Snowy owl
Band-tailed pigeon	Hutton's vireo	Tennessee warbler
Black-and-white warbler	Least flycatcher	Trumpeter swan
Black-legged kittiwake	Mountain chickadee	White-faced ibis
Black phoebe	Northern mockingbird	

Appendix Q – Mammals on the Monument

Common Name	Scientific Name
Bats	
Big brown bat	*Eptesicus fuscus*
Hoary bat	*Lasiurus cinereus*
Little brown myotis	*Myotis lucifugus*
Long-legged myotis	*Myotis volans*
Pallid bat	*Antrozous pallidus*
Silver-haired bat	*Lasionycteris noctivagans*
Western pipistrelle	*Pipistrellus hesperus*
Western small-footed myotis	*Myotis ciliolabrum*
Yuma myotis	*Myotis yumanensis*
Beavers	
American beaver	*Castor canadensis*
Canids	
Coyote	*Canis latrans*
Cats	
Bobcat	*Lynx rufus*
Mountain lion (cougar)	*Felis concolor*
Deer & Elk (Cervids)	
Mule deer	*Odocoileus hemionus*
Rocky Mountain elk	*Cervus elaphus*
White-tailed deer	*Odocoileus virginianus*
Hares & Rabbits	
Black-tailed jackrabbit	*Lepus californicus*
Mountain cottontail	*Sylvilagus nutalli*
Pygmy rabbit[(a)]	*Brachylagus idahoensis*
White-tailed jackrabbit	*Lepus townsendii*
Mice & Rats – New World (Cricetids)	
Bushy-tailed woodrat	*Neotoma cinerea*
Deer mouse	*Peromyscus maniculatus*
Montane vole	*Microtus montanus*
Muskrat	*Ondatra zibethica*
Northern grasshopper mouse	*Onychomys leucogaster*
Sagebrush vole	*Lemmiscus curtatus*
Western harvest mouse	*Riethrodontonomys megalotis*
Mice & Rats – Old World (Murids)	
House mouse[(b)]	*Mus musculus*
Norway rat[(b)]	*Rattus norvegicus*

Pocket Gophers	
Northern pocket gopher	*Thomomys talpoides*
Pocket Mice & Relatives (Heteromyids)	
Great Basin pocket mouse	*Perognathus parvus*
Porcupines	
Porcupine	*Erithizon dorsatum*
Racoons (Procyonids)	
Raccoon	*Procyon lotor*
Shrews	
Merriam's shrew	*Sorex merriami*
Vagrant shrew	*Sorex vagrans*
Squirrels	
Least chipmunk	*Eutamius minimus*
Townsend's ground squirrel	*Spermophilus townsendii*
Washington ground squirrel	*Spermophilus washingtoni*
Yellow-bellied marmot	*Marmota flaviventris*
Weasels & Relatives (Mustelids)	
American badger	*Taxidea taxus*
Long-tailed weasel	*Mustela frenata*
Mink	*Mustela vison*
River otter	*Lutra canadensis*
Striped skunk	*Mephitis mephitis*

(a) Probably extirpated.
(b) Introduced.

Appendix R – National Wildlife Refuge System Strategic Goals and the Monument RONS and MMS Project Lists

The Refuge Operating Needs System (RONS) is a nation-wide computerized database designed to optimize the management of staffing and operation needs. It uses standardized procedures to document and prioritize needs and to report accomplishments. RONS projects are separated into two tiers, Tier 1 and Tier 2. Tier 1 projects are regionally ranked and are: 1) for essential staffing; 2) mission critical; and 3) new or significantly expanded refuges. Tier 1 projects have been locked since 2001 and cannot be modified; no new projects can be added, but they can be reprioritized. Tier 2 projects encompass all other projects and are not regionally ranked. Tier 2 projects can be modified and new projects can be added. Accomplishment reports are required when any RONS project is completed.

The Maintenance Management System (MMS) is a computerized database designed to optimize the management of deferred maintenance and capital improvement activities throughout the FWS. It uses standardized procedures to document and prioritize field facility and equipment needs and to report accomplishments. It is a management tool for planning and budgeting deferred maintenance, capital improvement, equipment repair and replacement, and construction projects. The MMS documentation begins at the ground level with identification of deferred maintenance, capital improvements, construction needs, and equipment replacement and repair needs by field station managers. The database allows generation of reports that summarize data in a variety of ways, such as by maintenance codes, facility and equipment category, project cost estimates, priorities and project expenditures. The FWS must document all deferred maintenance and construction appropriation projects in the MMS database before they are eligible for funding. The MMS documents deferred maintenance, construction, capital improvement, and equipment needs to aid management in planning and budgeting for field activities. As such, it is managed to provide timely and accurate information to the DOI, Office of Management and Budget, Congress, and other organizations.

Activities and projects listed under the 12 NWRS Strategic Goals below will be implemented as funds become available.

1. Conserve, manage, and where appropriate, restore fish, wildlife and plant resources and their habitats to fulfill refuge purposes, trust resource responsibilities, and biological diversity/ integrity.

Project Description	RONS/MMS (M) No.	Estimated Cost (Thousands)
Control invasive plant species	00013/01012/03004/03006M	128/34/66/52
Management plan for elk	00016	138
Expand habitat and wildlife monitoring	00002	138
Restore and maintain habitats	00014/00025/03002/ 03003/03005	190/163/170/ 171/156
Manage and monitor islands and shorelines	00027/01010M	38/26
Black-tailed jack rabbit inventory	01030	58
Washington and Townsend's ground squirrel studies	01027	49
Ecology of rare plants	00033	70
Western burrowing owl nesting study	01028	50
Support Ecological Services for Hanford Site issues	01036	464
BPA transmission line easement vegetation control and road maintenance	01022	151
Comprehensive vegetation survey	03008	111
Reintroduce Columbia Basin pygmy rabbits	03011	32
Wildlife and Habitat Management Plan	Proposed	150
	TOTAL	2,605

2. Provide quality environments with adequate water.

Project Description	RONS/MMS (M) No.	Estimated Cost (Thousands)
In-river contaminants	01023	501
WB-10 ponds contaminant investigation	01029	59
Wetland restoration	03007	75
	TOTAL	635

3. Ensure that unique values of wilderness, other special designation areas, and cultural resources are protected.

Project Description	RONS/MMS (M) No.	Estimated Cost (Thousands)
Manage water flows through relicensing	01021	207
Wild and scenic river suitability: Interim protection	01019	84
Native American trust responsibilities	01034/01013/01035/03001	167/151/167/26
Columbia River Salmon Agreement	01020	138
Cultural resources surveys	03009/03012/03013	86/29/80
Pre-Manhattan Project history	03014	28
Cultural Resource Management Plan	03015	170
Cultural Resource MOU with tribes	03016	55
Cultural Resource repository, curation and lab	03018	23
Mitigation due to White Bluffs sloughing	03021	22
	TOTAL	1,433

4. Welcome and orient visitors.

Project Description	RONS/MMS (M) No.	Estimated Cost (Thousands)
Entrance signs	00014M	73
Entrance gates	00018M/03001M	32/32
	TOTAL	528

5. Provide quality wildlife-dependent recreation and education opportunities.

Project Description	RONS/MMS (M) No.	Estimated Cost (Thousands)
Outreach program	01032/00023	151/167
Interpretation and Education program	00008	138
Provide on-site interpretation	00031	75
Maintain public roads	00011	183
Interpretive kiosks	00009M	117
Remove cattle guards and watering troughs	01020M	42
Interpretive pullouts	00012M	104
Replace road grader	03003M	140
Replace boundary signs	01004M/00013M	31/55
Hanford Reach overlook on the Wahluke Unit	00024M	110
Unsafe parking lot removal	01017M	42
Jet boat and trailer	01011M	26
Parking area at north Wahluke entrance	05002M	100
Public use plan	Proposed	150
Hunting plan	Proposed	100
	TOTAL	1,786

6. Volunteers, friends, and conservation partners actively contribute to the NWRS mission.

Project Description	RONS/MMS (M) No.	Estimated Cost (Thousands)
Partnership for Arid Lands Stewardship	00017	138
White Bluffs erosion and sedimentation	01024	310
Coordinate volunteers	03010	138
Survey fossils in Ringold Formation	03019	138
Geology and tectonic/cataclysmic flood events	03020/03022	27/25
	TOTAL	776

7. Protect resources and visitors through law enforcement.

Project Description	RONS/MMS (M) No.	Estimated Cost (Thousands)
LE vehicle	01008	90
Manage recreational uses	01037	151
Jet boat and trailer	00019M	55
	TOTAL	296

8. Provide infrastructure and equipment adequate to support NWRS mission, maintained in good condition.

Project Description	RONS/MMS (M) No.	Estimated Cost (Thousands)
Maintain equipment and facilities	00015	128
Adequate shop tools and equipment	01011/01025	34/29
Bulldozer	01003	95
Low ground pressure equipment for restoration	01004	47
Front end loader	01019M	61
Challenger	03004M	180
Disc	03010M	8
Disc	03013M	11
Tractor	03005M	52
Tractor	01014M	58
Mower	03002M	16
Backhoe	03014	55
Front-end loader	01019M	61
	TOTAL	835

9. Quality and useful Comprehensive Conservation Plans are completed on schedule and with the full engagement of partners.

10. Strategically grow the NWRS.

Project Description	RONS/MMS (M) No.	Estimated Cost (Thousands)
Land acquisition and transfer	01038	167
	TOTAL	167

11. Reduce wildfire risks and improve habitats.

Project Description	RONS/MMS (M) No.	Estimated Cost (Thousands)
Fire history study	00019	120
Firefighting equipment	01002	48
Water truck	01007	57
Fire effects / fire rehabilitation monitoring	03006	27
Type 6 fire engine	01007M	105
Fire bunkhouse	05001M	250
	TOTAL	607

12. Organizational excellence.

Project Description	RONS/MMS (M) No.	Estimated Cost (Thousands)
Administration	00028/00004	127/117
Operations	00007/00030	151/151
	TOTAL	546

Appendix S – Monument Staffing Needs

Position	P/T*	Grade	Alt A		Alt B, B-1		Alt C, C-1		Alt D		Alt E		Alt F	
			Fill	Year	Fill	Year	Fill	Year	Fill	Year	Fill	Year	Fill	Year
Project Leader	P	GS-14	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Deputy Project Leader	P	GS-13	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Refuge Operations Specialist	P	GS-9	✓	0	✓	1	✓	1	✓	2	✓	2	✓	1
Supervisory Biologist	P	GS-12	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Wildlife Biologist	P	GS-11	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Wildlife Biologist	P	GS-11			✓	3	✓	3	✓	2	✓	3	✓	3
Wildlife Biologist	P	GS-9	✓	0	✓	5	✓	5					✓	5
Fisheries Biologist	P	GS-11			✓	5	✓	5			✓	5	✓	5
Biological Technician	T	GS-5	✓	0	✓	3	✓	3	✓	2	✓	3	✓	3
Biological Technician	T	GS-5			✓	5	✓	5			✓	5	✓	5
Archeologist**	P	GS-12	✓	4	✓	0	✓	0	✓	0	✓	0	✓	0
Historian	P	GS-9			✓	4	✓	0	✓	0	✓	0	✓	4
Geologist	P	GS-9			✓	7	✓	7			✓	7	✓	7
Tribal Coordinator	P	GS-11			✓	3							✓	3
Cultural Resources Technician	P	GS-9	✓	5	✓	0	✓	0	✓	0	✓	0	✓	0
Cultural Resources Technician	T	GS-7			✓	1							✓	1
Supervisory Outdoor Planner	P	GS-12	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0

Position	P/T*	Grade	Alt A		Alt B, B-1		Alt C, C-1		Alt D		Alt E		Alt F	
			Fill	Year	Fill	Year	Fill	Year	Fill	Year	Fill	Year	Fill	Year
Outdoor Recreation Planner	P	GS-11	✓	1	✓	1	✓	1	✓	1	✓	1	✓	1
Outdoor Recreation Planner	P	GS-9					✓	3	✓	3	✓	3		
Outdoor Recreation Planner	T	GS-9							✓	6				
Education Specialist	P	GS-12			✓	2	✓	2	✓	0	✓	2	✓	2
Interpreter	P	GS-9					✓	2	✓	2	✓	2		
Interpreter	T	GS-7							✓	4				
Supervisory Maintenance	P	WG-10	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Maintenance Worker	P	WG-9			✓	0	✓	0	✓	0	✓	0	✓	0
Maintenance Worker	T	WG-7	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Maintenance Worker	T	WG-5	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Maintenance Worker	T	WG-5							✓	0				
Administrative Officer	P	GS-11	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Automation Clerk	P	GS-9			✓	0	✓	0	✓	0	✓	0	✓	0
Automation Clerk	P	GS-5	✓	0	✓	2	✓	2	✓	2	✓	2	✓	2
Automation Clerk	T	GS-5	✓	0	✓	4	✓	4	✓	4	✓	4	✓	4
Purchasing Agent	P	GS-9			✓	0	✓	0	✓	0	✓	0	✓	0
Law Enforcement Officer	P	GS-11			✓	0	✓	0	✓	0	✓	0	✓	0
Law Enforcement Officer	P	GS-9	✓	0	✓	1	✓	1	✓	1	✓	1	✓	1
Law Enforcement Officer	P	GS-9							✓	3	✓	3	✓	3

Position	P/T*	Grade	Alt A		Alt B, B-1		Alt C, C-1		Alt D		Alt E		Alt F	
			Fill	Year	Fill	Year	Fill	Year	Fill	Year	Fill	Year	Fill	Year
Fire Management Officer	P	GS-12	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Asst. Fire Mgt. Officer	P	GS-11			✓	1	✓	1	✓	1	✓	1	✓	1
Supervisory Range Technician	P	GS-8	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Supervisory Range Technician	P	GS-8			✓	1	✓	1	✓	1	✓	1	✓	1
Crew Leader	P	GS-8	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Crew Leader	P	GS-7			✓	0	✓	0	✓	0	✓	0	✓	0
Range Technician	T	GS-5	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Range Technician	T	GS-5	✓	0	✓	1	✓	1	✓	1	✓	1	✓	1
Range Technician	T	GS-5			✓	1	✓	1	✓	1	✓	1	✓	1
Range Technician	T	GS-5			✓	1	✓	1	✓	1	✓	1	✓	1
Contaminants Specialist	P	GS-12	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Volunteer Coordinator	P	GS-9			✓	2	✓	2	✓	2	✓	2	✓	2
Research & Demo. Specialist	P	GS-13	✓	0	✓	0	✓	0	✓	0	✓	0	✓	0
Planner	P	GS-12	✓	0	✓	0	✓	0	✓	0	✓	0		
GIS Specialist	P	GS-11			✓	1	✓	1	✓	1	✓	1	✓	1
Total Positions			**26**		**45**		**45**		**45**		**45**		**45**	

* Permanent or Temporary position.

