Chapter 5. Environmental Consequences

Moapa dace viewing chamber at Moapa Valley National Wildlife Refuge

Chapter 5. Environmental Consequences

5.1 Introduction

This chapter provides an analysis of the effects of each of the alternatives on physical, natural, cultural, and socioeconomic resources at the refuges in the Desert National Wildlife Refuge Complex (Desert Complex). The analysis focuses on a programmatic-level approach to evaluate the effects of plans, projects, and management actions within each alternative. Where a higher level of detail is known for some actions, the analysis provides a more thorough analysis of the anticipated impacts. Most components included in the alternatives' management actions have not been developed at a project-specific level of detail; for those components, this Environmental Impact Statement (EIS) will serve as the first-tier National Environmental Policy Act (NEPA) document for future project-specific NEPA documents. The need for project-specific NEPA documents is identified in the evaluation of each impact; for potentially significant, adverse impacts, a more detailed analysis will be required at the project-specific level. In addition, mitigation measures will need to be refined during the preparation of project-specific NEPA documents.

Each refuge has a No Action Alternative, Alternative A, that would continue current management practices with implementation of a Comprehensive Conservation Plan (CCP); a brief discussion of this alternative is included for comparison purposes. Ash Meadows National Wildlife Refuge (NWR) and Moapa Valley NWR each have two action alternatives; Desert NWR and Pahranagat NWR have three action alternatives. Mitigation measures are included for resources with potentially significant adverse impacts to reduce the intensity of the impact.

This chapter is organized by refuge and then by resource, following the same order as Chapter 4 (Affected Environment). Impacts of the alternatives on each resource topic are compared to show the similarities and differences between alternatives and the range of impacts. Summary tables of the impacts for each refuge are provided at the end of each refuge discussion.

The following resources would not be affected by the Proposed Action:

- Physiography
- Geology and Minerals
- Paleontological Resources
- Hazardous Materials

These resources are not further discussed in this chapter.

Criteria were established to determine if a particular impact would represent a significant or potentially significant adverse effect. These criteria are listed below for each resource.

5.1.1 Physical Environment

Soils

An adverse impact is considered significant if an action would trigger or accelerate erosion, subsidence, or slope instability and affect other resources or on-site or adjacent facilities, or if an action would result in substantial loss of topsoil.

Water Resources

Surface Water

An adverse impact is considered significant if an action would:

- Alter the existing drainage pattern of the area in a manner that causes substantial erosion or siltation;
- Create runoff water that exceeds the capacity of downstream drainage systems;
- Impede or redirect 100-year flood flows; or
- Expose people or structures to a significant impact involving flooding.

Groundwater

An adverse impact is considered significant if an action would substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or lowering of the local groundwater table.

Water Quality

An adverse impact is considered significant if an action would violate water quality standards or substantially alter water quality.

Air Quality

An adverse impact is considered significant if an action would:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation; or
- Expose sensitive receptors to substantial pollutant concentrations.

5.1.2 Biological Resources

Vegetation

An adverse impact is considered significant if an action would:

- Substantially reduce or degrade habitats, especially riparian or wetland habitats;
- Result in an increase of nonnative species such that they become the dominant species in the habitat;
- Fragment or isolate habitats, particularly specialized habitat for sensitive species;

- Cause severe degradation of a habitat such that it is no longer suitable for native or endemic species;
- Result in direct mortality of sensitive species; or
- Alter suitable habitat conditions of sensitive species.

Wildlife

An adverse impact is considered significant if an action would:

- Significantly affect habitats as described above;
- Result in mortality or forced emigration of a substantial portion of a species' population (non-sensitive);
- Allow invasive species access to areas previously restricted (e.g., aquatic habitats); or
- Reduce, through direct or indirect means, the likelihood of both the survival and recovery of a sensitive species in the wild by reducing reproductive success, numbers, or distribution of that species.

5.1.3 Cultural Resources

An adverse impact is considered significant if an action would:

- Cause physical destruction of or damage to all or part of a historic or prehistoric site;
- Alter a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 Code of Federal Regulations [CFR] part 68) and applicable guidelines;
- Remove the property from its historic location;
- Change the character of the property's use or any physical features within the property's setting that contribute to its historic significance;
- Introduce visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features; or
- Neglect a property, which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an affiliated Native American tribe or Native Hawaiian organization.

5.1.4 Public Access and Recreation Opportunities

Public Access

An adverse impact is considered significant if an action would:

- Substantially reduce existing public or emergency access;
- Cause traffic on the refuges to exceed accepted increases in roadway volume to capacity ratios as established by affected jurisdictions;
- Cause road capacities to be exceeded;

- Create inadequate sight distance at ingress/egress points; or
- Substantially increase the demand for on- and/or off-road parking spaces.

Recreation

An adverse impact is considered significant if an action would:

- Substantially displace public recreation opportunities; or
- Increase the use of existing recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.

5.1.5 Social and Economic Conditions

Refuge Management and Local Economics

An adverse impact is considered significant if an action would result in substantial adverse impacts to local or regional economic conditions.

Environmental Justice

An adverse impact is considered significant if an action would result in disproportionate adverse human health impacts or environmental effects to low-income or minority populations.

Land Use

An adverse impact is considered significant if an action would:

- Result in substantial incompatibility between proposed uses or activities and adjacent existing uses;
- Create a conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the resources;
- Cause substantial changes in use or the intensity of use, where the resulting activity or use pattern would create significant noise, traffic, public safety, or similar environment impacts that would adversely affect the existing or future use of adjacent areas; or
- Result in direct or indirect damage to utilities or other public facilities, cause utilities or other public facilities to be relocated, either permanently or temporarily, or disrupt access to a public utility or other facility or temporarily obstruct an easement.

Aesthetics

An adverse impact is considered significant if an action would:

- Substantially alter the natural landform or construct facilities that would obstruct views to a public resource from public use areas (e.g., trails, observation blinds);
- Cause a substantial adverse effect on a scenic vista;
- Cause substantial damage to scenic resources, including, but not limited to, mountains, trees, rock outcroppings, and historic buildings;

- Substantially degrade the existing visual character or quality of the site and its surroundings; or
- Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

5.2 Ash Meadows National Wildlife Refuge

This section describes the potential impacts associated with the No Action Alternative and two action alternatives for Ash Meadows NWR. Impacts are judged for significance using the thresholds described in the introduction of this chapter. Mitigation measures are included for resources with significant impacts.

The two action alternatives involve monitoring, inventory, and research actions that would not result in adverse environmental impacts. These actions would provide the Refuge staff with an improved knowledge of the Refuge, which would later allow them to better assess the effects of their actions. These actions are not further evaluated in this section.

5.2.1 Physical Environment

Soils

Impacts

Restoration activities under each of the alternatives would disturb soils and expose them to wind and water erosion until native vegetation is restored. Areas that would be affected under each alternative include Upper Point of Rocks, Jackrabbit Springs, the Warm Springs (North and South Indian Springs and School Springs) Management Units, Crystal Springs Unit, and Carson Slough. Additional soil disturbance under Alternative B would occur in the Warm Springs, Jackrabbit/Big Springs, Crystal Springs, and Upper Carson Slough Management Units, where additional restoration is planned, and at Lower Point of Rocks, Lower Kings Pool, and Marsh, Big, and Fairbanks Springs, where restoration plans would be implemented. Under Alternative C, restoration activities would also occur at a larger scale in each of the management units and at Tubbs, Bradford, Crystal, Forest, and North and South Scruggs Springs as well as at Longstreet and Rogers Springs. Soil disturbance would increase under the two action alternatives and would result in a temporary increase in erosion, which would be significant where large areas of soil are exposed. Impacts will be analyzed further in project-specific NEPA documents to be prepared for the restoration activities. Establishment of native vegetation and restoration of the areas would provide long-term protection against erosion.

Removal of invasive plants under each alternative (more extensive under Alternatives B and C, specifically including salt cedar) and planting native vegetation would improve soil conditions by stabilizing soils and reducing salt and mineral concentrations that accumulate at the base of salt cedar.

In addition to the restoration activities, road maintenance and construction of visitor use facilities would result in temporary soil disturbance under each of the alternatives. Additional impacts would occur under Alternative C due to construction of a research facility and implementation of a Resurfacing Plan for Refuge roads. These impacts would not be significant where minor amounts of soil are disturbed and topsoil loss is minimal. Impacts will be analyzed further in project-specific NEPA documents to be prepared for the facility improvements and construction.

Mitigation

Mitigation measures that could reduce soil impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Native vegetation would be planted in areas where nonnative vegetation is removed and soils are exposed to improve soil conditions and stabilize soils. Appropriate best management practices (BMPs) would be implemented during restoration and construction activities to minimize indirect effects of soil disturbance, including dust, erosion, and sedimentation. These measures would include pre-watering and maintaining surface soils in stabilized conditions where support equipment and vehicles will operate; applying water or dust palliative during clearing and grubbing or earth-moving activity to keep soils moist throughout the process; watering disturbed soils immediately following clearing and grubbing activities; and stabilizing sloping surfaces using soil binders until vegetation or desert pavement (ground cover) can effectively stabilize the slope.

Water Resources

Impacts

Each of the alternatives involves restoration activities at major springs on the Refuge, invasive plant removal near open water sources, restoration of natural hydrology in various locations on the Refuge, and construction of a boardwalk and overlook near Kings Pool Stream. Additional facility improvements and construction would occur under Alternatives B and C. Ground disturbance activities associated with these activities and facility construction or maintenance near open water sources could cause erosion around the springs, along banks of streams, and at Kings Pool Stream and increase sedimentation and siltation, resulting in increased turbidity of the surface waters. These activities would result in significant, temporary impacts where large areas are restored or modified. Impacts will be analyzed further in project-specific NEPA documents to be prepared for the activities. Establishment of native vegetation and restoration of historic hydrology would improve surface water conditions on the Refuge over the long term. Removal of cattails at Kings, Point of Rocks, and Crystal springs under Alternative C could improve flow from the springs into downstream drainages.

Habitat restoration increases under each alternative; therefore, impacts to hydrology and water quality would also increase. Under Alternative A, impacts would occur in the Upper Point of Rocks, Jackrabbit Spring, Warm Springs and Crystal Springs Management Units as well as at Carson Slough. Under the two action alternatives, impacts would also occur around several springs. Temporary impacts caused by removing berms, ditches, dams, and impoundments, and closing, maintaining, or modifying roads in each of these units would increase the potential for soil erosion and increased sedimentation in surface waters. Short-term impacts to water quality could be significant; therefore, impacts will be analyzed further in project-specific NEPA documents to be prepared for the restoration activities.

Improved wetland and riparian conditions in the management units would benefit the Refuge's surface water quality over the longer term. For example, removal of salt cedar near surface waters would improve water quality because salt cedar accumulates salt at its base, uses a larger amount of water than most native plants, and degrades aquatic habitat.

Construction of new refugia for the Devils Hole pupfish and Warm Springs pupfish under each alternative may involve ground disturbance in or near existing springs and streams or diversion of water to create the necessary habitat conditions for the pupfish. Temporary impacts may include alteration of flows downstream of the refugia, increased turbidity or other changes to water quality, and modifications of hydrology. These impacts could be significant but temporary, depending on the project-specific details of the refugia; therefore, impacts will be analyzed further in a project-specific NEPA document to be prepared for the refugia.

Construction of new buildings and visitor use facilities under Alternatives B and C may result in short-term impacts to surface water hydrology and water quality caused by ground disturbance near surface waters. These impacts will be analyzed further in project-specific NEPA documents to be prepared for the buildings and facilities.

Alternative C includes implementing the plan to modify or remove Crystal Reservoir. Modifications to this reservoir would reduce open water habitat and allow for native habitat restoration, which would involve restoring historic hydrology (streams) and native habitats. The removal or modification of Crystal Reservoir would also reduce the potential for flooding downstream of the reservoir and benefit the social and natural environments. Construction activities associated with reservoir modifications may result in short-term impacts to surface water hydrology and water quality as a result of ground disturbance near surface waters. Over the long term, water resources on the Refuge would likely be improved through removal or modification of Crystal Reservoir because historic hydrology and native habitats would be restored, improving water conditions as described above for other restoration activities. These impacts will be analyzed further in a project-specific NEPA document to be prepared for the Crystal Reservoir modification plan.

Use of herbicides to control invasive plants under each alternative could potentially affect surface water quality in the reservoirs, springs, and streams on the Refuge. Herbicides reaching surface water could result in indirect impacts on vegetation, fish, and wildlife that rely on the water. Impacts to water quality are expected to be minimal and less than significant because mechanical methods would be used near surface water, and herbicides would be used only when necessary and in accordance with the Integrated Pest Management (IPM) Plan.

Mitigation

Mitigation measures that could reduce water quality impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Implementation of BMPs during ground-disturbing activities would reduce the effects of erosion, siltation, and sedimentation on water quality of the Refuge waters. These measures would include constructing small sediment collection pools downstream of work areas to trap sediment and reduce sediment movement through the aquatic system; using turbidity barriers in areas where sediment collection pools cannot be used; directing flows where feasible around the work area and temporarily detaining flows to reduce potential entrainment of sediment; and limiting the size of the area of disturbance where flows cannot be directed around the work area or detained, so that minimal sediment is added to stream flows.

Air Quality

Impacts

Habitat restoration activities under each of the alternatives would require the use of construction equipment to remove vegetation; plant new vegetation; remove dams, berms, and other facilities; and modify stream channels. Construction of buildings and visitor use facilities under Alternatives B and C would also require construction equipment that would disturb the ground and clear vegetation. The equipment and ground-disturbing activities would cause short-term, minor emissions (engine exhaust and fugitive dust) that may be noticeable on the Refuge. Depending on the extent of activities, an increase in emissions could violate ambient air quality standards and could be significant. These impacts will be analyzed further in project-specific NEPA documents to be prepared for the restoration activities and facility construction and improvement.

Increased traffic on and through the Refuge would result in a minor increase in traffic-related emissions and an increase in dust. Traffic would not result in violations of the ambient air quality standards for particulates because the amount of Refuge traffic at one time is expected to be small, and traffic would be limited to the main roads and parking areas. Through traffic would not remain on the Refuge for an extended period of time; thus, emissions would be minimal. Impacts associated with dust would also be minimal because under each alternative, the Refuge roads would be improved and maintained or closed to public access (more improvements would occur under the

action alternatives). Increased traffic-related emissions on the Refuge would not violate ambient air quality standards and would not be significant with respect to ambient air quality because of the minimal amount of traffic at one time and improved road conditions.

Wildfires can affect air quality through the release of smoke and gases. Fuel breaks and fuel reduction projects to reduce the risk of wildfire would be implemented under each alternative. These measures would reduce the potential for and intensity of air pollutant emissions from wildfires. However, prescribed burns under Alternatives B and C would result in a temporary increase in smoke over the Refuge, which would adversely affect air quality. This would be a less-than-significant impact because small areas would be burned at one time, and the smoke would be temporary, resulting in minimal adverse effects on ambient air quality.

Ground-disturbance, construction, and fire management (particularly fuels reduction) activities under any of the alternatives would result in direct emission of greenhouse gases (GHG) (temporary emissions) from construction equipment. Fire management would help prevent catastrophic wildfire over the long term and reduce long-term GHG emissions. Indirect, long-term emissions of GHG would occur due to increased visitation by the public and increased employee vehicle trips (as staff grows). An increase in GHG emissions would contribute to regional impacts on climate change and could result in significant impacts. Climate change impacts will be further analyzed in project-specific NEPA documents, as appropriate.

Mitigation

Mitigation measures that could reduce air quality impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Application of dust retardants on main roads, watering roads, and regularly maintaining main roads would minimize dust generation. BMPs would be implemented during construction activities that disturb the soil to reduce particulate emissions. These measures would include the BMPs identified for mitigating soil and water resources impacts as well as the following: maintaining effective cover over stockpiled fill or debris materials; limiting vehicle speeds to 15 mph in staging areas and on all unpaved access routes; and cleaning mud, silt, and soil tracked out onto paved surfaces immediately. In addition, use of low or zero-emission construction vehicles and limiting idling time for construction vehicles could reduce GHG emissions during construction.

5.2.2 Biological Resources

Vegetation

Impacts

Ground disturbance associated with construction of the boardwalk near Kings Pool Stream and road modifications under each alternative would result in a loss of vegetation in affected areas, increased potential for invasive plants, and potential impacts to sensitive plants. Construction of additional visitor use facilities under Alternatives B and C would also result in similar types of impacts. Habitat impacts associated with boardwalk construction, road modifications, and visitor facility construction would be less than significant because of the small amount of habitat affected by each facility. Invasive plants could establish in the disturbed areas following construction activities, but this impact would not be significant because the Service would implement measures to control invasive plants as part of the IPM Plan and would restore native vegetation to disturbed areas. Due to the sensitivity of many endemic plants on the Refuge, impacts to sensitive plants could be significant, depending on the project-specific details of the facilities; therefore, impacts will be analyzed further in project-specific NEPA documents to be prepared for these facilities.

Habitat restoration increases under each alternative; therefore, short-term impacts and long-term benefits to vegetation and habitats would also increase. Under Alternative A, approximately 70 acres of alkali wet meadow, 30 acres of mesquite bosques/lowland riparian habitat, and 30 acres of native upland habitat would be restored in the Warm Springs and Jackrabbit Springs Units. Additional restoration would also occur in the Upper Point of Rocks, Carson Slough, and Crystal Springs Units, and old agricultural fields would be rehabilitated. Alternative B would involve restoring 520 acres of alkali wet meadow, 220 acres of mesquite bosque/lowland riparian habitat, and 150 acres of emergent marsh as well as rehabilitating a larger percent of agricultural fields and implementing additional restoration to maintain alkaline meadow/wet meadow, native upland desert, and mesquite bosque. Alternative C would involve restoring 650 acres of alkali wet meadow, 550 acres of mesquite bosque/lowland riparian habitat, and 150 acres of emergent marsh as well as the additional restoration/rehabilitation under Alternative B.

Temporary disturbance during habitat restoration activities could result in impacts to sensitive species populations and sensitive habitats (i.e., wetlands), which could be significant. Sensitive plants may experience short-term, adverse impacts during construction activities (direct take or loss or modification of suitable habitat conditions) in areas where habitat restoration is proposed under each alternative. Threatened and endangered species that are more likely to be affected due to their presence in wetland/riparian habitats include spring-loving centaury, Ash Meadows gumplant, and Amargosa niterwort. Threatened and endangered species that occur in upland areas include Ash Meadows milkvetch, Ash Meadows sunray, Ash Meadows ivesia, and Ash Meadows blazing star. These impacts could be significant, depending on the project-specific details of the restoration activities; therefore, impacts will be analyzed further in project-specific NEPA

documents to be prepared for restoration of the habitats in each management unit.

Over the long term, restoration would provide improved habitat conditions throughout the Refuge for sensitive plants. Additional transplanting efforts for sensitive plants under Alternatives B and C would expand and benefit sensitive plant populations on the Refuge. Removal or modification of Crystal Reservoir under Alternative C would also improve habitat conditions on the Refuge, specifically for Amargosa niterwort.