** These positions are currently vacant, and it is not known when they will be refilled.

Appendix T – Literature Cited

Aikens, C. M. 1993. Archaeology of Oregon. Bureau of Land Management, Portland, Oregon.

Alessa, L., and C.G. Earnhart. 2000. Effects of soil compaction on root and root hair morphology; implications for campsite rehabilitation. *In* Wilderness Science in a Time of Change Conference, Volume 5, Wilderness Ecosystems, Threats and Management proceedings, pages 99-104 (D.N. Cole, S.F. McCool, W.T. Borrie, and J. O'Loughlin, compilers). RMRS-P-15-VOL-5. U.S. Department of Agriculture, Forest Service , Rocky Mountain Research Station, Ogden, Utah.

Ames, K., D. Dumond, J. Galm, and R. Minor. 1998. Prehistory of the Southern Plateau. *In* Handbook of North American Indians, Volume 12, Plateau, pages 103-119. Smithsonian Institution, Washington, D.C.

Amtrak. 2004. Route and schedule information. (www.amtrak.com). Accessed August 2003.

Anderson, D.C., K.T. Harper, and S.R. Rushforth. 1982. Recovery of cryptogamic soil crusts from grazing on Utah winter ranges. Journal of Range Management 35(3):355-359.

Anderson, D.M., M.J. Scott, A.L. Bunn, R.A. Fowler, E.L. Pendergast, T.B. Miley, T.O. Eschbach, and J.A. Jaksch. 2002. 2001 Columbia River recreation survey – Implications for the Hanford Site integrated assessment. Report prepared for the U.S. Department of Energy. PNNL-13840, Pacific Northwest National Laboratory, Richland, Washington.

Anglin, D.R., S.L. Haeseker, J.J. Skalicky, H. Schaller, K.F. Tiffan, J.R. Hatten, D.W. Rondorf, P. Hoffarth, J. Nugent, D. Benner, and M. Yoshinaka. 2006. Effects of hydropower operation on spawning habitat, rearing habitat, and stranding/entrapment mortality of fall Chinook salmon in the Hanford Reach of the Columbia River. U.S. Fish and Wildlife Service, Portland, Oregon.

Arntzen, Tim. 2003. Personal communication with Paula Call, U.S. Fish and Wildlife Service. Columbia River Journeys. September 24, 2003.

Ashley, E.P., and J.T. Robinson. 1996. Road mortality of amphibians, reptiles and other wildlife on the Long Point Causeway, Lake Erie, Ontario. Canadian Field-Naturalist 110(3):403. Ottawa, Ontario, Canada.

Bainbridge, D.A. 1974. Trail management. Ecological Society of America Bulletin 55:8-10.

Bartelt, G.A. 1987. Effects of disturbance and hunting on the behavior of Canada goose family groups in east-central Wisconsin. Journal of Wildlife Management 51:517-522.

Beck, K.G. 1993. How do weeds affect us all. Proceedings of the Eighth Grazing Lands Forum. Washington, District of Columbia. December 2, 1993, pages 5-13.

Beck, K.G. 2003. Russian knapweed. Colorado State University Cooperative Extension. www.ext.colostate.edu/pubs/natres/03111.html

Beier, P., and R.F. Noss. 1998. Do habitat corridors provide connectivity? Conservation Biology 12:1241-1252.

Bell, D.V., and L.W. Austin. 1985. The game-fishing season and its effects on overwintering wildfowl. Biological Conservation 33:65-80.

Belnap J. Undated. Cryptobiotic soils: Holding the place in place. U.S. Geological Survey.

Belnap, J. 1995. Surface disturbances: Their role in accelerating desertification. Environmental Monitoring and Assessment 37:39-57.

Belnap J., K.T. Harper, and S.D. Warren. 1994. Surface disturbance of cryptobiotic soil crusts: Nitrogenase activity, chlorophyll content, and chlorophyll degradation. Arid Soil Research and Rehabilitation 8:1-8.

Belnap J., J. Kaltenecker, R. Rosentreter, J. Williams, S. Leonard, and D. Eldridge. 2001. Biological soil crusts: Ecology and management. Technical Report 1730-2, United States Department of the Interior.

Belnap, J., and S.L. Phillips. 2001. Soil biota in an ungrazed grassland: Response to annual grass (*Bromus tectorum*) invasion. Ecological Applications 11:1261-1275.

Bennett, K.A. and E.F. Zuelke. 1999. The effects of recreation on birds: A literature review. Department of Natural Resources and Environmental Control, Division of Fish & Wildlife, Delaware Natural Heritage Program, Smyrna, Delaware.

Benton County. 2003. Comprehensive land use plan. Revised October 27, 2003, by Resolutions #03-602, 603, 604 & 605.

Benton-Franklin Council of Governments. 2001. Regional transportation plan for the Tri-Cities metropolitan area and the Benton-Franklin-Walla Walla RTPO. 2001-2020 (November).

Bonanno, S.E. 1992. Vegetation of a Lake Ontario dune barrier, Oswego and Jefferson Counties, New York, under high and low recreation pressure. Master's thesis. Syracuse State University, New York. 88 pages.

Bordignon, L. 1985. Effetti del disturbo antropico su una popolazione di germano reale *Anas platyrhynchos*. (Effects of human disturbance on a population of mallard *Anas platyrhynchos*). Avocetta 9:87-88.

Bouffard, S. 1982. Wildlife values versus human recreation: Ruby Lake National Wildlife Refuge. Transactions of the North American Wildlife and Natural Resources Conference 47:553-558.

Boyle, S.A., and F.B. Samson. 1985. Effects of non-consumptive recreation on wildlife: A review. Wildlife Society Bulletin 13:110-116.

Brandt, C.A., C.E. Cushing, W.H. Rickard, N.A. Cadoret, and R. Mazaika. 1993. Biological resources of the 300-FF-5 Operable Unit. Report prepared for the U.S. Department of Energy. WHC-SD-EN-TI-121, Westinghouse Hanford Company, Richland, Washington.

Braun, C.E. (Chair). 1976. Conservation Committee report on effects of alteration of sagebrush communities on the associated avifauna. Wilson Ornithological Society, The Wilson Bulletin, March 1976.

Braun, C.E., M.F. Baker, R.L. Eng, J.S. Gashwiler, and M.H. Schroeder. 1976. Conservation committee report on effects of alteration of sagebrush communities on the associated avifauna. Wilson Bulletin 88:165-171.

Bright, J.A. 1986. Hiker impact on herbaceous vegetation along trails in evergreen woodland of central Texas. Biological Conservation 36:53-69.

British Columbia Ministry of Water, Land and Air Protection. 2002. Sources of human-caused disturbance. Chapter 6 *in* Interim Wildlife Guidelines for Commercial Backcountry Recreation in British Columbia. British Columbia Ministry of Water, Land and Air Protection, Victoria, British Columbia, Canada.

British Columbia Ministry of Water, Land and Air Protection, Ecosystem Standards and Planning Biodiversity Branch, and Grassland Conservation Council of British Columbia. 2004. Best management practices for recreational activities on grasslands in the Thompson and Okanagan Basins. Guidelines and Best Management Practices Report. Available at www.env.gov.bc.ca/wld/documents/bmp/grasslands_th_ok_bmp.pdf (Last accessed on March 28, 2007). 92 pages.

Brooks, M.L., and D.A. Pyke. 2001. Invasive plants and fire in the deserts of North America. *In* Proceedings of the Invasive Species Workshop: The Role of Fire in the Control and Spread of Invasive Species (K.E.M. Galley and T.P. Wilson , editors). Tall Timbers Research Station Miscellaneous Publication No. 11:1-14.

Brooks, M.L., C.M. D'Antonio, D.M. Richardson, J.B. Grace, J.E. Keeley, J.M. DiTomaso, R.J. Hobbs, M. Pellant, and D. Pyke. 2004. Effects of invasive alien plants on fire regimes. BioScience 54:677-688.

Buckley, R. (editor) 2004. Impacts of ecotourism on birds. Environmental Impacts of Ecotourism. CAB Publishing.

Buckley, P.A., and F.G. Buckley. 1976. Guidelines for protection and management of colonially nesting waterbirds. North Atlantic Regional Office, National Park Service, Boston, Massachusetts. 52 pages.

Buddemeier, R.W., J.A. Kleypas, and R.B. Aronson. 2004. Coral reefs and global climate change: Potential contributions of climate change to stresses on coral reef ecosystems. Pew Centre For Global Climate Change, Arlington, Virginia.

Bureau of Land Management, Colorado State Office. Preliminary wilderness character inventory evaluation: Vermillion Basin.

Bureau of Land Management. 1996. Utah wilderness review procedures: Interim guidance. Instruction Memorandum Number 96-176.

Burger, J. 1981. The effect of human activity on birds at a coastal bay. Biological Conservation 21:231-241.

Burger, J., and M. Gochfeld. 1991. Human activity influence and diurnal and nocturnal foraging of sanderlings (*Calidris alba*). Condor 93: 259-265.

Burger, J., B. Harrington, J. Rodgers, and H. Smith. 1999. Minimum recommended set-back (RS) distances for various disturbances approaching directly towards waterbirds to prevent flushing.

Cadwell, L.L. 1994. Wildlife studies on the Hanford Site: 1993 highlights report. Report prepared for the U.S. Department of Energy. PNL-9380, Pacific Northwest National Laboratory, Richland, Washington.

Callihan, R.H., F.E. Northam, J.B. Johnson, E.L. Michalson, and T.S. Prather. 1989. Yellow starthistle: Biology and management in pasture and rangeland. Current Information Series Number 634, University of Idaho Cooperative Extension, Moscow, Idaho.

Caplow, F. 2003. Studies of Hanford rare plants, 2002. Washington Department of Natural Resources Natural Heritage Report 2003-04. Prepared for the Washington Office of The Nature Conservancy.

Carney, K.M., and W.J. Sydeman. 1999. A review of human disturbance effects on nesting colonial waterbirds. Waterbirds 22: 68-79.

Carter, L.M., E. Shea, M. Hamnett, C. Anderson, G. Dolcemascolo, C. Guard, M. Taylor, T. Barnston, Y. He, M. Larsen, L. Loope, L. Malone, and G. Meehl. 2001. Potential consequences of climate variability and change for the U.S.-affiliated islands of the Pacific and Caribbean. Pages 315-349 *in* Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change. National Assessment Synthesis Team, U.S. Global Change Research Program. Cambridge University Press, Cambridge, United Kingdom.

Casavant, L. 1993. Procedure for predicting and estimating the impact of rail line abandonments on Washington roads. An Economic Evaluation of A Multimodal Transportation System: Grain Transportation in Eastern Washington.

Caudill, J., and E. Henderson. 2003. Banking on nature 2002: The economic benefits to local communities of national wildlife refuge visitation. Updated from 1997 report prepared by Andrew Laughland and James Cahill. Division of Economics, U.S. Fish and Wildlife Service, Washington, District of Columbia.

Chalfant, S. 1974. A report on anthropological and ethnohistorical material relative to aboriginal land use and occupancy by the Columbia Salish of central Washington. *In* Interior Salish and Eastern Washington Indians IV. Garland Publishing, New York.

Chapman, D.W., D.E. Weitkamp, T.L. Welsh, M.B. Dell, and T.H. Schadt. 1986. Effects of river flow on the distribution of chinook salmon redds. Transactions of the American Fisheries Society 115:537-547.

Chatters, J., S. Hackenberger, N. Cadoret, B. Bicchieri L. Ferrier, and R. Wood. 1989/1990. Hanford archaeological mapping & testing project 1989: Yeager Island, blowout Wahluke, and Locke Island sites. Central Washington Archaeological Survey. Central Washington University, Ellensburg, Washington, and Battelle-Pacific Northwest National Laboratory, Richland, Washington.

Cline, R., N. Sexton, and S.C. Stewart. 2005. A human-dimensions review of human-wildlife disturbance: A literature review of impacts, frameworks, and management solutions. U.S. Fish and Wildlife Service Report.

Cohn, J.P. 2005. Tiff over tamarisk: Can a nuisance be nice, too? BioScience 55:648-654.

Cole, D.N. 1978. Estimating the susceptibility of wildland vegetation to trailside alteration. Journal of Applied Ecology 15:281-286.

Cole, D.N. 1983. Campsite conditions in the Bob Marshall Wilderness, Montana. Research Paper INT-312. U.S. Department of Agriculture, Forest Service, Intermountain Forestry and Range Experimental Station. 18 pages.

Cole, D.N. 1990. Trampling disturbance and recovery of cryptogamic soil crusts in Grand Canyon National Park. Great Basin Naturalist 50:321-325.

Cole, D.N. 1995a. Disturbance of natural vegetation by camping: Experimental applications of low-level stress. Environmental Management 19(3):405-416.

Cole, D.N. 1995b. Experimental trampling of vegetation. I. Relationship between trampling intensity and vegetation response. Journal of Applied Ecology 32:203-214.

Cole, D.N. 1995c. Experimental trampling of vegetation. II. Relationship between trampling intensity and vegetation response. Journal of Applied Ecology 32:215-224.

Cole, D.N. 2004a. Environmental impacts of outdoor recreation in wildlands. *In* Society and Natural Resources: A Summary of Knowledge (M.J. Manfredo, J.J. Vaske, B.L. Bruyerre, D.R. Field, and P.J. Brown, editors), pages 107-116. Modern Litho, Jefferson, Missouri.