Each of the alternatives involves restoration actions at major spring locations to improve native habitat. As part of these restoration actions, nonnative and invasive plants would be removed or controlled around the springs, and native plants would be planted in their place. These actions would benefit the habitats around the springs by encouraging native plant growth and reducing undesirable species. Native habitat is more desirable and suitable for most wildlife species and improves conditions of the springs by helping control water quality and temperature.

Each alternative involves removing invasive plants at restoration sites and in burned areas using physical and chemical means, in compliance with the IPM Plan, to benefit native habitats and improve conditions for native plants to reestablish. A more active invasive species removal program would be implemented under Alternatives B and C to control nonnative and invasive plants throughout the Refuge. Specifically, the Service would remove 50 to 75 percent of salt cedar and Russian knapweed populations (based on 2006 estimates) under Alternative B and 75 to 95 percent of their populations under Alternative C. Additional efforts under Alternative C would include evaluating alternative pest control strategies and expanding efforts to include all aquatic systems on the Refuge.

Invasive plant removal efforts could adversely affect sensitive plants through incidental take or habitat modification, which could affect their populations and result in significant impacts. Under Alternatives B and C, the Service would adjust its efforts based on the responses of sensitive plants to ensure minimal impacts to their populations. Ongoing monitoring of the species would allow the Service to determine where management activities should be modified.

Control and removal of invasive plants would allow native plants to establish, and establishment of native plants in moist areas would provide additional protection against invasive species over the long term. Removal of salt cedar under Alternatives B and C would also improve soil conditions and reduce the risk for high-intensity fires associated with salt cedar stands.

A variety of measures under each alternative, including law enforcement, fuel reduction projects, road closures, fixing and installing barriers, and expanding Service-managed lands within the Refuge boundary, would protect habitats and sensitive plants from unnecessary disturbance. Increased law enforcement and road gates

under Alternatives B and C would further protect habitat and sensitive plants.

Mitigation

Mitigation measures that could reduce vegetation (primarily sensitive species) impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section 7 consultation process, as appropriate.

Standard construction practices would be implemented to prevent invasive plant species from establishing in the disturbed areas around the facilities, such as cleaning vehicles and equipment used on the Refuge with high-pressure sprayers to dislodge seeds prior to accessing the area. Facilities would be designed to avoid sensitive habitats and sensitive species populations and impact the least amount of vegetation (based on pre-construction surveys and mapping). For activities that would result in take of sensitive plants, the Service would implement transplanting or restoration plans for affected plants to transplant or plant sensitive plants in suitable habitats on the Refuge.

Wildlife

Impacts

Temporary construction activities associated with visitor use facilities, roads, and fencing would disturb fish and wildlife species in the vicinity of the activity. Amphibians, reptiles, birds, mammals, fish, and invertebrates that use the affected habitats have the potential to be directly affected by construction equipment and vegetation removal activities. These species would be forced to temporarily relocate to other areas of the Refuge or off-site until the disturbance is removed. Because only minimal road improvements would occur under Alternative A, short-term adverse impacts to fish and wildlife species would be limited to small areas of the Refuge and would not be significant. More facilities would be constructed or improved under Alternatives B and C; thus, short-term adverse impacts would be greater and could be significant if sensitive fish or wildlife species are harmed or if breeding, nesting, and spawning activities are disturbed. These impacts will be analyzed further in project-specific NEPA documents to be prepared for facility construction and road improvements.

Habitat improvements under each alternative would benefit most wildlife species by restoring native conditions, although temporary construction activities would result in short-term disturbance to fish and wildlife. Temporary impacts would be similar to those described above for facility construction, and potentially significant impacts will be analyzed further in project-specific NEPA documents to be prepared for the habitat restoration activities.

Riparian and wetland species, such as waterfowl, song birds, southwestern willow flycatcher, and amphibians, would benefit from restoration of alkali wet meadow and mesquite bosque/lowland riparian habitat under each alternative, with greater benefits occurring under

Alternatives B and C because larger amounts of habitat would be restored. Management priority species that would benefit from wet meadow and riparian restoration include eared grebe, western grebe, Franklin's gull, black tern, snowy egret, marbled godwit, snowy plover, long-billed curlew, Arizona Bell's vireo, and western yellow-billed cuckoo.

Restoration of emergent marsh under Alternatives B and C would benefit migratory birds, fish, amphibians, and invertebrates. Specifically, eared grebe, western grebe, Franklin's gull, black tern, snowy egret, and canvasback would benefit from emergent marsh restoration. Control of cattails around open water sources under Alternatives B and C would expand open water habitat for migratory birds, waterfowl, and fish and may attract more birds to the Refuge. Improvements to springs and streams on the Refuge under each alternative would benefit the sensitive species occupying those habitats and could aid in their recovery.

Restoration of native upland habitat under each alternative would benefit migratory birds, burrowing owls, chuckwalla, and other reptiles, mammals, and birds that use the habitat. Specifically, white-throated swift would benefit from upland restoration. Restoration activities throughout the Refuge would benefit native, endemic, and migratory wildlife over the long term.

Habitat restoration, particularly in and around springs, continued restoration of spring outflow systems, and control of nonnative species in those systems would also benefit the Warm Springs pupfish and other fish species on the Refuge. Specific restoration activities in streams to provide flowing streams with riffles would benefit the Ash Meadows speckled dace under Alternatives B and C. Additional restoration activities under Alternative C, such as removal of cattails from Kings, Point of Rocks, and Crystal Springs, would benefit the native, endemic fish species present on the Refuge. In addition, eared grebe and snowy egret would benefit from spring and channel restoration.

Temporary disturbance during stream modifications and installation of temporary fish barriers would disturb fish directly, restrict movement, or affect water quality. These impacts could be significant, depending on the project-specific details of the restoration activities; therefore, impacts will be analyzed further in project-specific NEPA documents to be prepared for restoration of the spring habitats. Improved habitat conditions, specifically through removal of pest species as discussed below, would improve reproductive success and increase populations of sensitive fish on the Refuge to aid in their recovery.

The threatened Ash Meadows naucorid population would benefit from habitat improvements under Alternatives B and C. The Point of Rocks spring outflow channel would be restored to provide flowing streams with substrate. This would encourage the naucorid population to expand its range into the suitable habitat and aid in recovering the species' population.

Crystal Reservoir provides habitat primarily for nonnative or introduced fish species. These species adversely affect native species through predation and competition for resources, although efforts are ongoing to control their populations. The removal or modification plan for the reservoir would be implemented under Alternative C. Changes to the reservoir, in particular its removal, would substantially reduce or possibly eliminate nonnative predatory fish in the reservoir system, which would benefit native fish populations. Native fish occurring on the Refuge can survive in the stream and spring habitats; thus, reservoir removal would not be detrimental to native species. Temporary impacts during reservoir removal or modification would be reduced through relocating any native fish that are found in waters anticipated to be affected by reservoir removal or modification activities to suitable habitat outside the disturbance area during restoration activities. These impacts will be further analyzed in a project-specific NEPA document to be prepared for the reservoir modification plan.

Restoration of the native habitat and hydrology in the Crystal Reservoir area would benefit aquatic and avian species over the long term and could improve populations of sensitive and endemic fish by removing the nonnative fish.

Crayfish and bullfrogs compete with and prey on native, endemic fish and invertebrates. Under Alternatives B and C, the Service would actively remove crayfish from the spring habitats. These efforts would benefit fish and invertebrates by reducing predators and competition.

Under each alternative, the Point of Rocks refugium would be discontinued once a new refugium is established for the Devils Hole pupfish, or sooner. Construction and operation of new refugia for the endangered Devils Hole pupfish and Warm Springs pupfish under each alternative and refugia for other endemic species under Alternative C would benefit native fish species by providing a population base for reintroduction to the springs and streams on the Refuge, following restoration activities. The refugia would also ensure the continued survival of the species by providing a safe haven for the species. Temporary impacts on habitats and fish species during construction of the refugia will be analyzed in a project-specific NEPA document to be prepared for the refugia.

Mitigation

Mitigation measures that could reduce wildlife impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section 7 consultation process, as appropriate.

Standard construction measures would be implemented to minimize impacts on native wildlife, such as avoiding unnecessary disturbance to habitats by driving on existing roads and working only in the required area, minimizing direct disturbance to streams and open water sources, and throwing away all trash and other construction debris in approved disposal areas. Construction activities and restoration would be

implemented during the non-breeding/nesting season and outside of the spawning period for fish, to the extent feasible. Disturbance during the breeding/nesting season would require pre-construction surveys to locate active nests and establish barriers around the nest site until a qualified biologist determines the nest site is abandoned. Activities in or near waterways would be avoided during the spawning period to minimize impacts on sensitive fish.

5.2.3 Cultural Resources

Impacts

In addition to restoration activities, improvements and modifications to roads would result in ground disturbance under each of the alternatives. Additional ground disturbance would occur under Alternatives B and C because of the larger areas of restoration and construction of visitor use facilities. Cultural resources may be adversely affected by ground disturbance activities associated with construction and restoration activities. Impacts associated with each alternative have the potential to be significant, depending on the project-specific details of restoration, road construction, and visitor facilities, if important known or unknown cultural resources on the Refuge are destroyed or damaged. These impacts will be analyzed further in project-specific NEPA documents to be prepared for these activities.

Cultural resources are currently being adversely affected by vandalism, degradation, and, on occasion, fire. Alternative A involves minimal actions to reduce these impacts, and National Register–eligible cultural resource sites could be damaged, destroyed, or otherwise significantly affected. Several historic cabins on the Refuge have been destroyed by wildfires, which are carried by the salt cedars in the old farm canals. Alternatives B and C involve removing salt cedar and constructing fences, signs, and other barriers, which would provide some protection for cultural resources. Indirect adverse effects related to increased visitor use may include disturbance and destruction of sites and removal of artifacts. Impacts to cultural resources would be significant under the action alternatives if eligible sites lose their integrity through destruction, damage, or removal. Indirect impacts on cultural resources will be further analyzed in project-specific NEPA documents to be prepared for Refuge activities.

Because other aspects of the environment are important to tribes and can be considered cultural resources, adverse impacts to other resources could also be considered impacts to cultural resources. These impacts are not specifically discussed as cultural resource impacts; however, they may be of concern to culturally affiliated tribes if the resources are important to them. Examples include native plants that may be collected and used for various purposes, water resources, or geologic features.

Mitigation

Mitigation measures that could reduce cultural resource impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section 106 consultation process, as appropriate.

In order to prevent adverse impacts on cultural resources during restoration and construction activities, professional archaeologists would survey the project areas for cultural resources and record the information and locations prior to project implementation. Staff members would use their knowledge of site locations to design and construct facilities to avoid eligible resources. All ground disturbance activities would be monitored by an archaeologist and a tribal monitor in areas where known cultural resources are located and in areas with high potential for buried cultural deposits. If cultural resources are inadvertently exposed during activities, activities would immediately cease and a qualified archaeologist would be consulted to implement appropriate measures for mitigation or preservation. If eligible sites or portions thereof cannot be protected and would be adversely affected, other mitigation or data recovery methods would be conducted in consultation with the Nevada State Historic Preservation Office.

5.2.4 Public Access and Recreation

Public Access

Impacts

Public access would be temporarily affected during construction and restoration activities under each alternative. More activities are proposed under Alternatives B and C; therefore, access to larger areas of the Refuge would be temporarily affected for longer periods. These activities would result in incidental traffic from construction vehicles over a short-term period that would result in a relatively small increase in traffic in the immediate vicinity of the Refuge. Some congestion on roadways and longer stop times at intersections would be expected during the construction period. Areas under construction or being restored would be temporarily off-limits to the public for their safety.

Impacts to public access during restoration and construction could be significant depending on the locations and extent of activities implemented at one time. With the small number of visitors on the Refuge at one time, most activities would have minimal effects on traffic. Visitors would continue to have access to other areas of the Refuge during construction activities. Project-specific NEPA documents will include further analysis of public access impacts of Refuge actions.

Long-term public access on the Refuge would continue to be generally unrestricted under Alternative A, with some nonessential roads being closed and minimal law enforcement patrols. Visitors would be allowed to access the Refuge at any time and use multiple routes or points along the Refuge boundary. Primary access is from the south on Spring Meadows Road and is often a result of through traffic. There are also a number of other points of access to the Refuge that, along

with limited law enforcement patrols under current management, impair the ability of the Service to properly manage and protect resources on the Refuge.

Additional measures under Alternatives B and C would limit and control access on the Refuge by increasing law enforcement patrols and adding road gates to block access to non-public roads. These measures would restrict public access to certain areas, but visitors would continue to have access to open areas of the Refuge for recreational purposes, and private landowners would continue to have access to their lands. Access control measures would improve Refuge management by protecting resources on the Refuge and preventing or minimizing significant impacts to sensitive resources, which would improve the quality of the visitor's experience.

Under all alternatives, improvements to existing roadways and parking areas would have a beneficial effect on public access throughout the Refuge. Additional improvements to roads as part of the Resurfacing Plan under Alternative C would also benefit public access and improve Refuge road conditions. Improved road conditions would also encourage visitors to stay on designated roads and provide direction to public access points.

The various visitor use projects under Alternatives B and C would improve recreational opportunities for visitors and could attract more visitors to the Refuge. This increase would result in increased traffic on Highway 373/127 and increased traffic on the Refuge. The traffic impacts would be more noticeable on peak days, primarily weekends, when vehicle trips to the Refuge are highest. The increase in visitors and some additional road construction-related traffic would have a minor impact due to the relatively low number of visitors at one time and the low amount of traffic currently occurring on Highway 373/127 and the Refuge.

Mitigation

Mitigation measures that could reduce public access impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Areas under construction or being restored would be temporarily off-limits to the public for their safety. These areas would be adequately marked, and detours or alternative routes would be identified. Refuge staff would schedule construction for slower times of visitation during the week and slower seasons to minimize the impacts of construction traffic on public access.

Recreation

Impacts

Temporary construction activities associated with road improvements and restoration under each alternative would restrict access to affected areas of the Refuge for recreational purposes. Construction of visitor facilities under Alternatives B and C would also restrict public use of small areas of the Refuge where construction occurs. Recreational opportunities would continue to be available in other areas of the Refuge. Depending on the locations and extent of activities implemented at one time, impacts to recreational opportunities could be significant. With the small number of visitors on the Refuge at one time, most activities would have minimal effects on recreation. Project-specific NEPA documents will include further analysis of recreational impacts of Refuge actions.

A variety of recreational opportunities would be available to the public under each alternative, such as wildlife observation, hiking, and picnicking. These activities are supported by trails, kiosks, picnic areas, and restrooms at several locations on the Refuge. Under each alternative, recreational opportunities would be improved to provide more services for visitors. The most improvements would occur under Alternatives B and C with development of a Visitor Services Plan, an Outreach Plan, an Environmental Education Plan, and a Hunt Plan. The Visitor Services Plan and Hunt Plan would address potential public use conflicts associated with change in Refuge users and dynamics from a predominantly hunter use to school and international visitation.

Restoration activities and construction of visitor use facilities (i.e., the boardwalk at Kings Pool Stream) under each alternative would enhance visitor experiences and benefit recreational opportunities. Interpretive and education materials would also improve visitor experience and expand recreational opportunities on the Refuge. Implementation of the plan to remove or modify Crystal Reservoir under Alternative C would eliminate unauthorized fishing by removing the source of game fish. Habitat conditions for sensitive fish would be improved, but game fishing would be eliminated. The availability of other recreational opportunities on the Refuge would reduce adverse effects of eliminating unauthorized fishing.

The Refuge would continue its limited participation in community events and other forms of environmental education under Alternative A, including its partnership with Death Valley National Park to educate the public on Death Valley and the Devils Hole pupfish. Expanded outreach efforts would occur under Alternatives B and C to encourage the public to visit the Refuge and experience the opportunities available to them.

Alternatives B and C include the construction of a new visitor contact station and interpretive facilities and an expanded emphasis on educational activities and outreach to local groups. These actions would benefit environmental education and outreach opportunities for the Refuge.

Mitigation

Mitigation measures that could reduce recreation impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Areas under construction or being restored would be temporarily off-limits to the public for their safety. These areas would be adequately marked, and information on other recreational areas would be provided to the public. Refuge staff would schedule construction for slower times of visitation during the week and slower seasons when feasible, to minimize the impacts of construction traffic on public access.

5.2.5 Social and Economic Conditions

Refuge Management and Local Economics

Impacts

Under Alternative A, the annual Refuge budget, which includes operations, capital projects, and four full-time staff members, would remain comparable to current funding and staffing levels, resulting in continued limitations on management of the Refuge and opportunities for public interaction.

Under each alternative, the Service would continue to pursue acquisition of the remaining lands within the approved boundary from willing sellers. Lands acquired would be removed from the tax rolls, so state and local government income would be slightly reduced. However, this loss in property taxes would be at least partially offset by Refuge revenue-sharing payments, so this impact would not be significant.

Under each alternative, restoration projects, road improvements, and boardwalk construction would provide employment to qualified local citizens, including tribal individuals, for a short term. Under Alternatives B and C, new interpretive facilities, a visitor contact station, and Refuge headquarters would be constructed, along with other physical improvements. These actions would also require use of private contractors, which would have a minor beneficial effect in terms of providing short-term jobs to qualified local citizens, including tribal individuals. Additional activities related to environmental education would require increased expenditures to meet those needs. These actions would require increases in the Refuge management and operations budget and staffing.

An increase in the number of visitors to the Refuge would increase retail trade, lodging, and food service for the nearby local economy. Additional indirect employment as a result of the increased activity would also be expected.

Mitigation

Impacts to refuge management economics and local economies would not be significant, so specific mitigation measures are not necessary.

Environmental Justice

Impacts

Minority or low-income populations would not be affected by the continuation of existing operations of the Refuge under Alternative A.

Increased educational and outreach activities, both on-site and off-site, under Alternatives B and C would provide benefits to school children and tribal communities, including minority and low-income populations. Adverse effects on low-income or minority populations are not expected under the action alternatives.

Development of cultural resources interpretive and environmental education materials in coordination with affiliated Native American tribes under Alternatives B and C would address topics that would be of interest to the Native American population.

Mitigation

Impacts related to environmental justice would not be significant, so specific mitigation measures are not necessary.

Land Use

Impacts

With the Refuge continuing to operate at the current level of activities under Alternative A, new land use conflicts to existing or planned uses in the proximity of the Refuge are not anticipated.

Acquisition of existing private parcels within the Refuge would occur under each alternative. Any additional acquisitions of private land would allow greater public access to areas on the Refuge and would allow the Refuge to be managed as a whole with less fragmentation. Private land would only be purchased from landowners who wish to sell. Private landowners who do not want to sell would continue to have access to their property for private use.

Mitigation

Impacts to land use would not be significant, so specific mitigation measures are not necessary.

Aesthetics

Impacts

Restoration and protection efforts for native habitats under each alternative would improve visual character of the Refuge by restoring the habitats to native and historic conditions. Greater improvements to visual character would occur under Alternatives B and C because of the larger areas being affected. Temporary impacts would occur during restoration activities when vegetation is removed, and soils are exposed, adversely affecting views of the area for visitors; these impacts are not considered significant due to their short duration. These views would immediately improve upon establishment of native vegetation and restoration of historic hydrology.

Construction of a boardwalk under each alternative would affect views of the Refuge during and following construction. Additional visitor use facilities would be constructed under Alternatives B and C, including a visitor contact station and Refuge headquarters, which would result in greater temporary effects on aesthetics. Temporary dust, exposed soils, and construction activities would adversely affect views of the disturbed areas during construction; however, these impacts are not considered significant due to their short duration.

New visitor facilities could have a long-term impact on the natural features and vegetation currently on the Refuge, depending upon the siting of the facilities and integration into the Refuge's natural setting. The new Refuge headquarters, visitor contact station, and boardwalks would be constructed to improve the visual quality of the Refuge, specifically at the current administrative site, which consists of a variety of trailers and old metal structures. Impacts to aesthetics could be significant, depending on the project-specific details of the facilities; therefore, impacts will be analyzed further in project-specific NEPA documents to be prepared for the facilities.

Mitigation

Mitigation measures that could reduce aesthetics impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Visual impacts during construction of interpretive facilities and other physical improvements would be temporary and addressed through screening, ongoing construction site maintenance, and cleanup during construction. Refuge staff would schedule construction for slower times during the week and slower seasons, when feasible, to minimize these impacts. Impacts of new facilities on the long-term visual quality of the Refuge would be addressed through site-sensitive design standards that ensure compatibility with the Refuge environment.

5.2.6 Summary of Effects

Table 5.2-1 summarizes the potential effects for each of the three alternatives. Alternative A continues current management practices with little changes or improvements. Alternative A would involve restoration of 70 acres of alkali wet meadow, 30 acres of mesquite bosques/lowland riparian, and 30 acres of native upland habitat.

Compared with Alternative A, Alternative B would improve Refuge habitats to benefit native and sensitive plant and wildlife species, accommodate an increase in visitors, and enhance visitor experience. Alternative B would involve restoration of 520 acres of alkali wet meadow, 220 acres of mesquite bosque/lowland riparian, 30 acres of native upland habitat, and 150 acres of emergent marsh. Alternative B would, however, result in short-term, mitigable adverse impacts from restoration projects and facility and road construction.

Compared with Alternative B, Alternative C would provide greater biological and visitor benefits, but result in greater short-term mitigable adverse construction impacts. Alternative C would involve restoration of 650 acres of alkali wet meadow, 550 acres of mesquite bosques/lowland riparian, 30 acres of native upland habitat, and 150 acres of emergent marsh.

Impacts and mitigation measures of restoration actions, visitor facility construction and improvement, and other actions noted throughout this section will be further analyzed and refined in project-specific NEPA documents to be prepared for each action. The Service will use the analysis presented in this EIS to focus on key issues that need to be further evaluated in second-tier NEPA documents.

Table 5.2-1. Ash Meadows NWR: Summary of Environmental Consequences

Resource Issue or Concern	*Alternative A (No Action)*	*Alternative B*	*Alternative C (Preferred Alternative)*
Physical Environment			
Soil Conditions	EC[1]: Minimal long-term improvements; some temporary disturbance	SH: Improved long-term conditions through restoration; some temporary disturbance during construction and restoration	MH: Improved long-term conditions through restoration; some temporary disturbance during construction and restoration
Surface Water	EC: Some hydrology restored (long-term)	SH: Hydrology restored on portions of Refuge (long-term)	MH: Hydrology restored throughout Refuge (long-term)
Water Quality	EC: Improved with restoration over the long term in some areas; some temporary impacts	SH: Improved with restoration over the long term on portions of the Refuge; temporary impacts	MH: Improved with restoration over the long term throughout Refuge; temporary impacts
Air Quality	EC: Some emissions and dust (temporary and long-term)	SL: Minor emissions and dust from temporary construction activities and increased temporary and long-term traffic; temporary smoke from prescribed burns	SL: Minor emissions and dust from temporary construction activities and increased temporary and long-term traffic; temporary smoke from prescribed burns
Biological Resources			
Alkali Wet Meadow	EC: Restore 70 acres of habitat over the long term	CH: Restore 520 acres of habitat over the long term	CH: Restore 650 acres of habitat over the long term
Mesquite Bosque/Lowland Riparian	EC: Restore 30 acres of habitat over the long term	MH: Restore 220 acres of habitat over the long term	CH: Restore 550 acres of habitat over the long term
Emergent Marsh	EC: Maintain 132 acres of habitat over the long term	SH: Restore 150 acres of habitat over the long term	SH: Restore 150 acres of habitat over the long term
Upland Habitat	EC: Restore 30 acres of desert upland habitat over the long term	SH: Rehabilitate agricultural fields; maintain desert upland habitat over the long term	SH: Rehabilitate agricultural fields; maintain desert upland habitat over the long term
Sensitive Plants	EC: Improved habitat in some areas over the long term; minor temporary disturbance	MH: Population expansion over the long term; improved habitat on portions of the Refuge over the long term; potential for temporary impacts during restoration and facility construction activities	CH: Population expansion over the long term; improved habitat throughout the Refuge over the long term; potential for temporary impacts during restoration and facility construction activities in a larger area
Invasive Plants	EC: Minimal removal efforts over the long term	SH: Removal of invasive plants in restored areas over the long term	MH: Removal of invasive plants in restored areas over the long term

[1] EC = existing conditions; SH = slightly higher or improved than existing conditions; MH = moderately higher or improved than existing conditions; CH = considerably higher or improved than existing conditions; SL = slightly lower or decreased than existing conditions; ML = moderately lower or decreased than existing conditions; CL = considerably lower than existing conditions.

Table 5.2-1. Ash Meadows NWR: Summary of Environmental Consequences

Resource Issue or Concern	*Alternative A (No Action)*	*Alternative B*	*Alternative C (Preferred Alternative)*
Biological Resources, continued			
Common Wildlife Species	EC[2]: Some improved habitat over the long term; minimal temporary disturbance	SH: Improved habitat on portions of the Refuge over the long term but potential for impacts during construction	MH: Improved habitat throughout Refuge over the long term but potential for impacts during construction
Southwestern Willow Flycatcher	EC: Some improved habitat over the long term	SH: Improved habitat on portions of the Refuge over the long term	MH: Improved habitat throughout Refuge over the long term
Management Priority Birds	EC: Some improved habitat over the long term	MH: Improved and increased habitat on portions of the Refuge over the long term	CH: Improved and increased habitat throughout the Refuge over the long term
Sensitive Fish	EC: Some improved habitat over the long term; minimal temporary disturbance	MH: Improved habitat on portions of the Refuge over the long term; potential for impacts during construction	CH: Improved habitat throughout the Refuge over the long term; potential for impacts during construction
Invasive Fish	EC: Minimal removal efforts over the long term	SH: Removal of some invasive fish over the long term	MH: Removal of most invasive fish over the long term
Cultural Resources			
Cultural Resources	EC: Some impacts possible during construction and restoration activities	SL: Potential for impacts during construction and restoration activities	SL: Potential for impacts during construction and restoration activities
Public Access			
Roads	EC: Minor improvements to roads over the long term	SH: Improved roads and recreation facilities improve access over the long term; closures and barriers control access over the long term	SH: Improved roads and recreation facilities improve access over the long term; closures and barriers control access over the long term
Traffic	EC: Current traffic	SL: Increase in visitors would increase traffic on and to the Refuge over the long term	ML: Increase in visitors would increase traffic on and to the Refuge over the long term
Recreation			
Visitor Use Facilities	EC: Some facilities available	SH: More facilities constructed over the long term	SH: More facilities constructed over the long term
Recreational Opportunities	EC: Variety of opportunities available	SH: Improved opportunities and services over the long term; some temporary impacts	SH: Improved opportunities and services over the long term; some temporary impacts
Environmental Education/Interpretation	EC: Limited materials available	SH: More materials available over the long term	SH: More materials available over the long term
Outreach	EC: Limited outreach	SH: Increased outreach over the long term	SH: Increased outreach over the long term
Refuge Management and Local Economics			
Refuge Budget and Staffing	EC: Current budget and staffing	MH: Increased budget and staff to implement actions over the long term	CH: Increased budget and staff to implement actions over the long term

[2] EC = existing conditions; SH = slightly higher or improved than existing conditions; MH = moderately higher or improved than existing conditions; CH = considerably higher or improved than existing conditions; SL = slightly lower or decreased than existing conditions; ML = moderately lower or decreased than existing conditions; CL = considerably lower than existing conditions.

Table 5.2-1. Ash Meadows NWR: Summary of Environmental Consequences

Resource Issue or Concern	*Alternative A (No Action)*	*Alternative B*	*Alternative C (Preferred Alternative)*
Refuge Management and Local Economics, continued			
Local Economy	EC[3]: Current economy	SH: Increase in local economy from increased visitors over the long term	SH: Increase in local economy from increased visitors over the long term
Land Use			
Service-managed Lands within Boundary	EC: Current conditions	SH: Expand Service-managed lands within Refuge boundary over the long term; maintain access for private landowners	SH: Expand Service-managed lands within Refuge boundary over the long term; maintain access for private landowners
Aesthetics			
Restoration Activities	EC: Some improvements over the long term	SH: Improved visual character from restoration activities over the long term	MH: Improved visual character from restoration activities over the long term
Visitor Use Facilities	EC: Minimal changes over the long term	SH: Improved visual character over the long term; temporary disturbance	SH: Improved visual character over the long term; temporary disturbance

[3] EC = existing conditions; SH = slightly higher or improved than existing conditions; MH = moderately higher or improved than existing conditions; CH = considerably higher or improved than existing conditions; SL = slightly lower or decreased than existing conditions; ML = moderately lower or decreased than existing conditions; CL = considerably lower than existing conditions.

5.3 Desert National Wildlife Refuge

This section describes the potential impacts associated with each of the action alternatives for Desert NWR. Impacts are judged for significance using the thresholds described in the introduction of this chapter. Mitigation measures are included for resources with significant impacts. This section also summarizes the results of an Environmental Assessment (EA) for the visitor facilities at Corn Creek Field Station (Service 2007).

Each of the action alternatives involves monitoring, inventory, and research actions that would not result in adverse environmental impacts. These management actions would provide the Refuge staff with an improved knowledge of the Refuge, which would later allow them to better assess the effects of their actions. These actions are not further evaluated in this section.

5.3.1 Physical Environment

Soils

Impacts

Construction of visitor use facilities and road improvements under Alternatives B and C would result in disturbance to soil, potentially causing erosion in the small affected areas. These activities would result in less-than-significant impacts on soils due to the small areas being affected.

Construction of an auto tour route under Alternative B and boundary fences under Alternatives B, C, and D would result in substantial soil disturbance due to the lengths of the route and fencing. These impacts could be significant and will be analyzed further in project-specific NEPA documents to be prepared for the auto tour route and boundary fences.

Prescribed burns and naturally ignited fires would be used to restore vegetation characteristics representative of a natural fire regime under Alternatives C and D; however, the use of fire would also increase the potential for erosion immediately following the burn and before new plants become established. Because of the potentially large amount of soil exposed under these alternatives, temporary impacts could be significant. These impacts will be analyzed further in a project-specific NEPA document to be prepared for the revised Fire Management Plan. Under Alternatives C and D, highly flammable vegetation would be removed from around water catchments to protect bighorn sheep. This would also result in a temporary increase in erosion potential until new vegetation is established.

As discussed in the visitor facilities EA (Service 2007), construction and rehabilitation activities at Corn Creek Field Station would disturb soil and expose it to wind and water erosion. Establishment of native vegetation around springs and along streams would stabilize the soils and reduce further erosion potential.

Mitigation

Mitigation measures that could reduce soil impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Appropriate dust control measures and BMPs would be implemented during restoration and construction to reduce dust, erosion, and sedimentation. Mitigation measures would be implemented during prescribed burns to reduce the potential for erosion. These measures would include pre-watering and maintaining surface soils in stabilized conditions where support equipment and vehicles will operate, applying water or dust palliative during clearing and grubbing or earth-moving activity to keep soils moist throughout the process, watering disturbed soils immediately following clearing and grubbing activities, and stabilizing sloping surfaces using soil binders until vegetation or desert pavement (ground cover) can effectively stabilize the slope.

Water Resources

Impacts

None of the alternatives involves management actions that would adversely affect hydrology.

Vegetation removal around water catchments under Alternatives C and D would expose soils to wind and water erosion and could result in increased sedimentation and other pollutants in the water. Water quality impacts would be minimal, however, due to the small size of the affected area and minor amount of affected soil around the catchments.

Road improvements, fence construction, and construction of visitor use facilities under Alternatives B, C, and D (more construction under Alternative B) would have minimal direct impacts on surface water quality on the Refuge because of the lack of surface waters in the vicinity. Under Alternative B, construction of the auto tour route would result in substantial soil disturbance and could adversely affect downstream water quality. These impacts will be further analyzed in project-specific NEPA documents to be prepared for the auto tour route.

As discussed in the visitor facilities EA (Service 2007), construction and rehabilitation activities at Corn Creek Field Station would result in soil disturbance and could discharge sediment and pollutants into the surface waters at Corn Creek. Operation of the visitor facilities would result in a negligble amount of runoff due to permeable surfaces and recycling of rain water in the visitor center gutters. Removal of the two lower ponds would alter downstream hydrology at Corn Creek, but would not affect spring discharge.

Mitigation

Mitigation measures that could reduce water quality impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

The Service would implement BMPs during all construction activities near surface waters, including ephemeral washes, to ensure minimal discharge of pollutants and to control erosion and runoff.

Air Quality

Impacts

Construction activities under Alternatives B, C, and D, such as for visitor facilities, trails (B), an auto tour route (B), and fencing (C and D), would require construction equipment that would disturb the ground and clear vegetation. This equipment would cause short-term, minor emissions (engine exhaust and fugitive dust) that may be noticeable on the Refuge. Depending on the extent of activities, an increase in emissions could violate ambient air quality standards and could be significant. These impacts will be analyzed further in project-specific NEPA documents to be prepared for the facilities.

Increased traffic on the Refuge would result in a minor increase in traffic-related emissions. These emissions would not result in violations of the ambient air quality standards because the amount of Refuge traffic at any one time is expected to be small, and traffic would be limited to the main roads and parking areas. Therefore, traffic-related impacts to ambient air quality would not be significant.

Prescribed burns and naturally ignited fires allowed to burn under Alternatives C and D would affect air quality on the Refuge. Although the burns would generate smoke, which may be noticeable off the Refuge, impacts would not be significant because the burns would be temporary and would not be expected to violate ambient air quality standards. All burns would be completed in compliance with requirements from the Nevada Division of Environmental Protection, Bureau of Air Pollution Control. Specifics of air quality management will be further analyzed in a revised Fire Management Plan that will be subject to further public and regulatory review and NEPA compliance.

As discussed in the visitor facilities EA (Service 2007), construction activities, including building demolition, would generate dust and air pollutants and affect air quality. Increased vehicle emissions from increased visitor use would have a minor effect on air quality.

Ground-disturbance, construction, and fire management (particularly fuels reduction) activities under any of the alternatives would result in direct emission of greenhouse gases (GHG) (temporary emissions) from construction equipment. Fire management would help prevent catastrophic wildfire over the long term and reduce long-term GHG emissions. Indirect, long-term emissions of GHG would occur due to increased visitation by the public and increased employee vehicle trips (as staff grows). An increase in GHG emissions would contribute to

regional impacts on climate change and could result in significant impacts. Climate change impacts will be further analyzed in project-specific NEPA documents, as appropriate.

Mitigation

Mitigation measures that could reduce air quality impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

BMPs would be implemented during construction activities that disturb the soil to reduce particulate emissions. These measures would include the BMPs identified for mitigating soil and water resources impacts as well as the following: maintaining effective cover over stockpiled fill or debris materials; limiting vehicle speeds to 15 mph in staging areas and on all unpaved access routes; and cleaning mud, silt, and soil tracked out onto paved surfaces immediately. In addition, use of low or zero-emission construction vehicles and limiting idling time for construction vehicles could reduce GHG emissions during construction.

Prescribed burns would be implemented only during favorable meteorological conditions to minimize substantial impacts to air quality.

5.3.2 Biological Resources

Vegetation

Impacts

Under each alternative, public facility and road improvements would result in minimal impacts to habitat. Construction of additional visitor use facilities and road improvements under Alternatives B and C and construction of boundary fences under each action alternative would result in additional habitat impacts, resulting in minor losses of vegetation in the small affected areas. These activities would result in less-than-significant impacts on habitats due to the small areas being affected.

Establishment of an auto tour route and construction of wildlife viewing trails under Alternative B could result in substantial impacts to vegetation, including sensitive species, depending on the specific alignment of the route and trails. These impacts could be significant, depending on the project-specific details of the tour route and trails; therefore, impacts will be analyzed further in project-specific NEPA documents to be prepared for these activities.

In addition, construction of boundary fences under Alternatives C and D could result in adverse impacts to sensitive plants, if present, along the eastern and northern boundaries. Impacts to sensitive plants under Alternative B are not anticipated because sensitive plants are not expected to occur along the southern boundary. If sensitive plant populations are affected by fence construction, impacts would be significant and would be analyzed further in a project-specific NEPA document to be prepared for the boundary fence(s).

Prescribed burns and naturally ignited fires allowed to burn under Alternatives C and D would improve habitat conditions for wildlife and help return the vegetation communities to their natural fire regime. Temporary vegetation disturbance would occur during the fires, but herbaceous vegetation would return soon after the fire, and the habitat would restore over the long term; therefore, vegetation impacts from prescribed burns would be less than significant.

A variety of measures under each alternative, including maintaining or installing fences, signs, and barriers; maintaining or improving roads; designating wilderness; increasing law enforcement; and suppressing wildfires, would protect habitats from unnecessary disturbance. In addition, rehabilitation of habitat along the southern boundary under Alternatives C and D would remove man-made disturbances and improve desert scrub habitat.

As discussed in the visitor facilities EA (Service 2007), construction and rehabilitation activities would result in temporary disturbance to habitats at Corn Creek Field Station. Construction of the visitor facilities would result in a minor loss of habitat. Habitat rehabilitation would improve habitat for native species by replacing native plants with nonnative and invasive plants.

Mitigation

Mitigation measures that could reduce vegetation (specifically sensitive plants) impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section 7 consultation process, as appropriate.

Standard construction practices would be implemented to prevent invasive species from establishing in the disturbed areas around the facilities, such as cleaning vehicles and equipment used on the Refuge with high-pressure sprayers to dislodge seeds prior to accessing the area. Facilities would be designed to avoid sensitive habitats and impact the least amount of vegetation, based on prior surveys and mapping. The Service would coordinate with the Nevada Fish and Wildlife Office on pre-construction surveys and mitigation measures for ground-disturbing activities that would adversely affect rare or endemic plants, such as boundary fences construction, road improvements, or trail construction.

Wildlife

Impacts

Individuals of some wildlife species may be adversely affected by construction of visitor use facilities, roads, and fencing under Alternatives B, C, and D. Amphibians, reptiles, birds, mammals, and invertebrates that use the affected habitats have the potential to be directly affected during vegetation removal activities. These species would be forced to relocate to less disturbed areas of the Refuge where suitable habitat is available. Adverse impacts to wildlife species would be localized and dependent on the specific activity. For more common wildlife, impacts would be less than significant because of the localized

nature of the disturbance and minimal effects to their population. For resident and migratory birds, impacts could be significant if disturbance occurs during the breeding or nesting periods and would affect nesting species. These impacts will be analyzed further in project-specific NEPA documents to be prepared for these activities.