Cole, D.N. 2004b. Impacts of hiking and camping on soils and vegetation: A review. Environmental Impacts of Ecotourism (R. Buckley, editor). CAB Publishing, New York.

Cole, D.N., and R.L. Knight. 1990. Impacts of recreation on biodiversity in wilderness. Utah State University, Logan, Utah.

Cole, D.N., and R.L. Knight. 1990. Impacts of recreation on biodiversity in wilderness. Utah State University, Logan, Utah.

Cole, D.N., and P.B. Landres. 1995. Indirect effects of recreation on wildlife. Pages 183-201 *in* Wildlife and Recreationists: Coexistence Through Management and Research (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Washington, District of Columbia. 372 pages.

Cole, D.N., and J.L. Marion. 1988. Recreation impacts in some riparian forests of the eastern United States. Environmental Management 12:99-107.

Cole, D.N., and C.A. Monz. 2004. Spatial patterns of recreation impact on experimental campsites. Journal of Environmental Management 70:73-84.

Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines for management of sage grouse populations and habitats. Wildlife Society Bulletin 28:967-985.

Cook, S.F., Jr. 1959. The effects of fire on a population of small rodents. Ecology 40:102-108.

Cooke, A.S. 1987. Disturbance by anglers of birds at Grafham Water. ITE Symposium 19:15-22.

Cordell, H. K. 1999. Outdoor recreation in American life: A national assessment of demand and supply trends. Sagamore Publishing, Champaign, Illinois.

Council on Environmental Quality. 1997. Environmental justice: Guidance under the National Environmental Policy Act. Executive Office of the President, Washington, District of Columbia.

Cushing, C.E. 1995. Hanford Site National Environmental Policy Act (NEPA) characterization. Report prepared for the U.S. Department of Energy. PNL-6415, revision 7, Pacific Northwest National Laboratory, Richland, Washington.

D'Antonio, C. M., T. L. Dudley, and M. Mack. 1999. Disturbance and biological invasions: Direct effects and feedbacks. Pages 413-452 *in* Ecosystems of Disturbed Ground (L.R. Walker, editor). Elsevier, New York, New York.

D'Antonio, C.M., and P.M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics 23:63-87.

Daubenmire, R. 1970. Steppe vegetation of Washington. Washington Agricultural Experiment Station Technical Bulletin 62. Washington Agricultural Experiment Station, Pullman, Washington.

Dauble, D.D., and D.G. Watson. 1990. Spawning and abundance of fall Chinook salmon (*Oncorhynchus tshawytscha*) in the Hanford Reach of the Columbia River, 1948-l988. Report to the Bonneville Power Administration, Contract Number 1986BP62611, Project Number 198611800. (BPA Report DOE/BP-62611-16). Pacific Northwest National Laboratory, Richland, Washington. 72 pages (electronic).

Davis, W.E., Jr. 1986. Effects of old nests on nest-site selection in black-crowned night-herons and snowy egrets. Wilson Bulletin 98:300-303.

DeLong, A.K. 2002. Managing visitor use and disturbance of waterbirds – A literature review of impacts and mitigation measures. Prepared for Stillwater National Wildlife Refuge. Appendix L (114 pages) *in* Stillwater National Wildlife Refuge Complex Final Environmental Impact Statement for the Comprehensive Conservation Plan and Boundary Revision (Volume II). Department of the Interior, Fish and Wildlife Service, Region 1, Portland, Oregon. Available at www.fws.gov/stillwater/litreview.

Des Jean, T. 2000. The archaeological sites monitoring program at the Big South Fork National River and Recreation Area, 1986 to 1989. *In* Protecting the Past (G.S. Smith and J.E. Ehrenhard, editors). Online edition, National Park Service, Southeast Archeological Center, Tallahassee, Florida.

DiTomaso, J.M. 2000. Invasive weeds in rangelands: Species, impacts, and management. Weed Science 48:255-265.

Dobb, E. 1998. Reality check: The debate behind the lens. Audubon: January-February.

DOE – See U.S. Department of Energy.

Douglass, K.S., J. Hamann, and G. Joslin. 1999. Vegetation, soils and water. Pages 9.1-9.11 *in* Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of the Wildlife Society. 307pages.

Downs J.L., W.H. Rickard, C.A. Brandt, L.L Cadwell, C.E. Cushing, D.R. Geist, R.M Mazaida, D.A. Neitzel, L.E. Rogers, M.R. Sackschewsky, and J.J. Nugent. 1993. Habitat types on the Hanford Site: Wildlife and plant species of concern. Report prepared for the U.S. Department of Energy. PNL-8942, Pacific Northwest National Laboratory, Richland, Washington.

Duberstein, C.A. 1997. Use of riparian habitats by spring migrant land birds in the shrub-steppe of Washington. M.S. Thesis. Washington State University, Pullman, Washington.

Duffey, E. 1975. The effect of human trampling on the fauna of grassland litter. Biological Conservation 7:255-274.

Duncan C., J. Story, and R. Sheley. 2001. Montana knapweed: Identification, biology and management. Montana State University Extension Service.

Eberhardt, L.E., R.E. Anthony, and W.H. Rickard. 1989. Survival of juvenile Canada geese during the rearing period. Journal of Wildlife Management 53:372-377.

Edwards, R.W., and D.V. Bell. 1985. Fishing in troubled waters. New Science 1446, 7 March:19-21.

Eldridge, D.J. 1993. Cryptogam cover and soil surface condition: Effects on hydrology on a semiarid woodland soil. Arid Soil Research and Rehabilitation 7:203-217.

Erwin, M.R. 1989. Responses to human intruders by birds nesting in colonies: Experimental results and management guidelines. Colonial Waterbirds 12(1):104-108.

Evans, R.D., and J. Belnap. 1999. Long-term consequences of disturbance on nitrogen dynamics in an arid ecosystem. Ecology 80:150-160.

Evans, R.D., and J.R. Ehleringer. 1993. Broken nitrogen cycles in arid lands: Evidence from N15 soils. Oecologia 94:314-317.

Evans, J.R., and M.P. Lih. 2005. Recovery and rehabilitation of vegetation on the Fitzner-Eberhardt Arid Lands Ecology Reserve, Hanford Reach National Monument, following the 24 Command Fire. The Nature Conservancy, Seattle, Washington.

Evans, J.R., M.P. Lih, and P.W. Dunwiddie. 2003. Biodiversity studies of the Hanford Site: Final report 2002-2003. The Nature Conservancy of Washington, Seattle, Washington.

Evans, J.R., J.J. Nugent, and D.E. Ekblaw. 2002. Short-term impacts of the 24 Command Fire on vegetation of the Fitzner-Eberhardt Arid Lands Ecology Reserve, Hanford Reach National Monument: Synthesis of findings, 2001-2002. The Nature Conservancy of Washington, Seattle, Washington.

Fayer, M.J., G.W. Gee, M.L. Rockhold, M.D. Freshley, and T.B. Walters. 1996. Estimating recharge rates for a groundwater model using a GIS. Journal of Environmental Quality 25:510-518.

Fecht, K.R., S.P. Reidel, and A.M. Tallman. 1987. Paleodrainage of the Columbia River system on the Columbia Plateau of Washington State. A summary *in* Selected Papers on the Geology of Washington, pages 219-248 (J.E. Schuster, editor). Bulletin 77. Division of Geology and Earth Resources.

Fecht, K.R., K.A. Lindsey, B.N. Bjornstad, D.G. Horton, G.V. Last, and S.P. Reidel. 1999. Clastic injection dikes of the Pasco Basin and vicinity – Geologic Atlas Series. Report prepared for the U.S. Department of Energy. BHI-01103, Revision 0. Online at: www.erc.rl.gov/~pgs/ClasticDikes.pdf

Federal Committee on Ecological Reserves. 1977. A directory of research natural areas on federal lands of the United States of America. U.S. Department of Agriculture, Forest Service, Washington, District of Columbia. 280 pages.

Federal Register. February 28, 1996. Endangered and threatened wildlife and plants: Review of plant and animal taxa that are candidates for listing as endangered or threatened species. U.S. Fish and Wildlife Service, 61 FR 7595-7613.

Federal Register. November 12, 1999. Record of decision: Hanford comprehensive land-use plan environmental impact statement. U.S. Department of Energy, 64 FR 61615.

Federal Register. June 9, 2000. Establishment of the Hanford Reach National Monument. Proclamation 7319 of June 9, 2000, by the President of the United States of America. 65 FR 37253.

Fickeisen, D.H., D.D. Dauble, D.A. Neitzel, W.H. Rickard, R.L. Skaggs, and J.L. Warren. 1980. Aquatic and riparian resource study of the Hanford Reach, Columbia River, Washington. Report

prepared for the U.S. Department of Energy. Pacific Northwest National Laboratory, Richland, Washington.

Fitzner, R.E., and R.H. Gray. 1991. The status, distribution and ecology of wildlife on the U.S. DOE Hanford Site: A historical overview of research activities. Environmental Monitoring Assessment 18:173-202.

Fitzner, R.E., and S.G. Weiss. 1994. Bald eagle site management plan for the Hanford Site, south-central Washington. DOE/RL-94-150, U.S. Department of Energy, Richland, Washington.

Fitzner, R.E., S.G. Weiss, and J.A. Stegen. 1994. Threatened and endangered wildlife species of the Hanford Site related to characterization activities. Report prepared for the U.S. Department of Energy. WHC-EP-05-13, Westinghouse Hanford Company, Richland, Washington.

Forman, R.T.T., and L.E. Alexander. 1998. Roads and their major ecological effects. Annual Review of Ecology and Systematics 29:207-231.

Franklin, J.F., and C.T. Dyrness. 1973. Natural vegetation of Oregon and Washington. Pacific Northwest Forest and Range Experiment Station, U.S. Department of Agriculture, Forest Service, Portland, Oregon.

Franklin, J.F., F.C. Hall, C.T. Dyrness, and C. Maser (editors). 1972. Federal research natural areas in Oregon and Washington: A guidebook for scientists and educators. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Franklin County. 2000. Comprehensive plan. Adopted December 2000.

Fraser, J.D., L.D. Frenzel, and J.E. Mathisen. 1985. The impact of human activities on breeding bald eagles in north-central Minnesota. Journal of Wildlife Management 49:585-592.

Freddy, D.J. 1986. Responses of adult mule deer to human harassment during winter. Pages 286 *in* Proceedings II. Issues and Technology in the Management of Impacted Western Wildlife: Proceedings of a National Symposium (R.D. Comer, T.G. Baumann, P. Davis, J.W. Monarch, J. Todd, S. VanGytenbeek, D. Wills, and J. Woodling, editors). Thorne Ecological Institute, Boulder, Colorado.

Freshley, M.D., and M.J. Graham. 1988. Estimation of groundwater travel time at the Hanford Site: Description, past work, and future needs. Report prepared for the U.S. Department of Energy. PNL-6328, Pacific Northwest National Laboratory, Richland, Washington.

Frest, T.J., and E.J. Johannes. 1993. Mollusc survey of the Hanford Site, Benton and Franklin Counties, Washington. Report prepared for the U.S. Department of Energy. PNL-8653, Pacific Northwest Laboratory, Richland, Washington.

Frid, A., and L. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. Conservation Ecology 6(1):11.

FWS – See U.S. Fish and Wildlife Service.

Gaines, W.K., C.E. Cushing, and S.D. Smith. 1992. Secondary production estimates of benthic insects in three cold desert streams. Great Basin Naturalist 52:11-24.

Galm, J., G. Hartmann, R. Masten, and G.O. Stephenson. 1981. A cultural resources overview of the Bonneville Power Administration's Mid-Columbia Project, central Washington. Archeology & History Report #100 prepared for the Washington State Office of Archaeology and Historic Preservation. Eastern Washington University, Cheney, Washington.

Galm, J., G. Hartmann, and R. Masten. 1985. An archaeological overview of the Mid-Columbia study unit: Benton, Franklin, Klickitat and Walla-Walla Counties, Washington. Archeology & History Report #100-47 prepared for the Washington State Office of Archaeology and Historic Preservation. Archaeological and Historical Services, Eastern Washington University, Cheney, Washington.

Gaylord, D.R., and L.D. Stetler. 1994. Aeolian-climatic thresholds and sand dunes at the Hanford Site, south-central Washington. Journal of Arid Environments 28:95-116.

Gee, G.W., M.J. Fayer, M.L. Rockhold, and M.D. Campbell. 1992. Variations in recharge at the Hanford Site. Northwest Science 66(4):237.

Geist, D.R. August 7, 1989. Memorandum to Phil Peterson, Washington Department of Fisheries. Subject: Stranding of zero-age wild fall Chinook on the Hanford Reach of the Columbia River. Washington Department of Fisheries, Olympia, Washington.

Geist, D.R., J. Jones, C.J. Murray, and D.D. Dauble. 2000. Suitability criteria analyzed at the spatial scale of redd clusters improved estimates of fall chinook salmon *(Oncorhynchus tshawytscha)* spawning habitat use in the Hanford Reach, Columbia River. Canadian Journal of Fisheries and Aquatic Sciences 57:1636-1646.

Glinski, R.L. 1976. Birdwatching etiquette: The need for a developing philosophy. American Bird 30(3):655-657.

Grabherr, G. 1983. Damage to vegetation by recreation in the Austrian and German Alps. Pages 74-91 *in* The Ecological Impacts of Outdoor Recreation on Mountain Areas in Europe and North America (N.G. Bayfield and G.C. Barrow, editors). Report 9. 203 pages.

Grand Canyon National Park, Northern Arizona University, Glen Canyon National Recreation Area. 1998. 1998 summary report: Archaeological site monitoring and management along the Colorado River corridor below Glen Canyon Dam. National Park Service, Grand Canyon National Park, Park Management, Archaeology, Arizona.

Grant County. 1999. Draft comprehensive plan and final environmental impact statement. Adopted by the Grant County Planning Commission July 8, 1999.

Grassland Conservation Council of British Columbia. 2004. Best management practices for recreational activities on grassland in the Thompson and Okanagan Basins. Ministry of Water, Land and Air Protection Ecosystems Standards and Planning, Biodiversity Branch.

Gray, R.H., and D.D. Dauble. 1977. Checklist and relative abundance of fish species from the Hanford Reach of the Columbia River. Northwest Science 51:208-215.

Greene, G.S. 1975. Prehistoric utilization in the channeled scablands of eastern Washington. Unpublished Ph.D. dissertation, Department of Anthropology, Washington State University.

Grisham, W. 2001. Personal communication with Jenna Gaston, Hanford Reach National Monument Archaeologist. U.S. Fish and Wildlife Service, Richland, Washington.

Gutzwiller, K.J., E.A. Kroese, S.H. Anderson, and C.A. Wilkins. 1997. Does human intrusion alter the seasonal timing of avian song during breeding periods? Auk 114:55-65.

Gutzwiller, K.J., and H.A. Marcum. 1997. Bird reactions to observer clothing color: Implications for distance-sampling techniques. Journal of Wildlife Management 61:935-947.

Gutzwiller, K.J., H.A. Marcum, H.B. Harvey, H.D. Roth, and S.H. Anderson. 1998. Bird tolerance to human intrusion of Wyoming montane forests. Condor 100:519-527.

Gutzwiller, K.J., R.T. Wiedenmann, K.L. Clements, and S.H. Anderson. 1994. Effects of human intrusion on song occurrence and singing consistency in subalpine birds. Auk 111:28-37.

Haley-Oliphant, A. 1994. Exploration, risk-taking, and wonderment: Traveling to the margins of instruction. Pages 83-98 *in* Exploring the Place of Exemplary Science Teaching (A.E. Haley-Oliphant, editor). American Association for the Advancement of Science, Washington, District of Columbia.

Hajek, B.F. 1966. Soil survey: Hanford project in Benton County, Washington. Report prepared for the U.S. Department of Energy. BNWL-243, Pacific Northwest Laboratory, Richland, Washington.

Hale, L.L. September 1999. Cultural resources survey narrative report – dunes archaeological block survey (HCRC #99-0600-001. Unpublished report prepared for the U.S. Department of Energy-Richland Operations. Copy on file at the Pacific Northwest National Laboratory, Richland, Washington.

Hall, J.A. (editor). 1998. Biodiversity inventory and analysis of the Hanford Site, 1997 annual report. The Nature Conservancy of Washington, Seattle, Washington.

Hamann, B., H. Johnston, P. McClelland, S. Johnson, L. Kelly and J. Gobielle. 1999. Birds. Pages 3.1-3.34 *in* Effects of Recreation on Rocky Mountain Wildlife: A Review for Montana (G. Joslin and H. Youmans, coordinators). Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307pages.

Hammitt, W.E., and D.N. Cole. 1987. Wildland Recreation: Ecology and Management. John Wiley and Sons, New York, New York. 341 pages.

Hanford Reach Fall Chinook Protection Program Agreement. 2004. Filed by Public Utility District Number 2 of Grant County, Washington to the Federal Energy Regulatory Commission as part of the relicensing of the Priest Rapids Project, FERC No. 2114.

Harper, K.T. and L.L. St. Clair. 1985. Cryptogamic soil crusts on arid and semiarid rangelands in Utah: Effects on seedling establishment and soil stability. Final report Bureau of Land Management, Utah State Office, Salt Lake City.

Harris, M.P. 1972. Good-bye White Bluffs. Franklin Press, Yakima, Washington.

Harris P. 1992. Hydrology and water management of the Hanford Reach of the Columbia River and its effect on *Rorippa columbiae* habitat. Report to The Nature Conservancy, Seattle, Washington.

Hartley, R.J., and A.M. Wolley Vawser. 2004. Assessing contemporary human activity at sites in the Anasazi Archeological District, San Juan National Forest: A quantitative approach. National Park Service, Midwest Archeological Center, Lincoln, Nebraska.

Hartman, M.J., L.F. Morasch, and W.D. Webber (editors). 2001. Hanford Site groundwater monitoring for fiscal year 2000. Report prepared for the U.S. Department of Energy. PNNL-13404. Online at hanford-site.pnl.gov/groundwater/reports/gwrep00/start.htm.

Hazelbrook, R.E. September 2000. Draft cultural resources survey narrative report – west Vernita Bridge cultural resources survey and current impacts report (HCRC #2000-0600-019.

Unpublished report prepared for the U.S. Department of Energy-Richland Operations. Copy on file at the Pacific Northwest National Laboratory, Richland, Washington.

Hendee, J.C., G.H. Stankey, and R.C. Lucas. 1990. Wilderness Management. North American Press, Golden, Colorado.

Hickman, J.C. (editor). 1993. The Jepson manual: Higher plants of California. University of California Press, Los Angeles, California.

Hitchcock, C.L., and A. Cronquist. 1973. Flora of the Pacific Northwest. University of Washington Press, Seattle, Washington.

Hoitink, D.J., and K.W. Burk. 1995. Climatological data summary 1994 with historical data. Report prepared for the U.S. Department of Energy. PNL-10553, Pacific Northwest Laboratory, Richland, Washington.

Hoitink, D.J., K.W. Burk, J.V. Ramsdell, and W.J. Shaw. 2003. Hanford Site climatological data summary 2002 with historical data. Report prepared for the U.S. Department of Energy. PNNL-14242, Pacific Northwest National Laboratory, Richland, Washington.

Holmes, T.L.; R.L. Knight; L. Stegall; G.R. Craig. 1993. Responses of wintering grassland raptors to human disturbance. Wildlife Society Bulletin 21(4): 461-468.

Howard, R.P., and M.L. Wolfe. 1976. Range improvement practices and ferruginous hawks. Journal of Range Management 29:33-37.

Hunn, E.S. 1990. Nch i-Wána, the Big River: Mid-Columbia River Indians & Their Land. University of Washington Press, Seattle, Washington.

Hunn, E.S., and D.H. French. 1981. *Lomatium*: A key resource for Columbia Plateau native subsistence. Northwest Science 55(2):87-94.

Hunt, J.D., and P.J. Brown. 1971. Who can read our writing? The Journal of Environmental Education 2:27-29.

Huntington, C.S., W. Nehlsen, and J. Bowers. 1996. A survey of healthy native stocks of anadromous salmonids in the Pacific Northwest and California. Fisheries 21(3):6-14.

Institute of Transportation Engineers (ITE). 1999. Traffic Engineering Handbook, fifth edition (J.L. Pline, editor). Publication Number TB-010A. Washington, District of Columbia.

Intergovernmental Panel on Climate Change. 2001. Working Group II to the Third Assessment Report, Climate Change 2001: Impacts, Adaptation, and Vulnerability. Cambridge University Press, Cambridge, United Kingdom.

Ison, C. July 12, 1989. Oldest Indian site in Kentucky. Lexington Herald-Leader, Lexington, Kentucky.

Ison, C., C. Norville, and D. Pollack. 1981. Vandalism of rockshelter sites, Red River Gorge, Kentucky: An assessment. Unpublished research report. University of Kentucky, Department of Anthropology, Lexington, Kentucky.

Jahn, L.R., and R.A. Hunt. 1964. Duck and coot ecology and management in Wisconsin. Wisconsin Conservation Dept. Technical Bulletin Number 33. 212 pages.

James, K., and L.H. McAvoy. 1992. A qualitative study of factors influencing racial diversity in environmental education: Preliminary results. Pages 16-17 *in* Proceedings of the Symposium on Social Aspects and Recreation Research, February 19-22, 1992, Ontario, California (D.J. Chavez, technical coordinator). General Technical Report PSW-GTR-132. U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station, Albany, California.

Jenkins, O.P. 1922. Underground water supply of the region about White Bluffs and Hanford. Bulletin Number 26. Division of Geology, State of Washington Department of Conservation and Development, Olympia, Washington.

Johansen, J.R., and L.L. St. Clair. 1984. Recovery patterns of cryptogamic soil crusts in desert rangelands following fire disturbance. The Bryologist 87(3):238-243.

Johnson, C.G., and S.A. Simon. 1987. Plant associations of the Wallowa-Snake Province: Wallowa-Whitman National Forest. U.S. Department of Agriculture, Forest Service, Pacific Northwest Region, Wallowa-Whitman National Forest, Baker City, Oregon.

Johnson, V.G., F.N. Hodges, and S.P. Reidel. 1992. Arid environment aquifers: An example from south-central Washington. Geological Society of America (ABS) 24(5):36.

Jones, M.E. 2000. Road upgrade, road mortality and remedial measures; impacts on a population of eastern quolls and Tasmanian devils. Wildlife Research 27(3): 289-296.

Joslin, G., and H Youmans (coordinators). 1999. Effects of recreation on Rocky Mountain wildlife: A review for Montana. Committee on Effects of Recreation on Wildlife, Montana Chapter of the Wildlife Society. 307pages.

Kaiser, M.S., and E.K. Fritzell. 1984. Effects of river recreationists on green-backed heron behavior. Journal of Wildlife Management 48:561-567.

Kaltenecker, J.H., M. Wicklow-Howard, and M. Pellant. 1999. Biological soil crusts: Natural barriers to *Bromus tectorum L.* establishment in the northern Great Basin. *In* (D. Eldridge and D. Freudenberger, editors) Proceedings of the VI International Rangeland Congress, Aitkenvale, Queensland, Australia. Pages 109-111.

Karr, J.R. 2000. Defining and measuring river health. Freshwater Biology 41:221-234.

Katz, G.L., and P.B. Shafroth. 2003. Biology, ecology and management of *Elaegnus angustifolia* L. (Russian Olive) in western North America. Wetlands 23:763-777.

Keller, L.F., and D.M. Waller. 2002. Inbreeding effects in wild populations. Trends in Ecology and Evolution 17:230-241.

Kimmel, J. 1999. Ecotourism as environmental learning. Journal of Environmental Education 30(2):40-44.

Klein, M.L. 1989. Effects of high levels of human visitation on foraging waterbirds at J.N. "Ding" Darling National Wildlife Refuge, Sanibel, Florida. Final Report to the U.S. Fish and Wildlife Service. 103 pages.

Klein, M. 1989. Effects of high levels of human visitation on foraging waterbirds at J.N. "Ding" Darling National Wildlife Refuge, Sanibel, Florida. Masters thesis. University of Florida, Gainesville, Florida.

Klein, M.L. 1993. Waterbird behavioral responses to human disturbances. Wildlife Society Bulletin 21:31-39.

Knapp, D. 1997. The relationship between environmental interpretation and environmental education. Legacy 8(3):10-13.

Knick, S.T., D.S. Dobkin, J.T. Rotenberry, M.A. Schroeder, W.M. Vander Haegen, and C. Van Riper III. 2003. Teetering on the edge of too late? Conservation and Research Issues for Avifauna of Sagebrush Habitats. The Condor 105:611-634. The Cooper Ornithological Society.

Knick, S.T., and J.T. Rotenberry. 1995. Landscape characteristics of fragmented shrub-steppe habitats and breeding passerine birds. Conservation Biology 9:1059-1071.

Knight, R.L. 1984. Responses of wintering bald eagles to boating activity. Journal of Wildlife Management 48: 999-1004.

Knight, R.L., D.P. Anderson, and N.V. Marr. 1991. Responses of an avian scavenging guild to anglers. Biological Conservation 56:195-205.

Knight, R.L., and D.N. Cole. 1991. Wildlife responses to recreationists. *In* Wildlife and Recreationists (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Covelo, California.

Knight, R.L., and D.N. Cole 1995a. Wildlife responses to recreationists. *In* Wildlife and Recreationists: Coexistence Through Management and Research (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Washington, District of Columbia. Pages 51-70.

Knight, R.L. and D.N. Cole. 1995b. Factors that influence wildlife responses to recreationists. *In* Wildlife and Recreationists: Coexistence Through Management and Research (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Washington, District of Columbia. Pages 71-80.

Knight, R. L., and K.J. Gutzwiller (editors). 1995. Wildlife and Recreationists: Coexistence Through Management and Research. Island Press, Washington, DC. 372 pages.

Knight, R.L., and S.K. Knight. 1984. Responses of wintering bald eagles to boating activity. Journal of Wildlife Management 48:999-1004.

Knight, R.L., and S.K. Skagen. 1988. Effects of recreational disturbance on birds of prey: A review. Pages 355-359 *in* Proceedings of the Southwest Raptor Management Symposium Workshop. National Wildlife Federation, Washington, District of Columbia.

Knight, R.L., and S.A. Temple. 1995. Origin of wildlife responses to recreationists. *In* Wildlife and Recreationists: Coexistence Through Management and Research (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Washington, District of Columbia. Pages 81-91.

Korschgen, C.E., L.S. George, and W.L. Green. 1985. Disturbance of diving ducks by boaters on a migrational staging area. Wildlife Society Bulletin 13:290-296.

Krapfel, P. 1999. Deepening children's participation through local ecological investigations. Pages 47-64 *in* Ecological Education in Action (G.A. Smith and D.R. Williams, editors). State University of New York Press, Albany, New York.

Krieger, H.W. 1928. A prehistoric pit house village site on the Columbia River at Wahluke, Grant County, Washington. Proceedings of the United States National Museum. Volume 73, number 2732, article 11, pages 1-29. U.S. Government Printing Office, Washington, District of Columbia.

Kroeber, A.L. 1939. Cultural and Natural Areas of Native North America. University of California Press, Berkeley, California. 95 pages.

LaFramboise, W., and N. LaFramboise. 1998. Birds of the Fitzner-Eberhardt Arid Lands Ecology Reserve: 1998. Report to The Nature Conservancy of Washington, Seattle, Washington.

Landeen, D.S., A.R. Johnson, and R.M. Mitchell. 1992. Status of birds at the Hanford Site in southeastern Washington. Report prepared for the U.S. Department of Energy. WHC-EP-0402, Westinghouse Hanford Company , Richland, Washington.

Lee, R.G. 1975. The management of human components in the Yosemite National Park ecosystem. Yosemite National Park, California. 134 pages.