Desert tortoise, a threatened species, and Gila monster may potentially be disturbed or injured during construction of visitor facilities or fencing in desert scrub habitats under Alternatives B, C, and D. Additional impacts could occur under Alternative B during construction of the auto tour route. Construction activities could adversely affect the tortoise and Gila monster populations and their habitat. Impacts to these species could be significant, depending on the project-specific details of the fence and auto tour route alignments and visitor facility locations. These impacts will be analyzed further in project-specific NEPA documents to be prepared for the activities.

The desert tortoise is currently being adversely affected by illegal off-road activities along the southern boundary. Implementation of habitat protection efforts (e.g., fencing the boundaries and restricting access) would reduce the potential for this impact under Alternatives B, C, and D, and rehabilitation of habitat along the southern boundary under Alternatives C and D would improve habitat for the tortoise. These activities would also improve habitat for Bendire's thrasher and white-throated swift.

Habitat above 5,000 feet used by resident birds, specifically the pinyon jay, gray vireo, black-chinned sparrow, flammulated owl, and Gilbert's skink, a Nevada Department of Wildlife (NDOW) sensitive species, would be modified by prescribed burns and naturally ignited fires allowed to burn under Alternatives C and D. The prescribed burns and natural fire would result in a temporary loss of habitat and could harm individuals of these species, but the burns would improve habitat diversity over the long term for these species as well as others, including the bighorn sheep. Although minor impacts would occur over the short term, long-term effects of the burns would be beneficial.

Management actions under the action alternatives to improve bighorn sheep populations include translocating sheep to increase populations, developing a sheep management plan (Alternatives C and D), construction additional water catchments (Alternatives C and D), and removing highly flammable vegetation around water catchments to reduce potential for fire (Alternatives C and D). Desert bighorn sheep would benefit from these actions because their subpopulations would increase to more stable levels. Temporary disturbance would occur during activities in bighorn sheep habitat, but the sheep would be able to return to the affected areas following the disturbance. Temporary impacts will be analyzed further in a project-specific NEPA document to be prepared for sheep management.

Reestablishment of the Pahrump poolfish into streams, ponds, or springs at Corn Creek could benefit the regional poolfish population and contribute to its recovery. However, adverse effects from public use of the Corn Creek area could adversely affect the Refuge poolfish

population by introducing pest species (i.e., bullfrog, crayfish) and disturbing the habitat. Law enforcement patrols and close monitoring of the poolfish after reintroduction would be necessary to ensure minimal impacts to the reestablished population. If the habitat is determined to be unsuitable for poolfish, such as due to human disturbance, the Service would not reestablish a population at Corn Creek. These impacts will be analyzed further in a project-specific NEPA document to be prepared for the activities.

As discussed in the visitor facilities EA (Service 2007), construction and rehabilitation activities would result in temporary disturbance to fish and wildlife at Corn Creek Field Station. Construction of the visitor facilities would result in a minor loss of habitat and could affect desert tortoise. Habitat rehabilitation would improve habitat for native species, including native fish and avian species, such as the eared grebe, western grebe, snowy egret, Arizona Bell's vireo, southwestern willow flycatcher, and western yellow-billed cuckoo.

Mitigation

Mitigation measures that could reduce wildlife impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section 7 consultation process, as appropriate.

Standard construction measures would be implemented to minimize impacts on native wildlife, such as avoiding unnecessary disturbance to habitats by driving on existing roads and working only in the required area, minimizing direct disturbance to streams and open water sources, and throwing away all trash and other construction debris in approved disposal areas. Construction activities, restoration, and prescribed burns would be implemented during the non-breeding/nesting season for resident and migratory birds to the extent feasible. Disturbance during the breeding/nesting season would require pre-construction surveys in suitable habitats to locate active nests and establish barriers around the nest site until a qualified biologist determines the nest site is abandoned.

Prior to construction activities in desert scrub habitat, desert tortoise and Gila monster surveys would be conducted to determine the presence/absence of these species. If present, appropriate measures would be implemented to minimize adverse impacts, such as relocating tortoises or Gila monsters away from the construction area, using tortoise fencing, and monitoring by a qualified biologist to remove tortoises and Gila monsters during construction.

Prescribed burns would be implemented during portions of the year when the bighorn sheep are not present in or near the affected area. If burns must be conducted in an area where bighorn sheep are present, appropriate measures would be implemented to keep sheep out of the burned area.

5.3.3 Cultural Resources

Impacts

Under Alternatives B, C, and D, known and unknown cultural deposits may be adversely affected by ground disturbance activities associated with construction or modification of visitor use facilities, roads, water catchments, and boundary fences. Additional impacts may occur under Alternative B during establishment of the auto tour route. Prescribed burns around water developments under Alternatives C and D also have the potential to expose and affect cultural resources. Due to the presence of important cultural resources on the Refuge, including a variety of resources located in the Sheep Range Archaeological District, impacts associated with the action alternatives have the potential to be significant if known or unknown resources are destroyed or damaged. These impacts will be analyzed further in project-specific NEPA documents to be prepared for the activities.

Cultural resources are currently being affected by vandalism and degradation. Actions under Alternative A have minimal effects on reducing these impacts, and eligible cultural resource sites could be damaged, destroyed, or otherwise significantly affected. Alternatives B, C, and D involve constructing fences, signs, and other barriers and expanding law enforcement patrols on the Refuge, which would provide increased protection for cultural resources. Impacts to cultural resources would still have the potential to be significant under the action alternatives if eligible sites lose their integrity through destruction, damage, or removal. These impacts will be analyzed further in project-specific NEPA documents to be prepared for Refuge activities.

Because other aspects of the environment are important to tribes and can be considered cultural resources, adverse impacts to other resources could also be considered impacts to cultural resources. These impacts are not specifically discussed as cultural resource impacts; however, they may be of concern to culturally affiliated tribes if the resources are important to them. Examples include native plants that may be collected and used for various purposes, water resources, or geologic features.

As discussed in the visitor facilities EA (Service 2007), construction and rehabilitation activities would affect portions of the Corn Creek National Register District. The carpenter's shop, a contributing element of the district, would be removed, and other resources could be adversely affected by trail construction and operation. In addition, buried cultural resources are likely present at Corn Creek Field Station and could be affected by construction of the visitor center, restoration activities, and removal of the two lower ponds.

Mitigation

Mitigation measures that could reduce cultural resource impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section 106 consultation process, as appropriate.

In order to prevent significant adverse impacts to cultural resources during construction or ground-disturbing activities, professional archaeologists would survey the project areas for cultural resources information and locations prior to project implementation. Staff members would use their knowledge of site locations to construct facilities to avoid eligible resources. All ground disturbance activities would be monitored by an archaeologist and a tribal monitor in areas where known cultural resources are located and in areas with high potential for buried cultural deposits. If cultural resources are inadvertently exposed during activities, activities would immediately cease and a qualified archaeologist would be consulted to implement appropriate measures for mitigation or preservation. If eligible sites or portions thereof cannot be protected and would be adversely affected, other mitigation or data recovery methods would be conducted in consultation with the Nevada State Historic Preservation Office.

5.3.4 Public Access and Recreation

Public Access

Impacts

Construction activities under the action alternatives would result in incidental traffic over a short-term period that would result in a relatively small increase in traffic in the immediate vicinity of the Refuge. Some congestion on roadways and longer stop times at intersections would be expected during the construction period. Impacts to public access during construction could be significant depending on the locations and extent of activities implemented at one time. With the small number of visitors on the Refuge at one time, most activities would have minimal effects on traffic. Visitors would continue to have access to other areas of the Refuge during construction activities. Project-specific NEPA documents will include further analysis of public access impacts of Refuge actions.

The public would continue to have minimally restricted access to the Refuge under Alternative A, with the exception of the western half of the Refuge, which is part of the Nevada Test and Training Range (NTTR) and is closed to the public. Visitors would be allowed to access the eastern portion of the Refuge at any time and using any routes. The southern and eastern boundaries are being monitored by law enforcement patrols, but the generally unrestricted access impairs the ability of the Service to properly manage and protect resources on the Refuge.

Additional measures under Alternatives B, C, and D would control access on and to the Refuge. Boundary fences under each action alternative would guide public access to designated roads and prevent unauthorized off-road vehicle access. Road improvements to Mormon Well and Alamo Roads (not under Alternative D) and parking turnouts along Alamo, Mormon Well, and Gass Peak Roads would improve the public's ability to access remote areas of the Refuge while following designated routes. An auto tour route under Alternative B would also improve public access on the Refuge and would allow visitors from the Las Vegas area to easily access remote areas for recreational purposes.

Access control measures would improve Refuge management by protecting resources on the Refuge and preventing or minimizing significant impacts to sensitive resources, which would improve the quality of the visitor's experience.

Access to recreational opportunities would also be improved through increased information on trails, roads, and the Refuge. Additional signs and a kiosk at the Mormon Well Road entrance under Alternatives B, C, and D would enhance public access by directing visitors to the Refuge and providing them with information on trails and accessible roads on the Refuge. Trail guides would also be available for visitors to direct them to specific areas for recreation (Alternatives B and C).

The various visitor use projects under Alternatives B, C, and D would improve visitor services and could attract more visitors to the Refuge. An increase in visitors and construction-related activity would result in increased traffic on the Refuge and on the access roads. Traffic impacts would be more noticeable on peak days, primarily weekends, when vehicle trips to the Refuge are highest. The increase in visitors and some additional construction-related traffic would have a minor impact due to the relatively low number of visitors at one time and low amount of traffic currently on the Refuge.

As discussed in the visitor facilities EA (Service 2007), construction and rehabilitation activities would temporarily restrict public access to portions of the Corn Creek Field Station. The new visitor facilities would improve visitor services and could attract more visitors to the Refuge.

Mitigation

Mitigation measures that could reduce public access impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Areas under construction or being restored would be temporarily off-limits to the public for their safety. These areas would be adequately marked, and detours or alternative routes would be identified. Refuge staff would schedule construction for slower times of visitation during the week and slower seasons, when feasible, to minimize the impacts of construction traffic on public access.

Recreation

Impacts

Under Alternative A, current activities would continue. The Corn Creek Field Station is open on a limited basis. Camping, picnicking, and hiking, along with wildlife observation and hunting in designated areas, are the most popular recreational activities on the Refuge.

Wildlife viewing trails would be evaluated and developed in the Gass Peak and Sheep Range in Alternative B. Wildlife observation and photography would be enhanced in Alternatives B, C, and D with construction of photography blinds. An auto tour route on Gass Peak

Road is proposed in Alternative B. These facilities would enhance visitor experiences and benefit recreational opportunities, with the most improvements occurring under Alternative B and fewer improvements under Alternatives C and D. Areas under construction would be temporarily off-limits to visitors for public safety; however, other areas of the Refuge would continue to be open to the public during that time. Depending on the locations and extent of activities implemented at one time, impacts to recreational opportunities could be significant. With the small number of visitors on the Refuge at one time, most activities would have minimal effects on recreation. Project-specific NEPA documents will include further analysis of recreational impacts of Refuge actions.

Under Alternative A, the Refuge would continue its limited participation in community events and other forms of environmental education. Volunteers are currently used to provide interpretation and guidance to visitors at the field station, and signs are replaced and updated, as needed. Participation in community events is limited to two per year.

An expanded environmental education program would be implemented in Alternatives B, C, and D, including installation of interpretive panels and signs at entrances, increased participation in community events, an annual open house, and a display at a public venue in Las Vegas. An expanded emphasis on educational activities and outreach to local groups and other constituencies and displays on and off the Refuge would benefit environmental education under Alternatives B, C, and D.

As discussed in the visitor facilities EA (Service 2007), the new visitor facilities would improve recreational opportunities on the Refuge, specifically at Corn Creek Field Station, and would provide visitors with a central location to learn more about the Refuge and its resources.

Mitigation

Mitigation measures that could reduce recreation impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Areas under construction or being restored would be temporarily off-limits to the public for their safety. These areas would be adequately marked, and information on other recreational areas would be provided to the public. Refuge staff would schedule construction for slower times of visitation during the week and slower seasons, when feasible, to minimize the impacts of construction traffic on public access.

5.3.5 Social and Economic Conditions

Refuge Management and Local Economics

Impacts

Under Alternative A, the annual Refuge budget, which includes operations, capital projects, six full-time staff members, and one vacant part-time seasonal employee position, would expect to remain comparable to current limited funding and staffing levels. The continued level of restoration and management activities, recreation, and visitor services would be available.

New visitor facilities, road improvements, and other physical improvements under the action alternatives would require the use of private contractors, which would have a minor beneficial effect in terms of providing short-term jobs. Additional activities related to outreach and environmental education would require increased Refuge expenditures to meet those needs. These actions would require increases in the Refuge management and operations budget. Implementation of a recreation-fee program under Alternatives B, C, and D could help offset the costs of facility maintenance and improvements and improve the Refuge operations budget.

Alternatives B, C, and D would expand bighorn sheep habitat management, population management, and public use of the Refuge. These actions would result in increased staffing at the Refuge in order to accommodate visitor needs. Additional staff and salaries would have a beneficial effect by adding employment and income to the local economy.

An increase in the number of visitors to the Refuge would increase retail trade, lodging, and food service for the nearby local economy. Additional indirect employment as a result of the increased activity would also be expected.

As discussed in the visitor facilities EA (Service 2007), construction of the new visitor facilities and habitat rehabilitation would not require funding from the Refuge budget (they would be funded through the Southern Nevada Public Lands Management Act). The activities would generate short-term employment opportunities for construction.

Mitigation

Impacts to refuge management economics would not be significant, so specific mitigation measures are not necessary.

Environmental Justice

Impacts

There would be no adverse impacts to minority or low-income populations as a result of the continuing operations of the Refuge under Alternative A.

Development of cultural resources interpretive and environmental education materials in coordination with affiliated Native American tribes under Alternatives B, C, and D would address topics that would be of interest to the Native American population.

Mitigation

Impacts related to environmental justice would not be significant, so specific mitigation measures are not necessary.

Land Use

Impacts

With the Refuge continuing to operate at the current level under Alternative A, potential land use conflicts to existing or planned uses in the proximity of the Refuge are not anticipated. Growth continues to move toward the Refuge boundaries from the south, which is increasing unauthorized off-road vehicle use on the Refuge and creates concerns regarding further unrestricted access to the Refuge from the southern boundary, as discussed under the Public Access section.

Alternatives C and D would result in the de-designation of Papoose Lake Research Natural Area (RNA). The impact of this action would be minimal because this RNA is inaccessible and has never been used for research, Under each alternative, the Service would continue to manage the 1.3 million acres of proposed wilderness to protect its wilderness values. The proposed wilderness status would remain unchanged until Congress acts on the proposal.

Under Alternatives B, C, and D, the Refuge would coordinate with local jurisdictions to ensure that development adjacent to the Refuge is compatible with refuge land uses. Given the potential growth that may occur adjacent to the Refuge in the future, this coordination may have a beneficial effect on land uses both on and adjacent to the Refuge by protecting resources on the Refuge and controlling access. Construction of boundary fences would provide some protection against residential or urban uses along the southern boundary.

Mitigation

Impacts related to land use would not be significant, so specific mitigation measures are not necessary.

Aesthetics

Impacts

New visitor facilities to accommodate increased visitor use under each of the alternatives would have a temporary impact during construction and a long-term impact on the natural features and vegetation around the affected area, depending upon the siting of the facilities and integration into the Refuge's natural setting. Because these facilities would be small (e.g., information kiosk, signs, trails), impacts to visual character would be minimal and would not adversely affect views of the Refuge.

Habitat protection activities under each alternative, such as litter removal and general control of public access, would benefit the visual character of the Refuge for visitors by creating a more natural, native setting on the Refuge.

As discussed in the visitor facilities EA (Service 2007), temporary construction activities would have a short-term adverse effect on the visual setting of Corn Creek Field Station. Long-term visual resources would be improved through habitat rehabilitation; however, the new visitor center would create a permanent change in the visual setting of Corn Creek. The building would blend into the surrounding environment through use of earthen materials for construction, and vegetation would be used to mask views from sensitive locations, such as cultural resource sites.

Mitigation

Impacts related to aesthetics would not be significant, so specific mitigation measures are not necessary.

5.3.6 Summary of Effects

Table 5.3-1 summarizes the potential effects for each of the four alternatives. Alternative A continues current management practices with little changes or improvements.

Compared with Alternative A, Alternative B would accommodate an increase in visitors and enhance visitor experience with some beneficial effects on wildlife habitat. Alternative B would, however, result in short-term, mitigable adverse impacts from restoration projects and facility and road construction.

Compared with Alternative B, Alternative C would provide greater biological benefits and fewer visitor benefits, but result in greater short-term mitigable adverse construction impacts.

Compared with Alternative C, Alternative D would provide greater biological benefits with fewer benefits to visitors, but result in greater short-term mitigable adverse construction impacts.

Impacts and mitigation measures of bighorn sheep management, visitor facility construction and improvement, and other actions noted throughout this section will be further analyzed and refined in project-specific NEPA documents to be prepared for each action. The Service will use the analysis presented in this EIS to focus on key issues that need to be further evaluated in second-tier NEPA documents.

Table 5.3-1. Desert NWR: Summary of Environmental Consequences

Resource Issue or Concern	*Alternative A (No Action)*	*Alternative B*	*Alternative C (Preferred Alternative)*	*Alternative D*
Physical Environment				
Soil Conditions	EC[4]: Minimal temporary disturbance	ML: Some temporary disturbance during facility construction	ML: Temporary disturbance during facility construction and burns	ML: Temporary disturbance during facility construction and burns
Water Quality	EC: No effects	ML: Temporary downstream water quality impacts during construction	ML: Temporary downstream water quality impacts during construction and burns	ML: Temporary downstream water quality impacts during construction and burns
Air Quality	EC: Minor emissions and dust; smoke from wildfires	SL: Some emissions and dust from temporary construction activities and increased traffic; smoke from wildfires	ML: Some emissions and dust from temporary construction activities and increased traffic; increased smoke from burns	ML: Some emissions and dust from temporary construction activities and increased traffic; increased smoke from burns
Biological Resources				
Upland Habitat	EC: Minimal disturbance	SL: Some temporary disturbance from construction	SL: Some temporary disturbance from construction	SL: Some temporary disturbance from construction
Common Wildlife Species and Management Priority Birds	EC: Minimal disturbance	SL: Some temporary disturbance from construction	SL: Some temporary disturbance from construction	SL: Some temporary disturbance from construction
Desert Tortoise and Gila Monster	EC: Some protection and reduction of potential for take	SH: Improved protection over the long term but potential for temporary disturbance during actions in upland habitat	MH: Improved protection over the long term but potential for temporary disturbance during actions in upland habitat	MH: Improved protection over the long term but potential for temporary disturbance during actions in upland habitat
Pinyon Jay and Gray Vireo	EC: Minimal disturbance	SL: Some disturbance	SH: Temporary disturbance; some benefits from burns	SH: Temporary disturbance; some benefits from burns
Gilbert's Skink	EC: Minimal disturbance	SL: Some disturbance	SH: Temporary disturbance; some benefits from burns	SH: Temporary disturbance; some benefits from burns
Desert Bighorn Sheep	EC: Existing conditions	SH: Improved foraging habitat; increased subpopulations	MH: Improved foraging habitat; improved management; increased subpopulations	CH: Improved foraging habitat; improved management; increased subpopulations

[4] EC = existing conditions; SH = slightly higher or improved than existing conditions; MH = moderately higher or improved than existing conditions; CH = considerably higher or improved than existing conditions; SL = slightly lower or decreased than existing conditions; ML = moderately lower or decreased than existing conditions; CL = considerably lower than existing conditions.