Leonard, W.F., S.J. Bruce, A.J. Russell, and M.R. Cook. 1985. Chemicals for pasture renovation and improvement of herbage quality. Proceedings of the New Zealand Grassland Association 46:77-82.

Liddle, M.J. 1975. A selective review of the ecological effects on human trampling on natural ecosystems. Biological Conservation 7:17-36.

Liddle, M.J., and H.R.A. Scorgie. 1980. The effects of recreation on freshwater plants and animals: A review. Biological Conservation 17:183-206.

Lindsey, K.A. 1994. Large Pliocene-ages lakes in south-central Washington: Evidence for damming of the ancestral Columbia River. Geological Society of America abstracts with programs, volume 26, number 7, page 68.

Lindsey, K.A. 1995. Miocene- to Pliocene-aged suprabasalt sediments of the Hanford Site, south-central Washington. Report prepared for the U.S. Department of Energy. BHI-00184, Bechtel Hanford, Richland, Washington.

Lindsey, K.A. 1996. The Miocene to Pliocene Ringold Formation and associated deposits of the ancestral Columbia River system, south-central Washington and north-central Oregon. Washington Division of Geology and Earth Resources Open File Report 96-8, Washington State Department of Natural Resources, Olympia, Washington.

Link, S.O., and R.W. Hill. 2003. Fire risk of restored shrub-steppe plants.

Lloyd, T., R. Denny, and G. Constantino. 1983. Wintering waterfowl redistribution plan for the Columbia Basin of Oregon and Washington. Oregon Department of Fish and Wildlife and U. S. Fish and Wildlife Service.

MacArthur, R.A., V. Geist, and R. H. Johnston. 1982. Cardiac and behavioral responses of mountain sheep to human disturbance. Journal of Wildlife Management 46:351-358.

Mack, M.C., and C.M. D'Antonio. 1998. Impacts of biological invasions on disturbance regimes. Trends in Ecology and Evolution 13:195-198.

Mack, R.N., D. Simberloff, W.M. Lonsdale, H. Evans, M. Clout, and F.A. Bazzaz. 2000. Biotic invasions: Causes, epidemiology, global consequences, and control. Ecological Applications 10:689-710.

Mackintosh, B. 1986. Interpretation in the National Park Service: An historical perspective. National Park Service, History Division, Washington, District of Columbia. 68 pages.

Madsen, J. 1985. Impact of disturbance on field utilization of pink-footed geese in West Jutland, Denmark. Biological Conservation 33:53-63.

Mahaffey, B.D. 1972. A study of professional recommendations for curricular guidelines of environmental park employees. Unpublished doctoral dissertation. Texas A&M University, College Station, Texas.

Malde, H.E. 1968. The catastrophic late Pleistocene Bonneville Flood in the Snake River Plain, Idaho. Professional Paper 596, U.S. Geological Survey, Washington, District of Columbia.

Marceau, T. 2002. Excavation report for archaeological sites 45-BN-888 and 45-BN-606. Report prepared for the U.S. Department of Energy. BHI-01645, Bechtel Hanford, Richland, Washington.

Marceau, T.E., and J.J. Sharpe. 2001. Archaeological excavation report for extraction well C3662 in support of the 100-KR-4 pump-and-treat project. Report prepared for the U.S. Department of Energy. BHI-01645, Draft A, Bechtel Hanford, Richland, Washington.

Marceau, T.E., and J.J. Sharpe. 2002a. Excavation report for archaeological sites HT-2001-007 and 45-BN-606 on the Hanford Site, Richland Washington. Report prepared for the U.S. Department of Energy. BHI-01645, Bechtel Hanford, Richland, Washington.

Marceau, T.E., and J. J. Sharpe. 2002b. Report of archaeological excavations conducted at UPR-100-F-2 on the Hanford Site, Richland, Washington. Report prepared for the U.S. Department of Energy. BHI-01649, Bechtel Hanford, Richland, Washington.

McAvoy, L.H., and D.L. Dustin. 1983. Indirect versus direct regulation of recreation behavior. Journal of Park and Recreation Administration 1:12-17

McClaran, M.P., and D.N. Cole. 1993. Packstock in wilderness: Use, impacts, monitoring, and management. United States Forest Service, Intermountain Research Station, General Technical Report INT-301, Ogden, Utah.

McCormack, W.D., and J.M.V. Carlisle. 1984. Investigation of groundwater seepage from the Hanford shoreline of the Columbia River. Report prepared for the U.S. Department of Energy. PNL-5289, Pacific Northwest Laboratory, Richland, Washington.

McMahon, W.J., and R.E. Peterson. 1992. Estimating aquifer hydraulic properties using the Ferris Method, Hanford Site, Washington. U.S. Department of Energy, Richland, Washington.

McNeely, J.A. (editor). 2001. An introduction to human dimensions of invasive alien species. *In* The Great Reshuffling: Human Dimensions of Invasive Alien Species. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland, and Cambridge, United Kingdom. Pages 5-22.

McQuaid-Cook, J. 1978. Effects of hikers and horses on mountain trails. Journal of Environmental Management 6:209-212.

Meyer, S.E. 1994. Germination and establishment ecology of big sagebrush: Implications for community restoration. *In* (S.B. Monsen and S.G. Kitchen, compilers) Proceedings of Ecology and Management of Annual Rangelands. General technical report INT-GTR-313. U.S. Forest Service, Intermountain Research Station, Ogden, Utah. Pages 244-251.

Miller, R.F., and L. Eddleman. 2001. Spatial and temporal changes of sage grouse habitat in the sagebrush biome. Oregon State University Agricultural Experiment Station Technical Bulletin 151, Corvallis, Oregon.

Miller, S.G., R.L. Knight, and C.K. Miller. 1998. Influence of recreational trails on breeding bird communities. Ecological Application 8:162-169.

Miller, S.G., R.L. Knight, and C.K. Miller. 2001. Wildlife responses to pedestrians and dogs. Wildlife Society Bulletin 29:124-132.

Minnesota IMPAN Group. 2004. IMPLAN professional version 2.0. user's guide, analysis guide, and data guide.

Mize, A.L. 1993. Utilization of allochthonous and autochthonous carbon by aquatic insects of two shrub-steppe desert spring-streams: A stable carbon isotope analysis and critique of the method. Report prepared for the U.S. Department of Energy. PNL-8684, Pacific Northwest Laboratory, Richland, Washington.

Montana State University Extension Service. 2002. Montana knapweeds: Identification, biology, and management. Publication 2CO311.

Morton, J.M. 1995. Management of human disturbance and its effects on waterfowl. Pages F59-F86 *in* Waterfowl Habitat Restoration, Enhancement and Management in the Atlantic Flyway (W.R. Whitman, T. Strange, L. Widjeskog, R. Whittemore, P. Kehoe, and L. Roberts, editors). Third Edition of the Environmental Manage Committee, Atlantic Flyway Council Technical Section, and the Delaware Division of Fish and Wildlife, Dover, Delaware. 1,114 pages.

Nagy, J.A.S., and G.W. Scotter. 1974. A quantitative assessment of the effects of human and horse trampling on natural areas, Waterton Lakes National Park. Canadian Wildlife Service, Edmonton, Alberta, Canada. 145 pages.

National Park Service. 1991. The Vail Agenda: National Parks for the 21st Century. Report and recommendations to the Director of the National Park Service. Library of Congress card number 92-60471.

National Park Service. 1994. Hanford Reach of the Columbia River comprehensive river conservation study and environmental impact statement (final). National Park Service, Pacific Northwest Regional Office, Seattle, Washington. June 1994.

Natural Resources Conservation Service. 1997a. National Range and Pasture Handbook. U.S. Department of Agriculture, Natural Resources Conservation Service, Grazing Lands Institute, Washington, District of Columbia.

Natural Resources Conservation Service. 1997b. Introduction to microbiotic crusts. U.S. Department of Agriculture, Natural Resources Conservation Service, Grazing Lands Institute, Washington, District of Columbia.

Neitzel, D.A. (editor). 2004. Hanford Site NEPA characterization. Report prepared for the U.S. Department of Energy. Pacific Northwest National Laboratory, Richland, Washington.

Neitzel, D.A. (editor). 2005. Hanford Site NEPA characterization. Report prepared for the U.S. Department of Energy. Pacific Northwest National Laboratory, Richland, Washington.

Neitzel, D.A., and T.J. Frest. 1993. Survey of Columbia River basin streams for Columbia pebblesnail, *Fluminicola columbiana*, and shortface lanx, *Fisherola nuttalii*. Report prepared for the U.S. Department of Energy. PNL-8229, Pacific Northwest Laboratory, Richland, Washington.

Neitzel, D.A., T.L. Page, and R.W. Hanf, Jr. 1982a. Mid-Columbia River microflora. Freshwater Ecology 1(5):495-505.

Neitzel, D.A., T.L. Page, and R.W. Hanf, Jr. 1982b. Mid-Columbia River zooplankton. Northwest Science 57:112-118.

Nelson, Charles. 1969. The Sunset Creek site (45-KT-28) and its place in Plateau prehistory. Report #47. Washington State University Laboratory of Anthropology, Pullman, Washington.

Newcomb, R.C. 1958. Ringold Formation of Pleistocene age in the type of locality, the White Bluffs, Washington. American Journal of Science 256:328-340.

Newcomer, D.R., K.D. Pohlod, and J.P. McDonald. 1991. Water-table elevations on the Hanford Site, 1990. Report prepared for the U.S. Department of Energy. PNL-7693, Pacific Northwest Laboratory, Richland, Washington.

Newsome, D., D.N. Cole, and J.L. Marion. 2004. Environmental impacts associated with recreation horse-riding. *In* Environmental Impacts of Ecotourism (R. Buckley, editor). CAB Publishing.

Noss, R. 1995. Maintaining ecological integrity in representative reserve networks. World Wildlife Fund, Toronto, Ontario, Canada.

Nugent, J., T. Newsome, P. Hoffarth, M. Nugent, W. Brock, and M. Kuklinski. 2002. 2001 evaluation of juvenile fall chinook salmon stranding on the Hanford Reach of the Columbia River. Report prepared for the Bonneville Power Administration and the Public Utility District Number 2 of Grant County. BPA Contract Number 9701400 and Grant County PUD Contracts Document 97BI30417 (BPA Report DOE/BP-00004294-3). 57 pages. (electronic).

Nussbaum, R.A., E.D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. The University Press of Idaho, Caldwell, Idaho.

O'Connor, J.E., and V.R. Baker. 1992. Magnitudes and implications of peak discharges from glacial Lake Missoula. Geological Society of America Bulletin 104:267-279.

Ocker, P.A. September 17, 1996. Memorandum to Paul Wagner, Washington Department of Fish and Wildlife. Subject: Observations of salmonid strandings in the Hanford Reach. U.S. Fish and Wildlife Service, Portland, Oregon.

Orams, M.B. 1994. Creating effective interpretation for managing interaction between tourists and wildlife. Australian Journal of Environmental Education 10:21-34.

Overseas Private Investment Corporation. 2000. Climate change: Assessing our actions. Agency of the United States Government. Washington, District of Columbia.

Owen, M. 1973. The management of grassland areas for wintering geese. Wildfowl 24:123-130.

Owens, N.W. 1977. Responses of wintering brant geese to human disturbance. Wildfowl 28:5-14.

Pace, R.E. 1977. The land of the Yakimas. Yakima Indian Tribal Council, Toppenish, Washington.

Paige, C., and S.A. Ritter. 1999. Birds in a sagebrush sea: Managing sagebrush for bird communities. Partners in Flight Western Working Group, Boise, Idaho. 47 pages.

Palmberg, I., and J. Kuru. 2000. Outdoor activities as a basis for environmental responsibility. Journal of Environmental Education 31(4):32-36.

Parker, M.B. 1986. Tales of Richland, White Bluffs, and Hanford, 1805-1943, Before the Atomic Reserve. Ye Galleon Press, Fairfield, Washington.

Parker, P.L., and T.F. King. 1990. Guidelines for evaluating and documenting traditional cultural properties. National Register Bulletin 38, National Park Service, Washington, D.C.

Peterson, R.E. 1992. Hydrologic and geologic data available for the region north of Gable Mountain, Hanford Site, Washington. Report prepared for the U.S. Department of Energy. Westinghouse Hanford Company, Richland, Washington.

Pickering, C.M., J. Harrington, and G. Worboys. 2003. Environmental impacts of tourism on the Australian Alps protected areas. Mountain Research and Development 23:247-254.

Ponzetti, J., B. McCune, and D. Pyke. 2000. Biotic crusts on a central Washington landscape. Report to the Bureau of Land Management. 44 pages.

Poston, T.M., R.W. Hanf, and R.L. Dirkes (editors). 2000. Hanford Site environmental report for calendar year 1999. Report prepared for the U.S. Department of Energy. PNNL-13230, Pacific Northwest National Laboratory, Richland, Washington.

Poston, T.M., R.W. Hanf, R.L. Dirkes, and L.F. Morasch (editors). 2003. Hanford Site environmental report for calendar year 2002. Report prepared for the U.S. Department of Energy. PNNL-14687, Pacific Northwest National Laboratory, Richland, Washington.

Poston, T.M., R.W. Hanf, R.L. Dirkes, and L.F. Morasch (editors). 2005. Hanford Site environmental report for calendar year 2004. Report prepared for the U.S. Department of Energy. PNNL-15222, Pacific Northwest National Laboratory, Richland, Washington.

Purdy K.G., G.R. Goff, D.J. Decker, G.A. Pomerantz, N.A. Connelly. 1987. A guide to managing human activity on national wildlife refuges. U.S. Department of the Interior, Fish and Wildlife Service.

Pyle, R.M. 1989. Washington butterfly conservation status report and plan. Washington Department of Wildlife, Olympia, Washington. 217 pages.

Quigley T.M., and S.J. (editors). 1997. An assessment of ecosystem components in the interior Columbia basin and portions of the Klamath and Great Basins: Volume I. General technical report PNW-GTR-405. U.S. Forest Service, Portland, Oregon.

Randall, J.M. 1996. Weed control for the preservation of biological diversity. Weed Technology 10:370-383.

Raveling, D.G. 1979. The annual cycle of body composition of Canada geese with special reference to control of reproduction. Auk 96:234-252.

Ray, V.F. 1933. The Sanpoil and Nespelem: Salishan Peoples of Northeastern Washington. Originally published as Publications in Anthropology, Volume V, University of Washington, Seattle, Washington. Republished by the Human Relations Area Files, Yale University, New Haven, Connecticut. 1954.

Ray, V.R. 1936. Native villages and groupings of the Columbia Basin. Pacific Northwest Quarterly, 27:99-152.

Reidel, S.P., and P.R. Hooper. 1989. Volcanism and tectonism in the Columbia River Flood-Basalt Province. Geological Society of America Special Paper 239.

Reidel, S.P., K.A. Lindsay, and K.R. Fecht. 1992. Field trip guide to the Hanford Site. Report prepared for the U.S. Department of Energy. WHC-MR-0391, Westinghouse Hanford Company, Richland, Washington.

Reidel, S.P., N.P. Campbell, K.R. Fecht, and K.A. Lindsey. 1994. Late Cenozoic structure and stratigraphy of south-central Washington. *In* (R. Lasmanis and E.S. Cheney, conveners) Regional Geology of Washington State. Washington Division of Geology and Earth Resources Bulletin 80:180.

Reijnen, R., and R. Foppen. 1994. The effects of car traffic on breeding bird populations in woodland. Evidence of reduced habitat quality for willow warbler (*Pylloscopus trochilus*) breeding close to a highway. Journal of Applied Ecology 31: 85-94.

Relander, Click. 1956. Drummers and Dreamers. Caxton Printers, Caldwell, Idaho.

Rice, David. Undated. Cultural resources assessment of the Hanford Reach of the Columbia River. Masters report to the U.S. Army Corps of Engineers, Seattle, Washington.

Rice, D.G. 1980. Overview of cultural resources on the Hanford Reservation in south-central Washington State. Report submitted to the U.S. Department of Energy, Richland Operations. Contract Number RL-E-80-0043. Troy, Idaho.

Rickard, W.H., L.E. Rogers, B.E. Vaughn, and S.F. Liebetrau (editors). 1988. Shrub-steppe balance and charge in a semi-arid terrestrial ecosystem. Elsevier, Amsterdam.

Rickard, W.H., and L.D. Poole. 1989. Terrestrial wildlife of the Hanford Site: Past and future. Northwest Science 63(4):183-193.

Rickard, W.H., and L.E. Rogers. 1983. Industrial land use and the conservation of native biota in the shrub-steppe region of western North America. Environmental Conservation 10:205-211.

Ridenour, W.L., and R. M. Calloway. 1997. The effects of cryptogamic soil crusts on *Festuca idahoensis and Artemisia tridentata* in the sagebrush steppe of western Montana. Bulletin of the Ecological Society of America 78 (Supplement 4):302.

Riffell, S.K., K.J. Gutzwiller, and S.H. Anderson. 1996. Does repeated human intrusion cause cumulative declines in avian richness and abundance? Ecological Applications 6:492-505.

Roberts, B.C., and R.G. White. 1992. Effects of angler wading on survival of trout eggs and pre-emergent fry. North American Journal of Fisheries Management 12:450-459.

Rodgers, J.A., Jr., and H.T. Smith. 1995. Set-back distances to protect nesting bird colonies from human disturbance in Florida. Conservation Biology 9:89-99.

Rodgers, J.A., Jr., and H.T. Smith. 1997. Buffer zone distances to protect foraging and loafing waterbirds from human disturbance in Florida. Wildlife Society Bulletin 25:139-145.

Ruby, R., and J. Brown. 1974. Ferryboats on the Columbia River. Superior Publishing Company, Seattle, Washington.

Ruby, R., and J. Brown. 1992. A Guide to the Indian Tribes of the Pacific Northwest. University of Oklahoma Press, Norman, Oklahoma.

Sackschewsky, M.R., D.S. Landeen, G.I. Baird, W.H. Rickard, and J.L. Downs. 1992. Vascular plants of the Hanford Site. Report prepared for the U.S. Department of Energy. WHC-EP-0554, Westinghouse Hanford Company, Richland, Washington.

Sackschewsky, M.R. and J.L. Downs. 2001. Vascular plants of the Hanford Site. Report prepared for the U.S. Department of Energy. PNNL-13688, Pacific Northwest National Laboratory, Richland, Washington.

Salstrom, D.L., and R.T. Easterly. 1995. Riparian plant communities: South shore and islands of the Columbia River on the Hanford Site, Washington. Unpublished report to The Nature Conservancy, Washington Field Office, Seattle, Washington.

Salstrom, D.L., and R.T. Easterly. 2004. Current vegetation map of the Ringold, Saddle Mountain and Wahluke Units, Hanford Reach National Monument. U.S. Fish and Wildlife Service.

Salstrom, D., and J. Gehring. 1994. Report on the status of *Rorippa columbiae* Suksdorf ex. Howell. Washington Department of Natural Resources, Natural Heritage Program, Olympia, Washington.

Sauer, R.H., and W.H. Rickard. 1979. Vegetation of steep slopes in the shrub-steppe region of south-central Washington. Northwest Science 53(1).

Sauer, R., and J. Leder. 1985. The status of persistentsepal yellowcress in Washington. Northwest Science 59:198-203.

Schroeder, M.A., D.W. Hays, M.F. Livingston, L.E. Stream, J.E. Jacobson, and D. J.Pierce. 2000. Changes in the distribution and abundance of sage grouse in Washington. Northwestern Naturalist 81:104-112.

Sekercioglu, C.H. 2002. Impacts of birdwatching on human and avian communities. Environmental Conservation 29 (3): 282-289.

Servheen, C.W. (editor). 1980. Proceedings of the Washington bald eagle symposium. Seattle, Washington.

Sharpe, G.W. (editor). 1982. Interpreting the environment. John Wiley and Sons, Hoboen, New Jersey.

Sharpe, J. 2000. Chinese gold miners of the Mid-Columbia Region, phase I & phase II. Report prepared for the U.S. Department of Energy. Bechtel Hanford (BHI-0421), Richland, Washington.

Sheley, R.L., and J. Krueger-Mangold. 2003. Principles for restoring invasive plant-invested rangeland. Weed Science 51:260-265.

Sheley, R., M. Manoukian, and G. Marks. 2002. Preventing noxious weed invasion. Montana State University Extension Service, Montguide, Montana. T199517 AG 8/2002.

Sheley, R.S., and J.K. Petroff. 1999. Biology and management of noxious rangeland weeds. Oregon State University Press, Corvallis, Oregon. 438 pages.

Sime, C.A. 1999. Domestic dogs in wildlife habitats. Pages 8.1-8.17 *in* Effect of Recreation on Rocky Mountain Wildlife: A Review for Montana. (G. Joslin and H. Youmans, coordinators). Committee on Effects of Recreation on Wildlife, Montana Chapter of The Wildlife Society. 307pp.

Skagen, S.K., C.P. Melcher, and E. Muths. 2001. The interplay of habitat change, human disturbance and species interactions in a waterbird colony. American Midland Naturalist 145:18-28.

Slate, J.L. 1996. Buried carbonate paleosols developed in Pliocene-Pleistocene deposits of the Pasco Basin, south-central Washington. Quarternary International 34-36:191-196. Published by Science Limited, Great Britain.

Smith, M.R. 1994. Evaluating the conservation of avian diversity in eastern Washington: A geographic analysis of upland breeding birds. M.S. Thesis. University of Washington, Seattle, Washington.

Smith, R.L. 1996. Ecology and Field Biology (fifth edition). Harper Collins College Publishers, New York.

Smith, L., and J.D. Hunt. 1995. Nature tourism: Impacts and management. Pages 203-219 *in* Wildlife and Recreationists: Coexistence Through Management and Research (R.L. Knight and K.J. Gutzwiller, editors). Island Press, Washington, District of Columbia.

Soll, J., J.A. Hall, R. Pabst, and C. Soper (editors). 1999. Biodiversity inventory and analysis of the Hanford Site: Final report 1994-1999. The Nature Conservancy of Washington, Seattle, Washington. 179 pages.

Soll, J.A., and C. Soper (editors.) 1996. Biodiversity inventory and analysis of the Hanford Site, 1995 annual report. The Nature Conservancy of Washington, Seattle, Washington.

Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (editors). 2007. Climate change 2007: The physical science basis. Contribution of working group I to the fourth assessment report of the intergovernmental panel on climate change. Fourth assessment report of the intergovernmental panel on climate change. Cambridge University Press, Cambridge, United Kingdom.

Speight, M.C. 1973. Outdoor recreation and its ecological effects: A bibliography and review. Discussion Papers in Conservation 4. University College, London, England. 35 pages.

Spellerberg, I.F. 1998. Ecological effects of roads and traffic: A literature review. Global Ecology and Biogeography Letters 7(5):317-333.

Spier, L. 1936. Tribal distribution in Washington. *General Series in Anthropology*, number 3. Menasha, Wisconsin.

St. Clair, L.L., B.L. Webb, J.R. Johansen, and G.T. Nebeker. 1984. Cryptogamic soil crusts: Enhancement of seedling establishment in disturbed and undisturbed areas. Reclamation and Revegetation Research, 3:129-136.

Stalmaster, M.V., and J.L. Kaiser. 1998. Effects of recreation activity on wintering bald eagles. Wildlife Monongraphs 137:1-46.

Stalmaster, M.V., and J.R. Newman. 1978. Behavioral responses of wintering bald eagles to human activity. Journal of Wildlife Management 42:506-513.

Stalmaster, M.V., and J.R. Newman. 1979. Perch site preference of wintering bald eagles in northwest Washington. Journal of Wildlife Management 43:221-224.

Stepniewski, A.M. 1996. Birds of the north slope (Saddle Mountain National Wildlife Refuge/Wahluke Wildlife Area): Hanford Site biodiversity inventory. The Nature Conservancy of Washington, Seattle, Washington.

Stinson, D.W., D.W. Hayes, and M.A. Schroeder. 2004. Washington State recovery plan for the greater sage grouse. Washington Department of Fish and Wildlife, Olympia, Washington. 109 pages.

Stynes, D.J. and E.M. White. 2004. Spending profiles of national forest visitors, 2002 update. Joint venture between U.S. Forest Service Inventory and Monitoring Institute and Michigan State University.

Swan, G.A. 1989. Chinook salmon spawning surveys in deep waters of a large, regulated river. Regulated Rivers: Research and Management 4:355-370.

Swanson, D.A., T.L. Wright, P.R. Hooper, and R.D. Bentley, R.D. 1979. Revisions in stratigraphic nomenclature of the Columbia River Basalt Group. U.S. Geological Survey Bulletin 1457-G. 59 pages.

Swindell, E.G., Jr. 1942. Report on source, nature, and extent of the fishing, hunting and miscellaneous related rights of certain Indian tribes in Washington and Oregon together with affidavits showing locations of a number and usual accustomed fishing grounds and stations. U.S. Department of the Interior, Office of Indian Affairs, Division of Forestry and Grazing, Los Angeles, California.

Tallman, A.M., J.T. Lillie, and K.R. Fecht. 1981. Suprabasalt sediments of the Cold Creek Syncline Area. *In* Geology of the Cold Creek Syncline (C.W. Myers and S.M. Price, editors). Report prepared for the U.S. Department of Energy. RHO-BW1-ST-14, Rockwell Hanford Operations, Richland, Washington.

Teit, J. 1930. The Salishan Tribes of the Western Plateau. 45th annual report of the Bureau of American Ethnology for 1927-1928. Washington, District of Columbia.

The Nature Conservancy. 1995a. Biodiversity inventory and analysis of the Hanford Site, 1994 Annual Report. Prepared by The Nature Conservancy for the U.S. Department of Energy, Richland Operations Office, Richland, Washington (May).

The Nature Conservancy. 1995b. Riparian plant communities: South shore and islands of the Columbia River and the Hanford Site, Washington. Prepared by The Nature Conservancy for the U.S. Department of Energy, Richland Operations Office, Richland, Washington. Contract Number WAFO-021095.

The Nature Conservancy. 1997. Biodiversity inventory and analysis of the Hanford Site, 1996 annual report. Prepared by The Nature Conservancy for the U.S. Department of Energy, Richland, Washington.

The Nature Conservancy. 1998. Biodiversity inventory and analysis of the Hanford Site, 1997 annual report. Prepared by The Nature Conservancy for the U.S. Department of Energy, Richland, Washington.

The Nature Conservancy. 2003a. Final report: Biodiversity studies of the Hanford Site. U.S. Department of Energy and U.S. Fish and Wildlife Service, DE-FG-06-02RL14344.

The Nature Conservancy. 2003b. Invasive plant species inventory and management plan for the Hanford Reach National Monument. U.S. Department of Energy and U.S. Fish and Wildlife Service, DE-FG-06-02RL14344.

Thomas, J.W., C. Maser, and J.E. Rodiek. 1979. Wildlife habitats in managed rangelands: The Great Basin of Southeastern Oregon: Edges. General Technical Report PNW-85.

Thomas, V.G. 1983. Spring migration: The prelude to goose reproduction and a review of its implication. *In* Fourth Western Hemispheric Waterfowl and Waterbird Symposium (H. Boyd, editor), pages 73-81. Canadian Wildlife Service, Ottawa, Canada.

Thorne, P.D., M.A. Charnness, V.R. Vermeul, Q.C. MacDonald, and S.E. Schubert. 1994. Three-dimensional conceptual model for the Hanford Site unconfined aquifer system: Fiscal year 1994 status report. Report prepared for the U.S. Department of Energy. PNL-10195, Pacific Northwest National Laboratory, Richland, Washington.

Tilden, F. 1957. Interpreting Our Heritage. University of North Carolina Press, Chapel Hill, North Carolina.

Transportation Research Board. 2000. Highway Capacity Manual. Special Report 209. National Research Council. Washington, District of Columbia.

Trombulak, S.C., and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology 14:18-30.