Table 5.3-1. Desert NWR: Summary of Environmental Consequences

Resource Issue or Concern	*Alternative A (No Action)*	*Alternative B*	*Alternative C (Preferred Alternative)*	*Alternative D*
Cultural Resources				
Cultural Resources	EC: Some protection of resources; some impacts	SL: Increased protection of resources but potential for impacts during construction	SL: Increased protection of resources but potential for impacts during construction	SL: Increased protection of resources but potential for impacts during construction
Public Access				
Access	EC[5]: Generally unrestricted	SL: Some restrictions but roads and recreation facilities would improve access	ML: More restrictions but roads and recreation facilities would improve access	ML: More restrictions but roads and recreation facilities would improve access
Traffic	EC: Some traffic	SL: Increase in visitors would increase traffic on and to the Refuge	SL: Increase in visitors would increase traffic on and to the Refuge	SL: Increase in visitors would increase traffic on and to the Refuge
Recreation				
Visitor Use Facilities	EC: Some facilities available	MH: More facilities constructed	SH: More facilities constructed	SH: More facilities constructed
Recreational Opportunities	EC: Variety of opportunities available	MH: Improved opportunities and services over the long term; some temporary impacts	SH: Improved opportunities and services over the long term; some temporary impacts	SH: Improved opportunities and services over the long term; some temporary impacts
Outreach	EC: Limited outreach	SH: Increased outreach	SH: Increased outreach	SH: Increased outreach
Refuge Management and Local Economics				
Refuge Budget and Staffing	EC: Current budget and staffing	SH: Increased budget and staff to implement actions	MH: Increased budget and staff to implement actions	MH: Increased budget and staff to implement actions
Local Economy	EC: Current economy	SH: Increase in local economy from increased visitors	SH: Increase in local economy from increased visitors	SH: Increase in local economy from increased visitors
Land Use				
Wilderness Recommendation	EC: 1.3 million acres proposed	EC: 1.3 million acres proposed	EC: 1.3 million acres proposed	EC: 1.3 million acres proposed
RNAs	EC: No management	MH: Improve RNA use	SH: Improve RNA use but de-designate one RNA	SH: Improve RNA use but de-designate one RNA
Aesthetics				
Visitor Use Facilities	EC: Current views	SL: Minor impacts on visual quality	SL: Minor impacts on visual quality	SL: Minor impacts on visual quality
Habitat Protection	EC: Minimal protection	SH: Increased protection	SH: Increased protection	SH: Increased protection

[5] EC = existing conditions; SH = slightly higher or improved than existing conditions; MH = moderately higher or improved than existing conditions; CH = considerably higher or improved than existing conditions; SL = slightly lower or decreased than existing conditions; ML = moderately lower or decreased than existing conditions; CL = considerably lower than existing conditions.

5.4 Moapa Valley National Wildlife Refuge

This section describes the potential impacts associated with each of the action alternatives for the Moapa Valley NWR. Impacts are judged for significance using the thresholds described in the introduction of this chapter. Mitigation measures are included for resources with significant impacts.

Each of the action alternatives involves monitoring and inventory actions that would not result in adverse environmental impacts. These management actions would provide the Refuge staff with an improved knowledge of the Refuge, which would later allow them to better assess the effects of their actions. These actions are not further evaluated in this section.

5.4.1 Physical Environment

Soils

Impacts

Construction of visitor facilities (e.g., trails, parking areas, shade structures, restrooms) under Alternatives B and C would expose soils to erosion during construction and result in a minor loss of topsoil. These activities would disturb small amounts of soil, and impacts would be limited to the facility site. Erosion would be minimal in upland areas, but would be more noticeable along streams or in riparian areas. Most of the facilities would be constructed in upland areas, and the amount of disturbance would be small. For activities near streams and riparian areas, erosion impacts will be analyzed further in project-specific NEPA documents to be prepared for the facilities.

Habitat restoration activities would result in minor disturbance to topsoil on the Refuge. Most of the springheads, channels, and associated riparian habitat on the Refuge would be restored under Alternative C (approximately 10 acres in the Plummer, Pedersen, and Apcar Units), and about half that area would be restored under Alternative B (Plummer and Pedersen Units). Alternative A would continue restoration activities on the Plummer Unit (less than 3.5 acres). Removal of palm trees and other invasive plants could also require removal of the topsoil to remove the seedbank. Topsoil impacts would be most intense under Alternative C and less intense under Alternative B due to the size of the affected area. In addition, removal of vegetation along the streams during restoration activities under each alternative and prescribed burns under Alternatives B and C would temporarily expose the soils to wind and water erosion until native plants establish. Although small areas of the Refuge would be affected by restoration, soils would be exposed to erosion, and impacts could be significant. These impacts will be analyzed further in project-specific NEPA documents to be prepared for the restoration activities. The establishment of native vegetation would stabilize soils along the banks of surface waters, improving vegetative diversity and wildlife habitat.

Mitigation

Mitigation measures that could reduce soil impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Native vegetation would be planted in areas where nonnative vegetation is removed and soils are exposed to improve soil conditions and stabilize soils. Appropriate BMPs would be implemented during restoration and construction activities to minimize indirect effects of soil disturbance, including dust, erosion, and sedimentation. These measures would include pre-watering and maintaining surface soils in stabilized conditions where support equipment and vehicles will operate; applying water or dust palliative during clearing and grubbing or earth-moving activity to keep soils moist throughout the process; watering disturbed soils immediately following clearing and grubbing activities; and stabilizing sloping surfaces using soil binders until vegetation or desert pavement (ground cover) can effectively stabilize the slope.

Water Resources

Impacts

Habitat restoration activities under each of the alternatives could increase turbidity in some or all of the streams on the Refuge and have a temporary adverse effect on surface water quality. Alternative A activities would be limited to surface water on the Plummer Unit and downstream, and Alternative B activities would be expanded to surface waters on the Plummer and Pedersen Units and downstream. Alternative C activities would encompass all streams on the Refuge and downstream of the Refuge. Turbidity of affected surface waters could increase as vegetation is removed along the streams, and soils are discharged into the water. Soils along the banks may also erode and reach surface waters prior to establishment of new vegetation. In addition, ash and other sediment could be discharged into surface waters during prescribed burns under Alternatives B and C. These impacts will be analyzed further in project-specific NEPA documents to be prepared for the restoration activities.

Establishment of native plants along the banks would benefit streams on the Refuge by stabilizing stream banks and reducing the quantity of water needed for plant growth. Native species that are adapted to the desert environment require less water than invasive plants, such as palm trees.

Mitigation

Mitigation measures that could reduce water quality impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Implementation of BMPs during ground-disturbing activities would reduce the effects of erosion, siltation, and sedimentation on water quality of the Refuge waters. These measures would include constructing small sediment collection pools downstream of work areas to trap sediment and reduce sediment movement through the aquatic system; using turbidity barriers in areas where sediment collection pools cannot be used; directing flows where feasible around the work area and temporarily detaining flows to reduce potential entrainment of sediment; and limiting the size of the area of disturbance where flows cannot be directed around the work area or detained, so that minimal sediment is added to stream flows.

Air Quality

Impacts

Habitat restoration activities under each of the alternatives would require the use of construction equipment to remove trees and plant new trees. Construction activities for visitor facilities under Alternatives B and C would also require construction equipment that would disturb the ground and clear vegetation. This equipment would cause short-term, minor emissions (engine exhaust and fugitive dust) that may be noticeable on the Refuge. In addition, smoke would be visible from prescribed burns under Alternatives B and C and could adversely affect air quality. Depending on the extent of activities, an increase in emissions and smoke could violate ambient air quality standards and could be significant. These impacts will be analyzed further in project-specific NEPA documents to be prepared for the restoration activities and facilities.

Increased traffic on the Refuge under Alternatives B and C would result in a minor increase in traffic-related emissions. These emissions would not result in violations of the ambient air quality standards because the amount of Refuge traffic at one time is expected to be small, and traffic would be limited to the main roads and parking areas. Therefore, traffic-related impacts to ambient air quality would not be significant.

Ground-disturbance, construction, and fire management (particularly fuels reduction) activities under any of the alternatives would result in direct emission of greenhouse gases (GHG) (temporary emissions) from construction equipment. Fire management would help prevent catastrophic wildfire over the long term and reduce long-term GHG emissions. Indirect, long-term emissions of GHG would occur due to increased visitation by the public and increased employee vehicle trips (as staff grows). An increase in GHG emissions would contribute to regional impacts on climate change and could result in significant impacts. Climate change impacts will be further analyzed in project-specific NEPA documents, as appropriate.

Mitigation

Mitigation measures that could reduce air quality impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

BMPs would be implemented during construction activities that disturb the soil to reduce particulate emissions. These measures would include the BMPs identified for mitigating soil and water resources impacts as well as the following: maintaining effective cover over stockpiled fill or debris materials; limiting vehicle speeds to 15 mph in staging areas and on all unpaved access routes; and cleaning mud, silt, and soil tracked out onto paved surfaces immediately. In addition, use of low or zero-emission construction vehicles and limiting idling time for construction vehicles could reduce GHG emissions during construction.

5.4.2 Biological Resources

Vegetation

Impacts

Construction of visitor use facilities under Alternatives B and C would result in a loss of some vegetation within the proposed footprint of the facilities and an increase in the potential for invasive plants. Most of the facilities would likely be constructed in previously disturbed areas along existing roads. These actions would require ground disturbance, which would create suitable conditions for the reestablishment of invasive plants; however, measures would be implemented to minimize invasive plant establishment. Impacts to vegetation would be less than significant because of the small amount of vegetation that would be affected. Sensitive plant species are not expected to be affected by these activities because none are known to occur on the Refuge.

As part of restoration under each alternative, invasive plants would be removed along streams, and native plants or seeds would be planted in their place. Temporary disturbance during restoration would create desirable conditions for invasive and nonnative plants because these plants prefer disturbed, moist areas and often invade these areas immediately following ground disturbance activities. These species reduce the quality of native habitats and adversely affect native species by creating uniform stands that prevent other species from establishing. Under Alternative A, habitat in the Plummer Unit would be exposed to disturbance; under Alternative B, habitats in the Plummer and Pedersen Units would be exposed; and under Alternative C, habitats in all three Refuge units would be exposed. Implementation of an IPM Plan under the action alternatives would also reduce the potential for invasive plants to spread and become established in disturbed areas of the Refuge. Once the native species become established in the disturbed areas, the potential for invasive species would be lower. Temporary impacts will be analyzed further in project-specific NEPA documents to be prepared for the restoration activities.

Immediately following restoration activities, the riparian community would experience a temporary loss of overstory vegetation as palm trees and other invasive plants are removed. Restoration would occur in phases and would be limited to small portions of the Refuge at one time to maintain some habitat. Native plants would be planted in the disturbed areas to provide interim habitat for wildlife species until the

entire community is restored. These plantings would also encourage native plant establishment by improving the soil conditions and ensuring the availability of water and nutrients for new plant growth. Palm trees require more water and nutrients than native species, and they accumulate salt at their bases, which creates undesirable habitat conditions for native plants. Their removal would benefit native plants, as well as native fish and wildlife, by reducing unsuitable conditions and creating more desirable habitat conditions for the native species, which would increase native, desirable habitat over the long term. Temporary impacts associated with interim habitat loss will be analyzed further in project-specific NEPA documents to be prepared for restoration activities.

Habitat restoration and protection actions under each of the alternatives would benefit riparian habitat throughout the Refuge by restoring native vegetation and protecting sensitive areas. Habitat restoration actions would affect the smallest area (less than 3.5 acres) under Alternative A. Alternatives B and C would affect about 5 and 10 acres, respectively.

Fire management actions under each of the alternatives would benefit the habitats and infrastructure on the Refuge by reducing the risk of catastrophic fire, which could destroy habitats and adversely affect streams and wildlife. This risk would be lowest under Alternatives B and C, which involve the most fire management actions. These actions involve removal of palm trees and their fronds and thinning out of undergrowth.

Mitigation

Mitigation measures that could reduce vegetation (specifically sensitive plants) impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section 7 consultation process, as appropriate.

Invasive plant removal efforts would be implemented on a regular basis to prevent invasive species from establishing in the future. These measures would be identified in an IPM Plan and may include spraying herbicides; laying topsoil with native seedbed; mechanical removal of young invasive plants; or controlled, prescribed burns in areas where invasive plants begin to grow. Because of the presence of invasive plant seeds in the topsoil, topsoil with a native seedbed could be used to replace the existing topsoil in the restored areas. This topsoil could be obtained from off-site areas where construction activities are proposed that would require removal of topsoil (e.g., detention basins, residential development). This effort would be coordinated with local agencies and/or the U.S. Bureau of Land Management (BLM).

Standard construction practices would be implemented to prevent invasive species from establishing in the disturbed areas around the facilities, such as cleaning vehicles and equipment used on the Refuge with high-pressure sprayers to dislodge seeds prior to accessing the area. Facilities would be designed to avoid sensitive habitats and

impact the least amount of vegetation (based on pre-construction surveys and mapping).

Wildlife

Impacts

Individuals of some wildlife species may be adversely affected by restoration activities under each of the alternatives and by construction of visitor use facilities and prescribed burns under Alternatives B and C. Amphibians, reptiles, birds, mammals, and invertebrates that use the riparian community and the streams have the potential to be directly affected during vegetation removal activities. These species would be forced to temporarily relocate, likely to nearby suitable habitat, until new habitat establishes along the streams. Some species may return once suitable habitat becomes established in the restored areas, but palm tree–dependent species, such as the western yellow bat, may not return to restored areas of the Refuge under Alternative C due to removal of a large number of palm trees. These impacts will be analyzed further in project-specific NEPA documents to be prepared for restoration activities, facilities, and fire management.

Activities in upland habitats, such as visitor facility construction under Alternatives B and C, could temporarily disturb or harm individual desert tortoises or Gila monsters, if present. These activities would be adverse; however, the Service would implement measures to avoid direct impacts to these species. Protective measures such as habitat restoration, invasive plant management, and controlling public access under the action alternatives would benefit these species. These impacts and measures will be analyzed further in project-specific NEPA documents to be prepared for facilities.

For common wildlife species, the impact would not be significant because a minor portion of the population would be affected in comparison to the regional population. For sensitive species with low population densities in southern Nevada, such as Moapa dace, these impacts could be significant because the proportion of species affected on the Refuge compared to their regional populations would be higher.

Habitat restoration actions under each alternative would benefit most fish and wildlife species. Alternative A would provide minor benefits on a small portion of the Refuge, and Alternative B would provide moderate benefits. Alternative C would provide the most benefits because the largest amount of native habitat would be restored, and restoration would target a larger number of sensitive species (including fish and invertebrates). Establishment of riparian vegetation along the streams would provide suitable habitat for a variety of bird and mammal species, including resident and migratory birds, and could attract new species to the Refuge, such as the yellow-billed cuckoo and southwestern willow flycatcher. Several riparian-dependent bird species that are also conservation priorities within the Service, Nevada Department of Wildlife, and Partners in Flight, such as eared grebe, western grebe, snowy egret, and Arizona Bell's vireo, would likely experience an increase in suitable nesting sites and increase in abundance on and near the Refuge.

Native fish species would benefit from improved stream habitat, which could increase invertebrates and provide more suitable spawning habitat. Improved stream and riparian habitats may also benefit amphibians by increasing the amount of available habitat and providing suitable conditions for reproduction. Spring and channel restoration would also benefit eared grebe.

Although the southwestern willow flycatcher and yellow-billed cuckoo are not currently known to occur on the Refuge, improved habitat conditions may benefit these species by providing suitable habitat for breeding, foraging, or nesting because they have been detected in areas near the Refuge. Because the flycatcher is endangered, and the cuckoo is a candidate species for listing, the availability of suitable habitat on the Refuge could potentially aid in their recovery.

The western yellow bat, which is a palm-obligate species, would be adversely affected by the removal of palm trees on the Refuge. Individuals may be harmed during palm tree removal, and habitat on the Refuge would be decreased. Additional suitable habitat is available on lands adjacent to the Refuge and along the Muddy River corridor, so the species would likely be able to relocate. The population of the yellow bat on the Refuge would experience a decline as individuals are harmed or relocate to suitable habitat off the Refuge. These actions are not expected to significantly affect the yellow bat's regional population, although they would affect the local population on the Refuge. More of the local population would be affected under Alternatives B and C than Alternative A due to the amounts of riparian habitat restored. These impacts will be analyzed further in project-specific NEPA documents to be prepared for restoration activities.

The Moapa dace population on the Refuge would substantially benefit from improved riparian and stream habitat conditions and removal of nonnative fish from the streams on the Refuge. These actions would improve the aquatic habitat and could potentially increase the reproductive success of the dace, as well as other native fish, on the Refuge. Alternative C actions would benefit this species the most.

In addition, expansion of the Refuge boundary under Alternative C would increase Service-managed habitat for wildlife species. Similar types of habitat present on the Refuge would be managed by the Service under step-down habitat management plans. Future management actions would likely benefit native plants and wildlife over the long term, with temporary adverse impacts from disturbance. Specifically, management priority bird species, such as eared grebe, western grebe, Franklin's gull, black tern, snowy egret, Bendire's thrasher, Arizona Bell's vireo, southwestern willow flycatcher, western yellow-billed cuckoo, and canvasback, would benefit from the Refuge expansion. Subsequent plans and actions would be evaluated in separate NEPA documents.

Mitigation

Mitigation measures that could reduce wildlife impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section 7 consultation process, as appropriate.

Standard construction measures would be implemented to minimize impacts on native wildlife, such as avoiding unnecessary disturbance to habitats by driving on existing roads and working only in the required area, minimizing direct disturbance to streams and open water sources, and throwing away all trash and other construction debris in approved disposal areas. Construction activities and restoration would be implemented during the non-breeding/nesting season and outside of the spawning period for fish to the extent feasible. Disturbance during the breeding/nesting season would require pre-construction surveys to locate active nests and establish barriers around the nest site until a qualified biologist determines the nest site is abandoned. Activities in or near waterways should be avoided during the spawning period to minimize impacts on sensitive fish. The Service would also avoid discharging sediment during the spring spawning period for Moapa dace. Bats would be flushed from palm trees prior to removal to minimize harm of individuals. Pre-construction surveys for sensitive reptiles and other species would be conducted prior to activities in uplands to avoid direct impacts to the species.

5.4.3 Cultural Resources

Impacts

Although no significant cultural resources have yet been identified on the Refuge, ground disturbance activities associated with habitat restoration have the potential to disturb unknown cultural artifacts and sites that may be buried. Impacts to cultural resources would be significant under the action alternatives if eligible sites or resources lose their integrity through destruction, damage, or removal. These impacts will be analyzed further in project-specific NEPA documents to be prepared for Refuge actions.