Tu, I.M., C.C. Hurd, and J.M. Randall. 2001. Weed Control Methods Handbook: Tools and Techniques for Use in Natural Areas. The Nature Conservancy, University of California, Davis, California. 195 pages.

Tuite, C.H., M. Owen, and D. Paynther. 1983. Interaction between wildfowl and recreation at Llangorse Lake and Talybont Reservoir, South Wales. Wildfowl 34:48-63.

Turner, N., R. Bouchard, and D. Kennedy. 1980. Ethnobotany of the Okanagan-Colville Indians of British Columbia and Washington. British Columbia Provincial Museum 21, Occasional Paper Series. Victoria, British Columbia, Canada.

Tydeman, C.F. 1977. The importance of the close fishing season to breeding bird communities. Journal of Environmental Management 5:289-296.

U.S. Bureau of the Census. 1997. Population projections: States 1995–2025. (www.census.gov). Accessed June 2002.

U.S. Department of Energy. 1988. Site characterization plan, reference repository location, Hanford Site, Washington. DOE/RW-0164, 8 volumes, Richland, Washington.

U.S. Department of Energy. December 21, 1994. Department of energy land and facility use policy, stewards of a national resource. U.S. Department of Energy, Washington, District of Columbia.

U.S. Department of Energy. 1996. Hanford Site Biological Resource Management Plan. DOE/RL 96-32, Richland, Washington.

U.S. Department of Energy. 1997. Hanford Site background: Part 3, groundwater background, DOE/RL-96-61, revision 0, Richland, Washington.

U.S. Department of Energy. 1999. Final Hanford comprehensive land-use plan and environmental impact statement. DOE/EIS-0222F, U.S. Department of Energy, Washington, D.C.

U.S. Department of Energy. 2000. Threatened and endangered species management plan, salmon and steelhead. DOE/RL-2000-27, Richland, Washington.

U.S. Department of Energy. 2001. Hanford Site: Environmental report 2001 and related documents. PNNL-13910, Pacific Northwest National Laboratory, Richland, Washington.

U.S. Department of Energy. 2002. Hanford Site: Environmental report 2002 and related documents. PNNL-14295, Pacific Northwest National Laboratory, Richland, Washington.

U.S. Department of Energy. 2003. Hanford cultural resources management plan. DOE/RL, Richland, Washington.

U.S. Department of Energy. 2004. Hanford Site National Environmental Policy Act (NEPA) characterization. PNNL-6415 Rev. 16. DE-AC06-76RL01830, Pacific Northwest National Laboratory, Richland, Washington.

U.S. Department of Energy. 2007. Hanford Site: Environmental report for calendar year 2006. PNNL-16623, Pacific Northwest National Laboratory, Richland, Washington.

U.S. Department of Labor. 2005. 2005 Consumer Price Index. Bureau of Labor Statistics, Washington, District of Columbia. www.bls.gov/cpi/

U.S. Environmental Protection Agency. 2006. Columbia River Basin fish contaminant survey 1996-1998. EPA 910-R-02-006. U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

U.S. Fish and Wildlife Service. 1986. Pacific bald eagle recovery plan. U.S. Fish and Wildlife Service. Portland, Oregon. 160 pages.

U.S. Fish and Wildlife Service. August 20, 1994. Endangered and threatened wildlife and plants. 50 CFR 17.11 and 17.12.

U.S. Fish and Wildlife Service. 1998. Endangered, threatened, proposed and candidate species, species of concern, and critical habitat in eastern Washington. U.S. Fish and Wildlife Service, Upper Columbia River Basin Field Office, Spokane, Washington.

U.S. Fish and Wildlife Service. July 2000. 24 Command Fire burned area emergency stabilization and rehabilitation (BAER) plan. Hanford Reach National Monument, Richland, Washington.

U.S. Fish and Wildlife Service. 2002a. Refuge management information system. October 1, 2000 – September 30, 2001.

U.S. Fish and Wildlife Service. 2002b. Hanford Reach National Monument 2002 big game hunting regulations.

U.S. Fish and Wildlife Service. 2002c. 2001 national survey of fishing, hunting, and wildlife-associated recreation. U.S. Fish and Wildlife Service, Washington, District of Columbia.

U.S. Fish and Wildlife Service. January 2003. Hanford Reach National Monument public scoping report. U.S. Fish and Wildlife Service, Richland, Washington.

U.S. Fish and Wildlife Service. 2004a. Elk summit final report. Proceedings of a two-day elk management workshop, Prosser, Washington, April 5-6, 2004. U.S. Fish and Wildlife Service, Richland, Washington.

U.S. Fish and Wildlife Service. 2004b. Existing and projected recreational visitor day estimates for the Hanford Reach National Monument. Information emailed from Paula Call, U.S. Fish and Wildlife Sservice, to Jennifer Barnes, Jones & Stokes. December 20, 2004.

U.S. Forest Service. 1991. *See* James and McAvoy 1992.

U.S. Geological Survey (USGS). 1987. Subsurface transport of radionuclides in shallow deposits of the Hanford Nuclear Reservation, Washington – Review of selected previous work and suggestions for further study. USGS Open File Report 87-222, Tacoma, Washington.

U.S. Geological Survey (USGS). 1995. Nitrate concentrations in ground water of the central Columbia Plateau. Open file report 95-445, U.S. Geological Survey, Tacoma, Washington.

U.S. Geological Survey (USGS). 2001. Biological soil crusts: Webs of life in the desert. U.S. Geological Service Fact Sheet FS-065-01. U.S. Department of the Interior.

Vander Haegen, W.M., F.C. Dobler, and D.J. Pierce. 2000. Shrubsteppe bird response to habitat and landscape variables in eastern Washington, USA. Conservation Biology 14:1145-1160.

Verts, B.J., and L.N. Carraway. 1998. Land mammals of Oregon. University of California Press, Berkeley, California. 668 pages.

Wagner, P.G. May 16, 1995. Memorandum to Wolf Dammers, Washington Department of Fish and Wildlife. Subject: Observations of trapped and stranded fall Chinook fry near the Vernita Bridge. Washington Department of Fish and Wildlife, Olympia, Washington.

Waitt, R.B. 1980. About forty last-glacial Lake Missoula jokulhlaups through southern Washington. Journal of Geology 88:653-679.

Wallestad, R.O., J.G. Peterson, and R.L Eng. 1975. Foods of adult sage grouse in central Montana. Journal of Wildlife Management 39:628-630.

Walker, D.E. 1966. The Nez Perce sweat bath complex: An acculturational analysis. Southwestern Journal of Anthropology 22(2):133-171.

Washington Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy. 1989. Hanford federal facility agreement and consent order 89-10 (as amended). Richland, Washington.

Washington Department of Employment Security. 2000. Walla Walla County. Prepared by the Labor Market and Economic Analysis Branch. (October)

Washington Department of Employment Security. 2001. Tri-Cities profile. Prepared by the Labor Market and Economic Analysis Branch. (April)

Washington Department of Employment Security. 2002a. Adams and Grant County profile. Prepared by the Labor Market and Economic Analysis Branch. (December)

Washington Department of Employment Security. 2002b. Kittitas County profile. Prepared by the Labor Market and Economic Analysis Branch. (November)

Washington Department of Employment Security. 2002c. Yakima County profile. Prepared by the Labor Market and Economic Analysis Branch. (December)

Washington Department of Fish and Wildlife. 1998. State listed species, state candidate species, and state monitor species list. Wildlife Management Program, Olympia, Washington.

Washington Department of Fish and Wildlife. 1996. Priority habitats and species list. Washington Department of Fish and Wildlife, Habitat Program, Olympia, Washington.

Washington Department of Fish and Wildlife. 2000. Washington State sport catch report 2000. Washington Department of Fish and Wildlife, Fish Program, Science Division, Olympia, Washington. Available online at wdfw.wa.gov/fish/harvest/2000sport.pdf.

Washington Department of Fish and Wildlife. 2001. Priority species and habitats list. Available at www.wa.gov/wdfw/hab/phsvert.htm#birds.

Washington Department of Fish and Wildlife. 2004. Species of concern list.

Washington Department of Fish and Wildlife. 2005. Eastern Washington pheasant enhancement program.

Washington Department of Fish and Wildlife. 2006. 2006 Game status and trend report. Wildlife Program, Washington Department of Fish and Wildlife, Olympia, Washington.

Washington Department of Fish and Wildlife. 2007. Priority species and habitats list. Available at www.wdfw.wa.gov/hab/phsvert.htm.

Washington Department of Fish and Wildlife. 2007. Species of concern list. Available at wdfw.wa.gov/wlm/diversity/soc/concern.htm

Washington Department of Natural Resources. 1994. Endangered, threatened & sensitive vascular plants of Washington. Washington Department of Natural Resources, Washington Natural Heritage Program, Olympia, Washington.

Washington Department of Natural Resources. 1995. Endangered, threatened & sensitive vascular plants of Washington. Washington Department of Natural Resources, Washington Natural Heritage Program, Olympia, Washington.

Washington Department of Natural Resources. 1997. Endangered, threatened and sensitive vascular plants of Washington—With working lists of non-vascular species. Washington Department of Natural Resources Natural Heritage Program, Olympia, Washington.

Washington Department of Natural Resources. 2005. State of Washington natural heritage plan: 2003/2005 update. Washington Department of Natural Resources, Washington Natural Heritage Program, Olympia, Washington.

Washington Department of Natural Resources. 2007. Endangered, threatened and sensitive vascular plants of Washington—With working lists of non-vascular species. Washington Department of Natural Resources Natural Heritage Program, Olympia, Washington.

Washington Department of Transportation. 1997. 1996 Washington State highway accident report.

Washington Department of Transportation. 2003. Design Manual. Chapter 1420: Access Control; Chapter 1430: Limited Access; Chapter 920: Road Approaches (December).

Washington Department of Transportation. 2002a. Washington's transportation plan: 2003 – 2022. Prepared by the WSDOT Planning Office in cooperation with the Washington State Transportation Commission (February).

Washington Department of Transportation. 2002b. Washington State highway system plan: 2003 – 2022. Prepared by the WSDOT Planning Office (February).

Washington Department of Wildlife. 1994. Species of special concern in Washington (as amended by a listing and candidate notice update by the now Washington Department of Fish and Wildlife, dated April 2,1996). Washington Department of Wildlife, Olympia, Washington.

Washington Interagency Committee for Outdoor Recreation. 1990. Washington outdoors: Assessment and policy plan (1990-1995). Washington's State Comprehensive Outdoor Recreation Program. Olympia, Washington.

Washington Interagency Committee for Outdoor Recreation. 2002. An assessment of outdoor recreation in Washington State (draft). Washington's State Comprehensive Outdoor Recreation Program. Olympia, Washington.

Washington Office of Financial Management. 2001. Washington State data book 2001. (www.ofm.wa.gov). Accessed June 2002.

Washington Office of Financial Management. 2002. Projections of the total resident population for the Growth Management Act intermediate series: 2000 to 2025. (www.ofm.wa.gov). Accessed June 2002.

Washington Transportation Commission. 1998. Transportation Commission list of highways of statewide significance. (www.wsdot.wa.gov/ppsc/hsp/HSSLIST.pdf) Resolution #584.

Weaver, T., and D. Dale. 1978. Trampling effects of hikers, motorcycles and horses in meadows and forests. Journal of Applied Ecology 15:451-457.

West, N.E. 2000. Strategies for maintenance of and repair of biotic community diversity on rangelands, p. 342-346. *in* Biodiversity in Managed Landscapes: Theory and Practice (R.C. Szaro and D.W. Johnston, editors). Oxford University Press, New York.

White, C.M., and T.L. Thurow. 1985. Reproduction of ferruginous hawks exposed to controlled disturbance. Condor 87:14-22.

White-Robinson, R. 1982. Inland and salt marsh feeding of wintering brent geese in Essex. Wildfowl 33:113-118.

Wilderman, D. 1994. Plant Communities of the Fitzner/Eberhardt Arid Lands Ecology Reserve and the north slope of the Hanford Site. The Nature Conservancy of Washington, Seattle, Washington.

Whitson, P.D. 1974. The impact of human use upon the Chisos Basin and adjacent lands. National Park Service.

Whittaker, P.L. 1978. Comparison of surface impact by hiking and horseback riding in the Great Smoky Mountain National Park. National Park Service Management Report 24.

Wilson, J.P., and J.P. Seney. 1994. Erosional impact of hikers, horses, motorcycles, and off-road bicycles on mountain trails in Montana. Mountain Research and Development 14(1): 77-88.

Wolder, M. 1993. Disturbance of wintering northern pintails at Sacramento National Wildlife Refuge, California. M.S. Thesis. Humboldt State University, Arcata, California. 62 pages.

Wolf, E.G. 1976. Characterization of the benthos community. *In* Final Report on Aquatic Ecological Studies Conducted at the Hanford Generating Project. Pacific Northwest National Laboratory for United Engineers and Contractors. Washington Public Power Supply System contract number 2311201335, Richland, Washington.

Woody, Dave. 2003. Personal communication with Jenna Gaston, Archeologist, U.S. Fish and Wildlife Service, Richland, Washington. Pacific Northwest National Laboratory, Richland, Washington.

Youmans, H.B. 1999. Effects of recreation on Rocky Mountain wildlife: A review for Montana. Pages 1.1-1.18 *in* Committee on Effects of Recreation on Wildlife (G. Joslin and H. Youmans, coordinators). Montana Chapter of The Wilderness Society. 307 pages.

Appendix U – Distribution List

Following distribution of the draft CCP, the FWS mailed a letter to everyone on its mailing list to determine if they would like to remain on the list and continue to receive documents, including this final CCP. This was done to reduce costs and the use of natural resources. In order to remain on the Monument's mailing list, respondents were asked to return a pre-addressed postcard expressing their interest in continuing to receive Monument mailing. Numerous people opted out of the mailing list by not returning the postcard, so the following distribution list is considerably smaller than that used to distribute the draft CCP.

Anyone wanting to be added back to the mailing list can do so by calling (509) 371-1801 or emailing daniel_haas@fws.gov.

Tribal Leaders

Acting Executive Director, Confederated Tribes of the Colville Reservation
Rex Buck, Spiritual Leader, Wanapum
Antone Minthorn, Board of Trustees Chair, Confederated Tribes of the Umatilla Indian Reservation
Samuel Penney, Chair, Nez Perce Tribe
Ralph Sampson, Jr., Chair, Confederated Tribes and Bands of the Yakama Indian Nation

United States Senate – Oregon

The Honorable Gordon H. Smith
The Honorable Ron Wyden

United States Senate – Washington

The Honorable Maria Cantwell
The Honorable Patty Murray

United States House of Representatives – Oregon

The Honorable Earl Blumenauer
The Honorable Peter DeFazio
The Honorable Darlene Hooley
The Honorable Greg Walden
The Honorable David Wu

United States House of Representatives – Washington

The Honorable Brian Baird
The Honorable Norman Dicks
The Honorable Doc Hastings
The Honorable Jay Inslee
The Honorable Rick Larsen
The Honorable Jim McDermott
The Honorable Cathy McMorris
The Honorable Adam Smith
The Honorable David Reichert

Office of the Governor – Oregon

The Honorable Ted Kulongoski

Office of the Governor – Washington

The Honorable Christine Gregoire

Washington State Elected Officials

Washington State Senate

The Honorable Jerome Delvin
The Honorable Mike Hewitt
The Honorable Jim Honeyford
The Honorable Janéa Holmquist
The Honorable Curtis King
The Honorable Mark Schoesler

Washington State House of Representatives

The Honorable Bruce Chandler
The Honorable William Grant
The Honorable Steve Hailey
The Honorable Larry Haler
The Honorable Shirley Hankins
The Honorable William Hinkle
The Honorable Dan Newhouse
The Honorable Charles Ross
The Honorable Joe Schmick
The Honorable Mary Skinner
The Honorable Maureen Walsh
The Honorable Judith Warnick

County Commissioners

Adams County Commissioners

Roger Hartwig
Rudy Plager
Jeffery Stevens

Benton County Commissioners

Max Benitz, Jr.
Leo Bowman
Claude Oliver

Franklin County Commissioners

Neva Corkrum
Bob Koch
Rick Miller

Grant County Commissioners

LeRoy Allison
Cindy Carter
Richard Stevens

Kittitas County Commissioners

David Bowen
Alan Crankovich
Mark McClain

Walla Walla County Commissioners

David Carey
Greg Loney
Greg Tompkins

Yakima County Commissioners

Rand Elliot
Ronald Gamache
Mike Leita

Mayors

Patti Bailie (Mesa)
James Beaver (Kennewick)
Norm Childress (Grandview)
Gary Clark (Zillah)
Ronald Covey (Moses Lake)
Dave Edler (Yakima)
Judy Esser (Mattawa)
Ramona Fonseca (Granger)
John Fox (Richland)
Paul Garcia (Sunnyside)
Dale Jackson (West Richland)
Justin Jenks (Royal City)
Jim Lemon (Union Gap)
Shannon McKay (Othello)
Joyce Olson (Pasco)
Bryan Robinson (Benton City)
Paul Warden (Prosser)

Federal Agencies/Organizations

Bonneville Power Administration
Bureau of Indian Affairs
Bureau of Land Management
Bureau of Reclamation
Columbia River Inter-Tribal Fish Commission
Federal Energy Regulatory Commission
Federal Highway Administration
Lawrence Berkeley National Laboratory
Little Pend Oreille NWR
National Oceanic Atmospheric Administration
National Park Service
Natural Resources Conservation Service
Pacific Northwest National Laboratory
Puget Sound Naval Shipyard
Ridgefield NWR Complex
Stillwater NWR
Toppenish NWR
Turnbull NWR
United States Army
United States Army Corps of Engineers
United States Department of Energy
United States Environmental Protection Agency
United States Forest Service
United States Geological Survey
United States Department of Transportation

State Agencies/Organizations

Ringold Fish Hatchery
Washington Department of Agriculture
Washington Department of Ecology
Washington Department of Fish and Wildlife
Washington Department of Natural Resources
Washington Department of Transportation
Washington Fish and Wildlife Commission
Washington Interagency Committee for Outdoor Recreation
Washington State Historic Preservation Office

Local Agencies/Organizations

Benton Conservation District
Benton County Parks & Recreation Board
Benton-Franklin Public Health Department
Grant County Planning Department
Kennewick Community Education
Mattawa Fire Station
Port of Benton
Port of Mattawa
Richland Public Facilities District

Hanford Reach National Monument Federal Advisory Committee

Royace Aikin, Pacific Northwest National Laboratory (Education)
Leo Bowman, Benton County (Commissioner)
Frank Brock, Franklin County (Commissioner)
Rex Buck, Wanapum (Native American)
Nancy Craig, Grant County PUD
Dennis Dauble, Pacific Northwest National Laboratory (Science)
David Geist, Pacific Northwest National Laboratory (Science)
Eric Gerber (History)
Michele Gerber (History)
Harold Heacock, Tri-Cities Industrial Development Council (Economic Development)
Rick Leaumont, Lower Columbia Basin Audubon Society (Conservation)
Mike Lilga, Lower Columbia Basin Audubon Society (Conservation)
Gene Schreckhise, Washington State University (Science)
Ron Skinnarland, Washington Department of Ecology (State)
Rich Steele, Northwest Conservation League (Outdoor Recreation)
Jeff Tayer, Washington Department of Fish and Wildlife (State)
Bob Thompson, City of Richland (City)
Valoria Loveland (Public-At-Large)
Kris Watkins (Public-At-Large)
Jim Watts (Chair), Tri-Cities Industrial Development Council (Economic Development)
Karen Wieda, Pacific Northwest National Laboratory (Education)
Mike Wiemers, Northwest Conservation League (Outdoor Recreation)

Interest Groups

Alliance for the Advancement of Science Through Astronomy
American Rivers
Animal Protection Institute
B Reactor Museum Association
Backcountry Horsemen of Washington
Black Hills Audubon Society
Blue Mountain Audubon Society
Boy Scouts of America
Columbia River Conservation League
Columbia River Exhibition of History & Science
Columbia River United
Columbia Riverkeeper
Conservation Breeding Specialist Group
Conservation Force
Eastern Washington Steelhead Foundation
Enviro Issues
Franklin County Historical Society
Friends for Parks and Public Lands
Friends of Arizona Rivers
Friends of the Mid Columbia Refuges
Fund For Animals
Grays Harbor Audubon Society
Hanford Atomic Metal Trades Council
Heart of America Northwest
Institute for Energy & Environmental Research
Inter-Mountain Alpine Club
Kettle Range Conservation Group
Kitsap Audubon Society
Kittitas Audubon Society
Lower Columbia Basin Audubon Society
National Audubon Society
National Trappers Association
Native Plant Society
North-Central Washington Audubon Society
Northwest Environmental Defense Center
Northwest Ecosystem Alliance
Olympic Peninsula Audubon Society
Partnership for Arid Lands Stewardship
Pilchuck Audubon Society
Pioneer Trail Rider Association
Rainier Audubon Society
Richland Rod & Gun Club
Rocky Mountain Elk Foundation
Sagebrush Free Trappers
Seattle Audubon Society
Sierra Club
Skagit Audubon Society
Tawma Audubon Society
The Backpacking Club
The Columbia Basin Bass Club
The Lands Council
The Nature Conservancy
The Wilderness Society
Trout Unlimited
Vancouver Audubon Society
Wahluke Farmers Association
Washington Water Trails
Washington League of Voters
Washington Outfitters & Guides Association
Washington Waterfowl Association
Washington Kayak Club
White Bluffs - Hanford Heritage Association
Wildlife Management Institute
Willapa Hills Audubon Society
Yakima Valley Audubon Society

Economic Development/Tourism Organizations

Benton City Chamber of Commerce
Grant County Tourism Commission
Greater Pasco Area Chamber of Commerce
Prosser Chamber of Commerce
Richland Chamber of Commerce
Tri-Cities Industrial Development Council
Tri-Cities Visitor & Convention Bureau
Tri-City Area Chamber of Commerce
Walla Walla Valley Chamber of Commerce
West Richland Chamber of Commerce
Yakima Chamber of Commerce

Other Organizations

Diocese of Yakima
Hanford Advisory Board

Private/Public Companies

Anderson Brothers
Baker & Giles
Battelle
Bechtel Hanford
Canoe & Kayak Magazine
Cold Creek Vineyard
Columbia River Journeys
Confluence Kayak Tours
Eastern Oregon Stewardship Services
EDAW
Fluor Hanford
Four Feathers Fruit Company
Fredericks Family Limited Partnership
High Valley Ranch
JB's Guide Service
Key Bank
Norton-Arnold & Company
Plath Orchard Company
Three Rivers Family Medicine
Triangle Associates
U.S. Bank
Washington Closure - Hanford
White Bluffs Guide Service
White Shield

Utilities

Benton County PUD
Energy Northwest
Franklin County PUD
Grant County PUD
South Columbia Basin Irrigation District

Education

Central Washington University
City University
Columbia Basin College
Connell School District
Gonzaga University
Heritage College
Iowa State University
Northwestern University
University of California-Irvine
University of Washington
Wahluke School District #73
Washington State University

Media

Associated Press – Yakima
Columbia Basin Herald – Moses Lake (Newspaper)
Daily Sun News – Sunnyside (Newspaper)
East Oregonian – Pendleton (Newspaper)
El Mundo – Wenatchee (Newspaper)
Hermiston Herald – Hermiston (Newspaper)
KBWU – Kennewick (Television)
KEPR – Pasco (Television)
KFAE – Pullman (Radio)
KNDU – Kennewick (Television)
KNLT – Kennewick (Radio)
KONA – Pasco (Radio)
KORD – Pasco (Radio)
KTCR – Kennewick (Radio)
KVEW – Kennewick (Television)
Mattawa Area News – Mattawa (Newspaper)
Oregonian – Portland (Newspaper)
Outlook – Othello (Newspaper)
Prosser Record Bulletin – Prosser (Newspaper)
Seattle Post-Intelligencer – Seattle (Newspaper)
Seattle Times – Seattle (Newspaper)
Spokesman Review – Spokane (Newspaper)
Tri-Cities Area Journal of Business – Kennewick (Newspaper)
Tri-City Herald – Kennewick, Pasco, Richland, West Richland (Newspaper)
Walla Walla Union Bulletin – Walla Walla (Newspaper)
Wenatchee World – Wenatchee (Newspaper)
Yakima Herald Republic – Yakima (Newspaper)

Reading Rooms/Libraries

Gonzaga University, Foley Center
Library of Congress
Mid-Columbia Public Library, Benton City Branch
Mid-Columbia Public Library, Kennewick Branches
Mid-Columbia Public Library, West Richland Branch
Pasco Public Library
Prosser Public Library
Richland Public Library
United States Department of Energy Public Reading Room - Tri-Cities

Individuals

Michelle Ackermann
Mary Ann Allemann
David Ambrose
Jim Amundson
Leslie Amundson
Jeffrey Anderson
Marshall Anderson
Rick Anderson
Shannon Arntzen
Vanessa Bailey
Del Ballard
Nate Ballou
Kristie Baptiste
Tim Bardell
William Barnett
Brian Barry
Roxanne Bash
Julia Bent
Debbie Berkowitz
Tony Berven
Llorene Bezanson
Bruce Bjornstad
Kathy Blasdel
Rod Block
Arlyn Boatsman
Gerard Bohlke
Steve Brady
Jack Briggs
Madeleine Brown
Pam Brown Larsen
Ralph Broz
Steve Buckingham
Leland Burger
Gary Busselman
Burt Butler
Onnie Byers
Lynn Call
Sean Carrell
Annette Cary
Leslie Catherwood
Nick Ceto
Sue Chickman
Tom Chikalla
Paula Clark
Alene Clarke
Curtis Cleveland
Courtney Conklin
Rene Connatser
Harold Copeland
Don Crawford
Janet Crawford
Ron Crouse
Pat Daly
Everyll Davison
John Decker
Doug DeFord
Richard Ding
Shannon Dininny
Keith Dunbar
Bonnie Dunham
Joyce Edie
Paul Emler
Ralph Engle
John Engstrom
Connie Estep
Mike Estes
Jim Eychaner
Dennis Faulk
Doug Fenske
Henry Field
Bob Fields
Ron Filkowski
Melvin Finkbeiner
Elwin Fisk
Lisa Fitzner
Richard Fleming
Timothy Flood
Patricia Fredricks
Rick French
Paul Friesema
Adam Fyall
Larry Gadbois
Ken Gano
Howard Gardner
Jenna Gaston
Fred George
Roy Gephart
Richard Gies
Ed Gire
Dave Goeke
Jessie Gordon
Ray Gordon
Keith Greager
Robert Gretzinger
Walt Grisham
Eric Gustafson
Tom Halecki
Don Hall
Lynn Hall
Thomas Hall
Don Hand
Barbara Harper
Stuart Harris
David Hartwig
Perry Harvester
David Harvey
Bill Hays
Dick Hemore
Gayle Hennings
Henry Henrikson
James Hines
Patti Howard
Alisa Huckaby
Darryl Hudson
Roy Hull
William Hutton
Jeannette Hyatt
Harley Hylbak
David Jackson
Mike Jansky

Eric Jensen
Russell Jim
Robert Johnston
Dana Jones
Kayla Kelser
Aimee Kinney
Paul Kison
Jim Kline
Kathy Knutson
Chris Kovalchick
Don Kraege
Louis LaDouceur
Bill LaFramboise
Nancy LaFramboise
Thomas Lally
William Lambert
Dennis Larson
Al Laws
Gwen Leth
Michelle LeVar
Alma Lewandowski
Jeff Light
Michael Linde
Steven Link
Bruce Loranger
Jon Lucas
Mike Luzzo
Mary Lynn Arter
Bill Madison
Carl Mansperger
Eddie Manthos
Carol Martinez
Nick Martinez
Jay McConnaughey
Jay McCue
Charlie McKinney
Sam Meacham
Carl Merkle
Hugo Mertens
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