Because other aspects of the environment are important to tribes and can be considered cultural resources, adverse impacts to other resources could also be considered impacts to cultural resources. These impacts are not specifically discussed as cultural resource impacts; however, they may be of concern to culturally affiliated tribes if the resources are important to them. Examples include native plants that may be collected and used for various purposes, water resources, or geologic features.

Mitigation

Mitigation measures that could reduce cultural resource impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section 106 consultation process, as appropriate.

Pre-construction archaeological surveys of the restoration areas would allow Refuge archaeologists to identify significant cultural resources and mitigate potential impacts. If cultural resources are inadvertently exposed during activities, activities would immediately cease and a qualified archaeologist would be consulted to implement appropriate measures for mitigation or preservation. As appropriate, monitoring would occur by a qualified archaeologist and tribal monitor.

5.4.4 Public Access and Recreation

Public Access

Impacts

Construction of visitor use facilities under Alternatives B and C would not likely affect public access on or to the Refuge. Those facilities would be constructed prior to opening the Refuge to the public in order to provide future visitors with information on the Refuge.

Public access on the Refuge would continue to be restricted under Alternative A, with the Refuge closed to the general public.

Opening the Refuge to the public on weekends and school groups during the week in Alternative B and on a daily basis in Alternative C would benefit public access to the Refuge. Proposed directional signs on Interstate 15 (I-15), U.S. Highway 93, and on Warm Springs Road under Alternatives B and C would also benefit public access by increasing awareness of the Refuge to travelers and providing improved directions for those visiting the Refuge.

Visitor service opportunities on the Refuge would improve under Alternatives B and C and would increase visitation to the Refuge, resulting in a minor increase in traffic on U.S. Highway 93 and State Route (SR) 168 and on the Refuge. Average daily traffic counts on SR 168, the primary major road to the Refuge, were 1,200 per day in 2004 (Nevada Department of Transportation [NDOT] 2004). An increase in traffic would be most noticeable on weekends during peak visitor use. The increase in visits would have a minor impact, due to the relatively low number of visits at one time and small amount of traffic currently using the access roads.

Mitigation

Impacts to public access would not be significant, so specific mitigation measures are not necessary.

Recreation

Impacts

Recreational activities would continue to be restricted under Alternative A, with the Refuge closed to the general public.

Construction of facilities and other actions to support recreational activities under Alternatives B and C would benefit recreational opportunities by providing interpretive and educational signs, brochures, a self-guided trail system, a basic trail, shade structures (Alternative C), restrooms (Alternative C), water lines (Alternative C),

and parking areas. An increase in days and hours of operation would also benefit visitor services and recreational opportunities associated with the Refuge.

Public outreach and environmental education would continue to be very limited under Alternative A, with limited participation in community events and exhibits.

An increase in days and hours of operation under Alternatives B and C would allow the public to experience the Refuge and participate in environmental activities. Development of interpretive and educational materials, expanded emphasis on educational activities and outreach to local groups, and displays on and off the Refuge would occur under Alternatives B and C, resulting in expanded environmental education opportunities.

Mitigation

Impacts to recreation would not be significant, so specific mitigation measures are not necessary.

5.4.5 Social and Economic Conditions

Refuge Management and Local Economics

Impacts

Under Alternative A, the annual Refuge budget, which includes operations and capital projects, would be expected to remain comparable to past funding and staffing levels. There is currently no staff located at the Refuge, so the continued limited level of restoration and management activities would be available primarily through volunteer efforts.

Under Alternatives B and C, new facilities would be constructed, including trails and parking areas, possibly requiring use of private contractors, which would have a beneficial impact in terms of providing short-term jobs. Additional activities related to outreach and environmental education would require increased expenditures by the Refuge to meet those needs. These actions would require increases in the Refuge management and operations budget.

Alternatives B and C would also see expansion of public use, resulting in increased staffing at the Refuge to accommodate visitor needs due to the opening of the Refuge to the public. Additional staff and salaries would have a beneficial impact by adding employment and income to the local economy.

An increase in the number of visits to the Refuge would increase retail trade, lodging, and food service for the nearby local economy. Additional indirect employment as a result of the increased activity would also be expected.

Mitigation

Impacts to refuge management economics would not be significant, so specific mitigation measures are not necessary.

Environmental Justice

Impacts

There would be no adverse impacts to minority or low-income populations as a result of the continuing operations of the Refuge under Alternative A, as the Refuge would remain closed to the general public.

Increased educational and outreach activities under Alternatives B and C would provide benefits to school children and affiliated tribes, including minority and low-income populations in the surrounding Clark County area, such as Moapa and the Moapa River Reservation. Conferring with the Moapa Band of Paiutes to incorporate their history and native plant and animal species as part of the interpretive program in Alternative C would address several topics that would be of interest to the Native American population.

Development of a water resources management plan and expanded monitoring of water quality parameters in Alternatives B and C would provide a benefit to nearby communities and residents of Clark County, including the community of Moapa and the Moapa River Reservation that may be affected by water resources in the area.

Mitigation

Impacts related to environmental justice would not be significant, so specific mitigation measures are not necessary.

Land Use

Impacts

Alternatives A and B would not result in changes to land use on the Refuge. Alternative C would result in the expansion of the Refuge boundary through acquisition of an adjacent 1,500-acre property. Specific management actions for this expansion area would be developed as part of a step-down habitat management plan, which would require subsequent NEPA compliance. This expansion would improve management of the habitats and land adjacent to the Refuge and would not have an adverse effect on land use.

Mitigation

Impacts related to land use would not be significant, so specific mitigation measures are not necessary.

Aesthetics

Impacts

Alternatives B and C include construction of visitor facilities that would have a minor impact on aesthetics for visitors to the Refuge. New parking lots, trails, and structures to accommodate increased visitor use would have a temporary impact on visual quality during construction and a potential long-term impact on the natural features and vegetation viewed from locations on the Refuge, depending upon the siting of the facilities and integration into the Refuge's natural

setting. Temporary impacts would be minimal because the Refuge would not be open to the public during construction activities.

Habitat protection and restoration actions under Alternative A, such as removal of invasive plants, cutting of dead palm fronds, removal of palm trees from riparian areas, and general control of public access would continue to occur. Most of these activities would occur in the Plummer Unit and would benefit views from on and off the Refuge by enhancing the existing riparian community and restoring it to native conditions.

Alternatives B and C would continue the actions in Alternative A on the Pedersen and Apcar Units of the Refuge. Restoration of all of the riparian areas under Alternative C would create a more aesthetically pleasing and natural environment for Refuge visitors when walking along trails, and for the general public as they drive along the highway.

The proposed restoration activities, along with additional trails and visitor facilities, would enhance visitor views of the natural habitat and setting of the area, providing a beneficial effect.

Mitigation

Impacts related to aesthetics would not be significant, so specific mitigation measures are not necessary.

5.4.6 Summary of Effects

Table 5.4-1 summarizes the potential effects for each of the three alternatives. Alternative A continues current management practices with little changes or improvements. Alternative A restoration would disturb and restore less than 3.5 acres of habitats.

Compared with Alternative A, Alternative B would improve Refuge habitats to benefit native and sensitive fish and wildlife species, accommodate an increase in visitors, and enhance visitor experience. Alternative B restoration would disturb and restore approximately 5 acres of habitats. Alternative B would, however, result in short-term, mitigable adverse impacts from restoration projects and facility and road construction.

Compared with Alternative B, Alternative C would provide greater biological and visitor benefits, but result in greater short-term mitigable adverse construction impacts. Alternative C would disturb and restore approximately 10 acres of habitats and expand the Refuge boundary by approximately 1,500 acres to management and protect additional riparian, stream, spring, and associated habitats.

Impacts and mitigation measures of restoration actions, visitor facility construction, and other actions noted throughout this section will be further analyzed and refined in project-specific NEPA documents to be prepared for each action. The Service will use the analysis presented in this EIS to focus on key issues that need to be further evaluated in second-tier NEPA documents.

Table 5.4-1. Moapa Valley NWR: Summary of Environmental Consequences

Resource Issue or Concern	*Alternative A (No Action)*	*Alternative B*	*Alternative C (Preferred Alternative)*
Physical Environment			
Soil Conditions	EC[6]: Some temporary disturbance; improved conditions in some areas over the long term	SH: Minor temporary disturbance; improved conditions in portions of Refuge over the long term	MH: Minor temporary disturbance; improved conditions on Refuge over the long term
Water Quality	EC: Some temporary impacts; improved water quality in some areas over the long term	SH: Minor temporary impacts; improved water quality in portions of Refuge over the long term	MH: Minor temporary impacts; improved water quality on Refuge over the long term
Air Quality	EC: Minimal emissions	SL: Minor emissions from construction activities (temporary) and increased traffic; temporary smoke from burns	SL: Minor emissions from construction activities (temporary) and increased traffic; temporary smoke from burns
Biological Resources			
Riparian/Wetland Habitat	EC: Some improved habitat on Plummer Unit and decreased potential for fire, but increased potential for invasive plants to reestablish and temporary loss of riparian habitat; less than 3.5 acres restored	MH: Improved habitat on Plummer and Pedersen Units and decreased potential for fire, but increased potential for invasive plants to reestablish and temporary loss of riparian habitat; approximately 5 acres restored	CH: Improved habitat on Plummer, Apcar, and Pedersen Units and decreased potential for fire and decreased potential for invasive plants to reestablish, but temporary loss of riparian habitat; approximately 10 acres restored
Upland Habitat	EC: Minimal disturbance	SL: Some disturbance during construction activities	SL: Some disturbance during construction activities
Desert Tortoise and Gila Monster	EC: Minimal protect or disturbance	SH: Improved protection; temporary disturbance	SH: Improved protection; temporary disturbance
Riparian Community Wildlife	EC: Some improved habitat conditions but temporary loss of riparian habitat and potential for adverse impacts during restoration activities	MH: Improved habitat conditions but temporary loss of riparian habitat and potential for adverse impacts during restoration activities	CH: Improved habitat conditions but temporary loss of riparian habitat and potential for adverse impacts during restoration activities
Southwestern Willow Flycatcher and Yellow-billed Cuckoo	EC: Some available habitat on Refuge	SH: Increased availability of habitat on Refuge	MH: Increased availability of habitat on Refuge
Management Priority Birds	EC: Some native habitat on Refuge	MH: Increased native habitat on Refuge	CH: Increased native habitat on Refuge
Western Yellow Bat	EC: Minor loss of palm tree habitat on Refuge	SL: Loss of palm tree habitat on refuge	ML: Loss of palm tree habitat on refuge
Native Aquatic Species	EC: Some improved habitat on refuge	MH: Improved habitat on Refuge	CH: Improved habitat on Refuge
Moapa Dace	EC: Some improved habitat and potentially improved reproductive success; minor temporary disturbance	MH: Improved habitat and potentially improved reproductive success; some temporary disturbance	CH: Improved habitat and potentially improved reproductive success; some temporary disturbance

[6] EC = existing conditions; SH = slightly higher or improved than existing conditions; MH = moderately higher or improved than existing conditions; CH = considerably higher or improved than existing conditions; SL = slightly lower or decreased than existing conditions; ML = moderately lower or decreased than existing conditions; CL = considerably lower than existing conditions.

Table 5.4-1. Moapa Valley NWR: Summary of Environmental Consequences

Resource Issue or Concern	*Alternative A (No Action)*	*Alternative B*	*Alternative C (Preferred Alternative)*
Cultural Resources			
Cultural Resources	EC[7]: Minimal impacts	SL: Potential for impacts during construction and restoration activities	SL: Potential for impacts during construction and restoration activities
Public Access			
Access	EC: Minimal access for volunteers	SH: Increased access	MH: Increased access
Traffic	EC: Minimal traffic	SL: Increase in visitors would increase traffic on and to the Refuge	SL: Increase in visitors would increase traffic on and to the Refuge
Recreation			
Visitor Use Facilities	EC: Minimal facilities available	SH: More facilities constructed	SH: More facilities constructed
Recreational Opportunities	EC: Minimal opportunities	SH: Improved recreation	SH: Improved recreation
Outreach	EC: Limited efforts	SH: Increased outreach	SH: Increased outreach
Refuge Management and Local Economics			
Refuge Budget and Staffing	EC: Current budget and staffing	SH: Increased budget and staff to implement actions	SH: Increased budget and staff to implement actions
Local Economy	EC: Current economy	SH: Increase in local economy from increased visitors	SH: Increase in local economy from increased visitors
Aesthetics			
Restoration Activities	EC: Some improvements to visual quality from restoration activities	MH: Improved visual quality from restoration activities	CH: Improved visual quality from restoration activities
Visitor Use Facilities	EC: Minimal facilities	SL: Minor decreased visual quality from visitor use facilities	SL: Minor decreased visual quality from visitor use facilities

[7] EC = existing conditions; SH = slightly higher or improved than existing conditions; MH = moderately higher or improved than existing conditions; CH = considerably higher or improved than existing conditions; SL = slightly lower or decreased than existing conditions; ML = moderately lower or decreased than existing conditions; CL = considerably lower than existing conditions.

5.5 Pahranagat National Wildlife Refuge

This section describes the potential impacts associated with each of the action alternatives for the Pahranagat NWR. Impacts are judged for significance using the thresholds described in the introduction of this chapter. Mitigation measures are included for resources with significant impacts.

Each of the action alternatives involves monitoring and inventory actions that would not result in adverse environmental impacts. These management actions would provide the Refuge staff with an improved knowledge of the Refuge, which would later allow them to better assess the effects of their actions. These actions are not further evaluated in this section.

None of the action alternatives would involve changes to land use; this topic is not further discussed in this section.

5.5.1 Physical Environment

Soils

Impacts

Alternative A would involve some soil disturbance. No new facilities would be constructed, but restoration activities could disturb soils around open water areas. These efforts would involve primarily removing and controlling invasive and nonnative plants, but may also include modifications to hydrology. Invasive plant control would involve prescribed burns in wet meadow and seasonal marsh habitats that would temporarily expose soils to erosion until vegetation is reestablished. Prescribed fire in wet meadow and chemical and mechanical clearing of plants would also be implemented under each of the action alternatives. These impacts would be minimal because of the small areas affected, and the Service would implement measures to minimize soil erosion.

Construction of visitor use facilities under each of the action alternatives would result in temporary soil disturbance, increased potential for erosion, and minor loss of topsoil. Installation of gauges and data-logging equipment in or near springs under Alternatives C and D would also increase the potential for erosion near affected open water sources. These impacts would not be significant where minor amounts of soil are disturbed and topsoil loss is minimal. Impacts will be analyzed further in project-specific NEPA documents to be prepared for the facilities.

Restoration activities around springs under each of the action alternatives would disturb soils and expose them to wind and water erosion until native vegetation is restored. Under Alternatives C and D, additional restoration activities would be implemented in riparian habitat to remove salt cedar and plant native vegetation. Additional soil disturbance would occur under Alternative D as part of the restoration of the historic stream channel through Black Canyon. Temporary soil disturbance could be significant, depending on the project-specific details of the restoration; therefore, impacts will be analyzed further in

a project-specific NEPA document to be prepared for the restoration activities. Establishment of native vegetation and restoration of the areas would provide long-term protection against erosion. Removal of salt cedar and planting native vegetation would improve soil conditions by stabilizing soils and reducing salt and mineral concentrations.

Mitigation

Mitigation measures that could reduce soil impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Visitor facilities would be sited in previously disturbed areas to the extent feasible. Appropriate BMPs would be implemented during restoration and construction activities to minimize indirect effects of soil disturbance, including dust, erosion, and sedimentation. These measures would include pre-watering and maintaining surface soils in stabilized conditions where support equipment and vehicles will operate; applying water or dust palliative during clearing and grubbing or earth-moving activity to keep soils moist throughout the process; watering disturbed soils immediately following clearing and grubbing activities; and stabilizing sloping surfaces using soil binders until vegetation or desert pavement (ground cover) can effectively stabilize the slope.

Water Resources

Impacts

Vegetation clearing in ditches on the Refuge under each alternative would improve surface flow through the Refuge, but temporary disturbance could affect water quality. Construction of visitor facilities under Alternatives B, C, and D and installation of water monitoring equipment under Alternatives C and D could increase sedimentation in the open water areas and streams on the Refuge and adversely affect water quality. This impact would not be significant because a small amount of soil would be disturbed, and most construction activities would occur in previously disturbed areas away from the reservoirs and streams. Water quality would not substantially change as a result of the minor increase in sedimentation.

Restoration activities around springs and along channels under each alternative could adversely affect surface water quality. Erosion along the banks would increase sedimentation in the surface water. These impacts could be significant, depending on the project-specific details of the restoration; therefore, impacts will be analyzed further in a project-specific NEPA document to be prepared for the restoration activities.

Chemical methods to control invasive plants under Alternatives C and D could affect surface water quality in the reservoirs and streams on the Refuge. Herbicides reaching surface water would increase pollutant concentrations in the water. This impact would not be significant because water levels would be reduced during treatment to reduce the possibility of herbicide concentrations reaching water

systems; in addition, other management methods would be used near open water areas, such as burning or mechanical removal.

Hydrology on the Refuge would be modified under each alternative to improve habitat conditions throughout the Refuge. More open water habitat may be created, and hydrology of some springs would be returned to historic conditions. To supplement existing flows from Upper Pahranagat Lake, groundwater wells on the Refuge would be pumped to increase flows to Middle Marsh. Under Alternative D, more water may be provided to the Refuge (pending acquisition of additional water rights), and the historic stream channel through Black Canyon would be restored. This would expand the amount of open water and recreate historic hydrologic conditions. These actions would increase surface water quantities on the Refuge.

The quantity of pumped groundwater would be dependent on the needs for the habitats and the seasons. More water would likely be pumped in the summer to account for the smaller quantity of available surface water. Groundwater recharge during summer months is likely to be minimal due to consumptive use by vegetation and high evaporation rates. During this time, pumping could cause the groundwater table to lower. However, pumping is not expected to adversely affect private groundwater wells in the nearby communities because they are located upgradient and far enough away that impacts are unlikely. Impacts to the groundwater table will be analyzed further in a project-specific NEPA document to be prepared for the water management actions.

Alternative D would also include pursuit of additional water rights to allow for increased water use on the Refuge, as well as pursuit of the 1996 application for year-round discharges, which would occur under each alternative. Changes to allocated water rights is controversial in Pahranagat Valley, so Service staff would need to coordinate with the upstream communities to acquire additional water rights. Acquisition of additional surface water rights could reduce the need to pump large quantities of groundwater and minimize effects on the groundwater aquifer. Impacts of obtaining additional water rights are speculative because a specific water rights action has not been proposed. These impacts will be analyzed further in a project-specific NEPA document to be prepared for the water rights action.

New visitor use facilities under Alternatives B, C, and D would increase the water demand from the domestic well on the Refuge. As mentioned above, additional groundwater pumping is not expected to adversely affect nearby private wells. Changes in the groundwater table, however, with the additional demand, could be significant. These impacts will be analyzed further in project-specific NEPA documents to be prepared for the facilities.

Mitigation

Mitigation measures that could reduce water quality impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Implementation of BMPs during ground-disturbing activities would reduce the effects of erosion, siltation, and sedimentation on water quality of the Refuge waters. These measures would include constructing small sediment collection pools downstream of work areas to trap sediment and reduce sediment movement through the aquatic system; using turbidity barriers in areas where sediment collection pools cannot be used; directing flows where feasible around the work area and temporarily detaining flows to reduce potential entrainment of sediment; and limiting the size of the area of disturbance where flows cannot be directed around the work area or detained so that minimal sediment is added to stream flows.

Service staff would implement a monitoring plan to observe changes in the groundwater levels on and off the Refuge and modify groundwater pumping if the groundwater table appears to be adversely affected. Mitigation may include pumping groundwater during non-summer months and increasing surface storage or setting a maximum limit for groundwater pumped per day.

Air Quality

Impacts

Habitat restoration activities under each alternative would require the use of construction equipment to remove vegetation and plant new vegetation. Construction of visitor facilities under the action alternatives would also require construction equipment that would disturb the ground and clear vegetation. This equipment would cause short-term, minor emissions (engine exhaust and fugitive dust) that may be noticeable on the Refuge. Depending on the extent of activities, an increase in emissions could violate ambient air quality standards and could be significant. These impacts will be analyzed further in project-specific NEPA documents to be prepared for the restoration activities and facility construction and improvement.

Prescribed burns under each alternative would adversely affect air quality on the Refuge. Although the burns would generate smoke, which may be noticeable off the Refuge, impacts would not be significant because the burns would be temporary and would not violate ambient air quality standards.

Increased traffic on the Refuge would result in a minor increase in traffic-related emissions. These emissions would not result in violations of the ambient air quality standards because the amount of Refuge traffic at one time is expected to be small, and traffic would be limited to the main roads and parking areas. Therefore, traffic-related impacts to ambient air quality would not be significant.

Ground-disturbance, construction, and fire management (particularly fuels reduction) activities under any of the alternatives would result in direct emission of greenhouse gases (GHG) (temporary emissions) from construction equipment. Fire management would help prevent catastrophic wildfire over the long term and reduce long-term GHG emissions. Indirect, long-term emissions of GHG would occur due to increased visitation by the public and increased employee vehicle trips (as staff grows). An increase in GHG emissions would contribute to

regional impacts on climate change and could result in significant impacts. Climate change impacts will be further analyzed in project-specific NEPA documents, as appropriate.

Mitigation

Mitigation measures that could reduce air quality impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

BMPs would be implemented during construction activities that disturb the soil to reduce particulate emissions. These measures would include the BMPs identified for mitigating soil and water resources impacts as well as the following: maintaining effective cover over stockpiled fill or debris materials; limiting vehicle speeds to 15 mph in staging areas and on all unpaved access routes; and cleaning mud, silt, and soil tracked out onto paved surfaces immediately. In addition, use of low or zero-emission construction vehicles and limiting idling time for construction vehicles could reduce GHG emissions during construction.

5.5.2 Biological Resources

Vegetation

Impacts

Construction of visitor use facilities under Alternatives B, C, and D would result in minor losses of vegetation within the footprints of the facilities and an increased potential for invasive species. This impact would not be significant due to the small amount of vegetation that would be affected because facilities would be constructed, for the most part, in previously disturbed areas. Sensitive plants are not expected to be affected by construction activities because none are known to occur on the Refuge.

Each alternative would involve enhancing, restoring, or increasing wetland and riparian habitats on the Refuge. A wetland restoration plan would be implemented for open water habitat, and site Restoration Plans would be implemented for springs and channels on the Refuge. Alternatives C and D would increase the amount of cottonwood-willow habitat from the current 100 acres to 300 total acres to benefit the southwestern willow flycatcher. Alternative D would also involve restoring the historic stream channel and riparian corridor through Black Canyon. Nonnative vegetation (i.e., salt cedar and Russian olive) would be replaced with native species (i.e., cottonwood and willow), and disturbed areas would be restored with native vegetation. These activities would result in a temporary disturbance during restoration as vegetation is removed and new vegetation is planted. Temporary impacts will be analyzed further in project-specific NEPA documents to be prepared for the restoration activities. Long-term changes to the habitats would benefit native vegetation on the Refuge by providing a means for native plants to establish.

Invasive plants occur in riparian, wet meadow, and grassland habitats on the Refuge. These species outcompete native plants and create uniform stands that prevent establishment of native species. They also provide less desirable habitat for native wildlife. Alternative A would continue using prescribed burns in wet meadow and seasonal marsh habitats. Alternatives B, C, and D involve implementing measures to reduce or control Russian knapweed in the grassland habitat, such as through mechanical, chemical, or biological means, and removal of salt cedar and Russian olive in riparian areas. IPM efforts would be expanded under Alternatives C and D. Targeted species would include bulrush, Russian knapweed, salt cedar, Russian olive, Scotch thistle, and other invasive plants. The action alternatives would benefit native plants by reducing invasive species and providing more suitable habitat, with Alternatives C and D resulting in the greatest benefits.

Desert upland habitat is currently being adversely affected by illegal off-road uses. Despite prohibitions on off-road vehicles, these impacts would likely continue under Alternative A. The potential for impacts to desert upland habitat would be reduced under Alternatives B, C, and D through installation of barriers around closed areas and roads and additionally under Alternative D with construction of a fence along the eastern boundary.

Mitigation

Mitigation measures that could reduce vegetation (specifically sensitive plants) impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section 7 consultation process, as appropriate.

Standard construction practices would be implemented to prevent invasive species from establishing in the disturbed areas around the facilities, such as cleaning vehicles and equipment used on the Refuge with high-pressure sprayers to dislodge seeds prior to accessing the area. Facilities would be designed to avoid sensitive habitats and affect the least amount of vegetation (based on prior surveys and mapping).

Wildlife

Impacts

Individuals of some wildlife species may be adversely affected by construction of visitor use facilities and other structures under Alternatives B, C, and D. Amphibians, reptiles, birds (migrant and resident), mammals, fish, and invertebrates that use the affected habitats have the potential to be directly affected during vegetation removal activities and installation of equipment in surface waters. These species would be forced to relocate to less disturbed areas of the Refuge or in nearby suitable habitats. Adverse impacts to wildlife species would be localized and dependent on the specific activity. For more common wildlife, impacts would be less than significant because of the localized nature of the disturbance and minimal effects to their populations. Impacts to sensitive wildlife will be analyzed further in project-specific NEPA documents to be prepared for the facilities and restoration activities.

Desert tortoise, a threatened species, may be disturbed or injured during facility construction or modification in desert scrub habitats under Alternatives B, C, and D. These actions could adversely affect the regional tortoise population depending on the amount of habitat affected and extent of impacts. The Service would implement specific conservation measures as part of each action to minimize impacts on desert tortoise. Because of potential impacts to the tortoise, the facilities will be analyzed further in a project-specific NEPA document and Section 7 consultation.

The desert tortoise is currently being adversely affected by illegal off-road activities throughout the area. Implementation of habitat protection efforts (e.g., fencing closed areas and restricting access) would reduce the potential for this impact under Alternatives B, C, and D.

Construction of a refugium for the endangered Pahranagat roundtail chub under Alternative B, C, and D would benefit the species by providing a safe haven for reproduction and could aid in its recovery. Construction activities would result in minor disturbance to other wildlife on the Refuge due to the localized nature of the impact and minimal amount of habitat likely affected. These impacts will be analyzed further in a project-specific NEPA document to be prepared for the refugium. A refugium may also benefit waterfowl and migratory birds by creating diverse wetland habitat.

Improvements to wetland habitats (marsh, open water, wet meadow, and alkali flat) under each alternative would benefit a variety of bird and mammal species and the few amphibians that occur on the Refuge. Specifically, eared grebe, western grebe, Franklin's gull, black tern, snowy egret, marbled godwit, snowy plover, long-billed curlew, white-throated swift, southwestern willow flycatcher, and canvasback would benefit from wetland restoration and enhancement. These species would also be temporarily affected by disturbance during the restoration activities. These impacts would force the species to temporarily relocate away from the disturbance. Impacts will be analyzed further in project-specific NEPA documents to be prepared for the restoration activities.

Wetland species would experience improved nesting, foraging, and breeding habitat, which could potentially increase their populations on the Refuge. Expansion of open water habitat may attract more waterfowl and migratory birds to the Refuge, such as the bald eagle, during the migrating periods. Species that would benefit from these actions include Canada geese, mallards, gadwalls, pintails, greater sandhill cranes, shorebirds, green-wing teal, redheads, and particularly black-necked stilts.

An increase in grain crops under the action alternatives and an increase in native forage under Alternative D would benefit the sandhill crane, waterfowl, and other grassland-dependent birds by increasing foraging and resting habitat.

Enhancement and expansion of riparian habitat under Alternatives C and D would benefit the endangered southwestern willow flycatcher and could aid in its recovery. Many other migrant and resident birds that are conservation priorities within the Service, NDOW, and Partners in Flight would also benefit from increased acreage of native riparian habitat. These species include eared grebe, western grebe, snowy egret, pinyon jay, Arizona Bell's vireo, and western yellow-billed cuckoo.

Mitigation

Mitigation measures that could reduce wildlife impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section 7 consultation process, as appropriate.

The Service would survey upland habitats for desert tortoise prior to construction activities and implement measures to avoid impacts on the species. Tortoise fencing and relocation of individuals would reduce impacts. Habitat restoration activities and facility improvements or construction would occur outside of the breeding and nesting period for resident and migratory birds to the extent feasible.

5.5.3 Cultural Resources

Impacts

Under each alternative, cultural resources may be adversely affected by ground disturbance activities associated with construction and modification of visitor use facilities and habitat restoration activities. Due to the presence of important cultural resources on the Refuge, such as at Black Canyon, impacts have the potential to be significant if known or unknown resources are destroyed or damaged. These impacts will be analyzed further in project-specific NEPA documents to be prepared for the activities.

Cultural resources are currently being adversely affected by vandalism and degradation. Alternative A would not involve actions that would reduce these impacts, and eligible cultural resource sites could be damaged, destroyed, or otherwise significantly affected. Alternatives B, C, and D involve constructing fencing, signs, and other barriers and educating the public, which would provide some protection for cultural resources and minimize vandalism. Indirect adverse impacts related to increased visitor use may include disturbance and destruction of sites and removal of artifacts. Impacts to cultural resources would still have the potential to be significant under the action alternatives if eligible sites lose their integrity through destruction, damage, or removal. These impacts will be analyzed further in project-specific NEPA documents to be prepared for Refuge actions.

Because other aspects of the environment are important to tribes and can be considered cultural resources, adverse impacts to other resources could also be considered impacts to cultural resources. These impacts are not specifically discussed as cultural resource impacts; however, they may be of concern to culturally affiliated tribes if the

resources are important to them. Examples include native plants that may be collected and used for various purposes, water resources, or geologic features.

Mitigation

Mitigation measures that could reduce cultural resource impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities and through the Section106 consultation process, as appropriate.

In order to prevent adverse impacts on cultural resources during restoration and construction activities, professional archaeologists would archaeologically survey the Refuge for cultural resources and record the information and locations prior to project implementation. Staff would use their knowledge of site locations to design facilities to avoid eligible resources. All ground disturbance activities would be monitored by an archaeologist and a tribal monitor in areas where known cultural resources are located and in areas with high potential for buried cultural deposits. If cultural resources are inadvertently exposed during activities, activities would immediately cease and a qualified archaeologist would be consulted to implement appropriate measures for mitigation or preservation. If eligible sites or portions thereof cannot be protected and would be adversely affected, other mitigation or data recovery methods would be conducted in consultation with the Nevada State Historic Preservation Office.

5.5.4 Public Access and Recreation

Public Access

Impacts

Construction activities and habitat restoration would result in incidental traffic over a short-term period in the immediate vicinity of the Refuge and temporary restrictions on access to the affected areas. Some congestion on roadways and longer stop times at intersections would be expected during the construction period. Impacts to public access during restoration and construction could be significant depending on the locations and extent of activities implemented at one time. With the small number of visitors on the Refuge at one time, most activities would have minimal effects on traffic. Project-specific NEPA documents will include further analysis of public access impacts of Refuge actions.

No adverse impacts to public access would occur under Alternative A, as no changes would occur from current operations on the Refuge. The Refuge is currently open to the public year-round with three main unpaved access roads from U.S. Highway 93. The main road to the Refuge headquarters connects to Alamo Road, which continues onto the Desert NWR. Public access is available to Lower Lake and Middle Marsh, as well as North Marsh and Upper Pahranagat Lake.

Proposed directional signs on I-15 and U.S. Highway 93 under Alternatives C and D would benefit public access by increasing awareness of the Refuge to travelers and providing improved directions for those visiting the Refuge.

Visitor services would be improved under Alternatives B, C, and D and could result in an increase in visitation, resulting in increased traffic on U.S. Highway 93. Average daily traffic counts on U.S. Highway 93 near the Refuge were 1,600 per day in 2004 (NDOT 2004). An increase in traffic would be most noticeable on weekends during peak visitor use. Improvements to visitor facilities under each action alternative would alleviate impacts by providing the necessary facilities to accommodate an increase in use; however, traffic along the adjacent highway would be expected to increase as a result of increased visitors.

Visitors attempting to access the Refuge from northbound U.S. Highway 93 would have to yield to oncoming traffic to turn left across the highway. The highway is currently a two-lane road without a left-turn lane. The increased traffic under each action alternative could create traffic safety issues and longer stop times when yielding to traffic. Turning lanes may be needed during peak visitor periods. Under Alternatives C and D, the Service would coordinate with the NDOT to construct turn lanes along the highway to allow visitors to safely turn onto the Refuge. These turning lanes could reduce traffic impacts from increased visitation. Traffic impacts will be analyzed further in project-specific NEPA documents to be prepared for Refuge actions.

Some maintenance roads would be closed to the public, as necessary, in Alternatives B, C, and D, and some historic ranch roads may be converted to trails. Barriers would be installed to prevent vehicle traffic in closed areas, including the campground (day use area) under Alternative D. These actions would reduce public access to some areas of the Refuge, but they would have a beneficial effect by protecting resources and preserving natural conditions on the Refuge.

Mitigation

Mitigation measures that could reduce public access impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Refuge staff would schedule construction and restoration for slower times of visitation during the week and slower seasons, when feasible, to minimize the impacts of construction traffic on public access. Signs and information would be provided to inform visitors of construction activities and areas that are temporarily off-limits to the public.

Recreation

Impacts

Under Alternative A, current recreational activities would continue. Recreation opportunities on the Refuge currently include fishing, hunting, and wildlife observation at Upper Pahranagat Lake and Middle Marsh, camping at Upper Pahranagat Lake, and hiking on nature trails throughout the Refuge.

Alternatives B, C, and D would generally increase and improve recreational opportunities on the Refuge. Wildlife observation and photography activities would be enhanced with construction of an expanded trail system and observation blinds under each of the action alternatives. Hunting opportunities would continue under all alternatives, but the hunt area would be slightly modified under Alternatives B, C, and D to reduce safety concerns near Refuge headquarters. The designated hunt area would be located south of Dove Dike. Campground use would be modified under Alternatives C and D to be a day use area only, and boat use would be restricted to car top boats (no trailer accessible boat launches) under Alternative D to reduce concerns with introduced quagga mussels. Car access to the day use area would also be restricted under Alternative D, preventing the use of boat launches.

Outreach and environmental education would continue under Alternative A. The administrative building currently serves as the Refuge administrative office and visitor contact station, with brochures, maps, and fact sheets. An outside contact station with information kiosks is located at the north end of the Refuge in the camping area. The Refuge has an active volunteer program, staff-conducted and non–staff-conducted tours, and off-site exhibits.

The visitor contact station would be expanded in Alternatives B, and a new visitor contact station would be constructed in Alternatives C and D. Each of the action alternatives would also expand educational and interpretive activities on the Refuge and outreach efforts off the Refuge. The improvements and expansions would benefit environmental education opportunities on the Refuge.

Mitigation

Impacts to recreation would not be significant, so specific mitigation measures are not necessary.

5.5.5 Social and Economic Conditions

Refuge Management and Local Economics

Impacts

Under Alternative A, the annual Refuge budget and staffing, which includes operations, capital projects, two full-time staff, and one part-time seasonal employee, would remain comparable to current limited funding and staffing levels. Restoration activities, management efforts, recreation opportunities, and visitor services would continue to be implemented as staffing and funding are available.

Alternatives B, C, and D would improve and expand habitats and water resources management activities, as well as visitor services and environmental education. New trails, wildlife observation blinds, a visitor contact station, and a refugium would be constructed, as well as other physical improvements, possibly requiring use of private contractors, which would have some beneficial impact in terms of providing short-term jobs. Additional activities related to outreach and environmental education would require increased expenditures to meet those needs. These actions would require increases in the Refuge management and operations budget.

Increased staffing at the Refuge under Alternatives B, C, and D would be needed in order to accommodate expanded visitor needs and management actions. Additional staff and salaries would have a beneficial impact on the area in by adding employment and income to the local economy.

An increase in the number of visitors to the Refuge would increase retail trade, lodging, and food service for the nearby local economy. Additional indirect employment as a result of the increased activity would also be expected.

Mitigation

Impacts to refuge management economics would not be significant, so specific mitigation measures are not necessary.

Environmental Justice

Impacts

There would be no adverse impacts to minority or low-income populations as a result of the continuing operations of the Refuge under Alternative A.

Increased educational, interpretive, and outreach activities under Alternatives B, C, and D would provide benefits to minority and low-income populations in southern Lincoln County and the nearby communities, such as Alamo, that are served by off-site Refuge educational exhibits.

Development of cultural resources interpretive and environmental education materials in coordination with affiliated Native American tribes under Alternatives B, C, and D would address topics that would be of interest to the Native American population.

Mitigation

Impacts to environmental justice would not be significant, so specific mitigation measures are not necessary.

Aesthetics

Impacts

Habitat protection and restoration actions under Alternative A, such as limited control of invasive plants and general control of public access, would continue to occur. These activities would benefit views for visitors using the trails and wildlife observation/photo blinds by creating a more natural, native setting on the Refuge.

Alternatives B, C, and D would expand the actions in Alternative A. Construction of new parking areas and trails under the action alternatives would have a short-term adverse impact on visitor views during construction. Views from areas designated for wildlife observation locations along the highway could be affected, but these impacts are not considered significant due to their short duration. New facilities may also have a potential long-term visual impact on the natural features and vegetation currently on the Refuge, depending upon the siting of the facilities and integration into the Refuge's natural setting. These impacts could be significant, depending on the project-specific details of the facilities, and will be analyzed further in project-specific NEPA documents to be prepared for the facilities.

Restoration activities in each alternative would provide improved habitat that would enhance views from on and off the Refuge. These restoration activities, along with additional observation blinds and trails under the action alternatives, would enhance the visitor views of the natural habitat and setting of the area.

Mitigation

Mitigation measures that could reduce aesthetics impacts include the measures discussed below. These measures will be refined in project-specific NEPA documents to apply specifically to the proposed activities.

Visual impacts during construction of facilities and other physical improvements would be temporary and addressed through screening and ongoing construction site maintenance and cleanup during construction. Refuge staff would schedule construction for slower times during the week and slower seasons, when feasible, to minimize these impacts. Impacts of the facilities on the long-term visual quality for the Refuge would be addressed through site-sensitive design standards and ensuring compatibility with the Refuge environment.

5.5.6 Summary of Effects

Table 5.5-1 summarizes the potential effects for each of the four alternatives. Alternative A continues current management practices with little changes or improvements. Alternative A includes maintaining 100 acres of cottonwood-willow habitat.

Compared with Alternative A, Alternative B would improve Refuge habitats to benefit native and sensitive plant and wildlife species, particularly waterfowl, accommodate an increase in visitors, and enhance visitor experience. Alternative B includes maintaining and enhancing 100 acres of cottonwood-willow habitat. Alternative B would,

however, result in short-term, mitigable adverse impacts from restoration projects and facility and road construction.

Compared with Alternative B, Alternative C would provide greater biological and visitor benefits, but result in greater short-term mitigable adverse construction impacts. Alternative C includes restoration of 300 acres of cottonwood-willow habitat.

Compared with Alternative C, Alternative D would provide greater biological and visitor benefits, but result in greater short-term mitigable adverse construction impacts. Alternative D includes restoration of 300 acres of cottonwood-willow habitat.

Impacts and mitigation measures of restoration actions, visitor facility construction and improvement, and other actions noted throughout this section will be further analyzed and refined in project-specific NEPA documents to be prepared for each action. The Service will use the analysis presented in this EIS to focus on key issues that need to be further evaluated in second-tier NEPA documents.

Table 5.5-1. Pahranagat NWR: Summary of Environmental Consequences

Resource Issue or Concern	*Alternative A (No Action)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
Physical Environment				
Soil Conditions	EC[8]: Some temporary disturbance	SL: Increased temporary disturbance	ML: Increased temporary disturbance	ML: Increased temporary disturbance
Surface Water	EC: Some open water	SH: Increased open water over the long term	SH: Increased open water over the long term	MH: Increased open water over the long term; restored historic channel
Groundwater	EC: Current conditions	SL: Increased pumping for habitats and visitor use over the long term	SL: Increased pumping for habitats and visitor use over the long term	SL: Increased pumping for habitats and visitor use over the long term
Water Quality	EC: Some temporary impacts	SL: Increased temporary impacts	ML: Increased temporary impacts	ML: Increased temporary impacts
Water Rights	EC: Current conditions	EC: Current conditions	EC: Current conditions	SH: Increased water rights
Air Quality	EC: Minor emissions and dust from restoration; temporary smoke from burns	SL: Minor emissions from construction activities (temporary) and increased traffic; emissions and dust from restoration; temporary smoke from burns	SL: Minor emissions from construction activities (temporary) and increased traffic; emissions and dust from restoration; temporary smoke from burns	SL: Minor emissions from construction activities (temporary) and increased traffic; emissions and dust from restoration; temporary smoke from burns
Biological Resources				
Open Water/Marsh Habitat	EC: Some open water	SH: Improved habitat over the long term; more open water	SH: Improved habitat over the long term; more open water	MH: Improved habitat over the long term; more open water; restored historic channel
Spring Habitat	EC: Some improved habitat	SH: Improved habitat over the long term	SH: Improved habitat over the long term	SH: Improved habitat over the long term
Cottonwood-Willow Habitat	EC: 100 acres	SH: 100 acres; improved conditions over the long term	MH: 300 acres	MH: 300 acres
Upland Habitat	EC: Current conditions	SH: Increased protection; temporary disturbance	SH: Increased protection; temporary disturbance	SH: Increased protection; temporary disturbance

[8] EC = existing conditions; SH = slightly higher or improved than existing conditions; MH = moderately higher or improved than existing conditions; CH = considerably higher or improved than existing conditions; SL = slightly lower or decreased than existing conditions; ML = moderately lower or decreased than existing conditions; CL = considerably lower than existing conditions.

Table 5.5-1. Pahranagat NWR: Summary of Environmental Consequences

Resource Issue or Concern	*Alternative A (No Action)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
Biological Resources, continued				
Invasive Plants	EC: Some invasive plant removal efforts	SH: Increased invasive plant removal efforts	MH: Increased invasive plant removal efforts	MH: Increased invasive plant removal efforts
Common Wildlife Species	EC[9]: Temporary disturbance from restoration; some improved habitat over the long term	SH: Temporary disturbance; improved habitat over the long term	MH: Temporary disturbance; improved habitat over the long term	MH: Temporary disturbance; improved habitat over the long term
Management Priority Birds	EC: Temporary disturbance from restoration; some improved habitat over the long term	SH: Temporary disturbance; improved habitat over the long term	MH: Temporary disturbance; improved habitat over the long term	MH: Temporary disturbance; improved habitat over the long term
Sandhill Crane and Waterfowl	EC: No management	SH: Increased foraging habitat over the long term	MH: Improved and increased foraging habitat over the long term	CH: Improved and increased foraging habitat over the long term
Southwestern Willow Flycatcher	EC: Current conditions	SH: Temporary disturbance; improved and increased habitat over the long term	MH: Temporary disturbance; improved and increased habitat over the long term	MH: Temporary disturbance; improved and increased habitat over the long term
Desert Tortoise	EC: Current conditions	SH: Temporary disturbance; improved protection over the long term	SH: Temporary disturbance; improved protection over the long term	SH: Temporary disturbance; improved protection over the long term
Pahranagat Roundtail Chub	EC: Not present	SH: Refugium would establish population	SH: Refugium would establish population	SH: Refugium would establish population
Cultural Resources				
Cultural Resources	EC: Some protection of resources; potential for impacts during restoration	SL: Potential for impacts during ground disturbance; increased protection	SL: Potential for impacts during ground disturbance; increased protection	SL: Potential for impacts during ground disturbance; increased protection
Public Access				
Access	EC: Current conditions	SH: Improved access	MH: Improved access	MH: Improved access
Traffic	EC: Current conditions	ML: Increased traffic on and to the Refuge	SL: Increased traffic on and to the Refuge; improved safety on highway	SL: Increased traffic on and to the Refuge; improved safety on highway

[9] EC = existing conditions; SH = slightly higher or improved than existing conditions; MH = moderately higher or improved than existing conditions; CH = considerably higher or improved than existing conditions; SL = slightly lower or decreased than existing conditions; ML = moderately lower or decreased than existing conditions; CL = considerably lower than existing conditions.

Table 5.5-1. Pahranagat NWR: Summary of Environmental Consequences

Resource Issue or Concern	*Alternative A (No Action)*	*Alternative B*	*Alternative C*	*Alternative D (Preferred Alternative)*
Recreation				
Visitor Use Facilities	EC: Current conditions	SH: More facilities constructed	SH: More facilities constructed	SH: More facilities constructed
Recreation	EC[10]: Current opportunities	SH: Improved opportunities	SH: Improved opportunities	SH: Improved opportunities
Outreach	EC: Limited outreach	SH: Increased outreach	SH: Increased outreach	SH: Increased outreach
Refuge Management and Local Economics				
Refuge Budget and Staffing	EC: Current budget and staffing	SH: Increased budget and staff to implement actions	MH: Increased budget and staff to implement actions	MH: Increased budget and staff to implement actions
Local Economy	EC: Current economy	SH: Increase in local economy from increased visitors	SH: Increase in local economy from increased visitors	SH: Increase in local economy from increased visitors
Aesthetics				
Restoration Activities	EC: Current conditions	SH: Improved visual quality from restoration activities	MH: Improved visual quality from restoration activities	MH: Improved visual quality from restoration activities
Visitor Use Facilities	EC: Current views	SL: Minor impacts on visual quality	SL: Minor impacts on visual quality	SL: Minor impacts on visual quality

[10] EC = existing conditions; SH = slightly higher or improved than existing conditions; MH = moderately higher or improved than existing conditions; CH = considerably higher or improved than existing conditions; SL = slightly lower or decreased than existing conditions; ML = moderately lower or decreased than existing conditions; CL = considerably lower than existing conditions.

5.6 Unavoidable Adverse Impacts

The Proposed Action would not result in direct or indirect, unavoidable adverse effects on the physical, biological, cultural, or social and economic environments. During implementation of the Proposed Action, the Service would implement measures to avoid or reduce incremental adverse impacts on the various resources at the refuges.

5.7 Irreversible and Irretrievable Commitments of Resources

Neither the Proposed Action nor other alternatives would result in an irreversible or irretrievable commitment of resources. Management actions involving construction of facilities or modification of habitats will implement appropriate measures to preserve or relocate sensitive species and avoid cultural resources.

5.8 Short-Term Uses Versus Long-Term Productivity

Implementation of the Proposed Action would result in short-term resource uses that enhance long-term productivity of the refuges. Habitat restoration and management actions that are part of each of the alternatives would benefit fish and wildlife, particularly sensitive and endemic species, over the long term. Public use of the refuges would improve over the long term as new opportunities become available and new facilities are constructed.

5.9 Cumulative Impacts

A cumulative impact is the incremental impact of a Proposed Action when added to other past, present, and reasonably foreseeable future federal and non-federal actions. Cumulative impacts can result from individually minor but collectively significant actions occurring over a period of time (40 CFR 1508.7). Impacts of past and present related actions are included in the affected environment descriptions of this EIS. Therefore, this section focuses on the impacts of the Proposed Action when added to other reasonably foreseeable future actions.

5.9.1 Approach to Cumulative Impacts

Implementation of the preferred alternative for each refuge in the Desert Complex would result in cumulative effects on physical, biological, cultural, and social resources in the Desert Complex and in southern Nevada. This section discusses both the cumulative effects of increased management of the four refuges in the Desert Complex and the cumulative effects of other reasonably foreseeable future projects in southern Nevada.

The following reasonably foreseeable future projects are evaluated in the cumulative impact analysis.

Coyote Springs 42,800-acre Development (first phases)

The Coyote Springs project, in its entirety, contains approximately 42,800 acres located about 50 miles north of Las Vegas. It is bordered by the Delamar Mountains to the north, the Meadow Valley Mountains to the east, SR 168 to the south, and U.S. Highway 93 to the west.

The Coyote Springs development includes lands in Clark County (approximately 13,100 acres) and Lincoln County. The development would include a series of villages featuring a mix of uses with a range of unit types, lot sizes, and densities, and amenities including golf courses, clubhouse facilities, parks, and open space network linking different areas of the community. The master plan for the development encourages the effective use of natural topography, open space, and other natural and existing features and has a set of design guidelines intended to act as a guide for construction and development of the planning areas as a whole.

The development of the community is projected to be over a 40-year cycle. The developer envisions maintaining the rural character of the site by developing a series of villages with varying densities surrounded by open space and recreational opportunities. The latter phases focus on creating a self-reliant planned community with a full array of facilities and amenities.

City of North Las Vegas Comprehensive Master Plan

The City of North Las Vegas completed a Draft Comprehensive Master Plan in September 2006 to update the 1999 master plan. The City encompasses an area of 82 square miles just south of the Desert NWR. The plan will provide the City with guidance for implementation of the plan over the next 20 years.

BLM Land Disposal in Clark County

The Las Vegas Valley disposal boundary was created by the 1998 Southern Nevada Public Land Management Act and modified by the 2002 Clark County Conservation of Public Land and Natural Resources Act. The BLM has identified available lands in the Las Vegas Valley that are appropriate for auction and prepared an EIS to assess the potential environmental impacts resulting from the sale of these lands. The land disposal area consists of all lands currently identified for disposal within the Las Vegas Valley, including the Las Vegas Valley disposal area, the Valley West Disposal area, and other legislatively authorized disposal areas. These lands are being transferred to the highest bidder through multiple auctions, and the lands will become available for development or other uses.

Nevada Test and Training Range Ongoing Actions

Approximately 846,000 acres of the Desert NWR are managed by the Department of Defense (DOD) and Department of Energy (DOE) as an aerial bombing and gunnery range (known as the NTTR). The NTTR overlay has been used since 1940 for testing armament and for training pilots in aerial warfare. Public Law 106–65 authorizes the U.S. Air Force (USAF) to use the NTTR (A) as an armament and high-

hazard testing area; (B) for training for aerial gunnery, rocketry, electronic warfare, and tactical maneuvering and air support; (C) for equipment and tactics development and testing; and (D) for other defense-related purposes consistent with the purposes specified above. Use of this area is subject to the terms of a Memorandum of Understanding (MOU) between the Secretary of the Interior and the Secretary of the USAF.

In addition to ongoing actions, future actions may include more targets, increased sorties, more noise and sonic booms, and other improvements to the NTTR (USAF 2007).

West-Side Energy Corridor

The DOE, BLM, U.S. Forest Service (USFS), and DOD are preparing a Programmatic Environmental Impact Statement (PEIS) to evaluate issues associated with the designation of energy corridors on federal lands in 11 Western states. Based upon the information and analyses developed in this PEIS, each agency would amend its respective land use plans by designating a series of energy corridors. The purpose of and need for the Proposed Action are to implement Section 368 of the Energy Policy Act of 2005 by designating corridors for the preferred location of future oil, gas, and hydrogen pipelines and electricity transmission and distribution facilities (DOE and BLM 2007). Each agency would be responsible for incorporating the designated corridors into the relevant agency land use and resource management plans.

Other Development, Management Plans, and Recreational Facilities in Southern Nevada

Southern Nevada contains several growing communities, including Las Vegas, Pahrump, and Mesquite. Within each community, various development projects are ongoing to provide more housing and commercial opportunities for existing and new residents. The various public land management agencies in southern Nevada (National Park Service, BLM, USFS, and others) are continually managing their lands and identifying strategies to improve habitat and provide recreational opportunities. Local agencies, such as Clark County and the Cities of North Las Vegas and Las Vegas, are also expanding recreational opportunities in their communities. The Clark County Wetlands Park, for example, is undergoing improvements to provide more trails for public use.

5.9.2 Potential Cumulative Impacts

Physical Resources

Cumulative Impacts of Each Refuge's Actions

As described above, the preferred alternative for each refuge involves ground-disturbing activities that would have temporary effects on soils, water quality, and air quality. Because these impacts would be localized, they would not create cumulatively significant impacts on the Desert Complex.

Similarly, hydrology modifications on each refuge would also not contribute to cumulatively significant impacts because of the distances between each refuge and lack of surface water connectivity between the refuges.

Cumulative Impacts of Desert Complex Actions and Other Future Actions

Actions within the NTTR overlay in combination with other ground-disturbing activities on the Desert NWR could result in a temporary increase in soil erosion and air pollutant emissions, and adverse impacts on water quality. These impacts would be localized, but could result in cumulatively significant impacts if the actions are implemented at the same time. The Service would implement mitigation measures to reduce the impacts of each action.

Development, including construction activities and increased traffic, human activities, and related effects of development, as well as other projects involving ground disturbance or increased operations in the vicinity of each refuge, would add to the cumulative effects on soil disturbances, hydrology modifications, water quality impacts, increased air pollutants, and increased GHG emissions. Major developments, such as at Coyote Springs and in North Las Vegas, would create cumulatively significant impacts because of the large amount of affected land. The combination of all activities could contribute to climate change from increases in GHG emissions throughout southern Nevada.

Groundwater in the vicinity of each refuge would also be adversely affected by expanded urban developments that use groundwater wells for water supply. The groundwater aquifer within each Refuge connects to other aquifers in southern Nevada; therefore, impacts at Coyote Springs, for example, could have adverse impacts at Ash Meadows NWR. Cumulative impacts on the groundwater aquifer would be significant because groundwater impacts could affect the entire region.

Biological Resources

Cumulative Impacts of Each Refuge's Actions

As described above, the preferred alternative for each refuge involves ground-disturbing activities that would result in a loss of vegetation, potential impacts to sensitive plants on some refuges, and increased potential for invasive plants. Restoration activities proposed on each refuge would improve various habitats on the refuges and reduce the extent of invasive plants.

Habitat impacts would not be cumulatively significant because of the minimal amount of affected vegetation and the greater amount of habitat that would be restored at each refuge. Short-term impacts to sensitive plants would not be cumulatively significant because none of the sensitive plants are located on more than one refuge. Invasive plant removal and control efforts would be implemented on each refuge to help reduce the regional extent of invasive plant populations.

Cumulative Impacts of Desert Complex Actions and Other Future Actions

Actions within the NTTR overlay in combination with other ground-disturbing activities on the Desert NWR could result in minor losses of wildlife habitat. The Service would implement mitigation measures to reduce the impacts of each action. Restoration activities on the Desert NWR would result in cumulatively beneficial effects on habitat.

Development and other activities in the vicinity of each refuge would add to the cumulative effects on habitat, sensitive plant, and invasive plant impacts. Major developments, such as at Coyote Springs and in North Las Vegas, would create cumulatively significant impacts because of the large amount of affected land. Sensitive plant populations in affected areas could be at risk if measures are not implemented to protect or restore them on a regional basis.

Cultural Resources

Cumulative Impacts of Each Refuge's Actions

As described above, the preferred alternative for each refuge involves ground-disturbing activities that could result in adverse impacts on known and unknown cultural resources at each refuge. Increased visitation at each refuge also increases the potential for theft, vandalism, and other adverse impacts on the resources. These impacts would be cumulatively significant because the cultural resources in the Desert Complex provide important information on the history and prehistory of southern Nevada. Each activity would include measures to identify and avoid important resources, especially eligible resources, and protect known resources from adverse visitor impacts.

Cumulative Impacts of Desert Complex Actions and Other Future Actions

Actions within the NTTR overlay in combination with other ground-disturbing activities on the Desert NWR could result in adverse impacts to known and unknown cultural resources on the Refuge. Cumulative impacts to cultural resources could result from individually minor, but collectively significant, actions taking place over a period of time. Cumulative effects often occur to eligible districts where several minor changes to contributing properties, their landscaping, or to the setting over time could result in a significant loss of integrity. These impacts would be cumulatively significant because the resources on the Refuge may contribute to the history and prehistory of the area and provide important information on past uses. Mitigation measures would be implemented for each action to identify, avoid, or reduce impacts on important resources.

Development in the vicinity of each refuge would add to the cumulative effects on cultural resources and could result in adverse impacts to resources that provide important information on the history and prehistory of southern Nevada. Increased residential development in rural areas also increases the potential for adverse impacts on resources from vandalism and theft. Cultural resources could be destroyed if measures are not implemented as part of each action to protect them.

Social Values

Cumulative Impacts of Each Refuge's Actions

As described above, the preferred alternative for each refuge involves actions to improve recreational opportunities on each refuge and expand visitor services. Access to some refuges would be more controlled in order to protect resources, but improvements would be made to enhance visitor experience and provide more recreational opportunities. Temporary adverse impacts on aesthetics would occur on each refuge during ground-disturbing activities. Long-term changes in visual quality would occur as a result of new visitor facilities; however, these facilities would improve visitor experience and attract more visitors to the refuges. Local and refuge management economics would be improved through an increase in visitors and increased actions on each refuge. Cumulative impacts of each refuge's actions would be beneficial to the Desert Complex.

Cumulative Impacts of Desert Complex Actions and Other Future Actions

Development in the vicinity of each refuge would add to the cumulative effects on social values in southern Nevada. Access to recreational opportunities would be improved as new opportunities are provided on public lands and in new developments. Local and regional economics would be improved through new development and increased visitors to southern Nevada.