WILDLAND FIRE MANAGEMENT PLAN

COLUMBIA NATIONAL WILDLIFE REFUGE

2001

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EXECUTIVE SUMMARY

When approved, this document will become the fire management plan for Columbia National Wildlife Refuge Complex including the various scattered parcels under its management. This plan is written to provide guidelines for appropriate suppression and prescribed fire programs within the Columbia National Wildlife Refuge Complex. Prescribed fires may be used to reduce hazard fuels, restore the natural processes and vitality of ecosystems, improve wildlife habitat, remove or reduce non-native species, agricultural residue management, and/or conduct research. Major components include:

– updated policy for prescribed fires within the Complex.

– implements objectives set forth in the Refuge's Habitat Management Plans.

– implements format changes under the direction of the USDI Fish and Wildlife Service Fire Management Handbook (Release Date 6/1/00).

– establishes policy and procedure for wildland fire suppression and prevention within the Complex.

– establishes a prescribed fire program to manage critical habitat and reduce hazardous fuels.

This document is a revision of the current approved fire management plan for Columbia National Wildlife Refuge. In addition, this fire management plan will set policy and procedure for those lands managed by the Columbia National Wildlife Refuge Complex.

INTRODUCTION

Columbia National Wildlife Refuge (NWR) is located in Grant and Adams counties east of the Cascade Mountains in Washington, and encompasses portions of the Crab Creek drainage downstream of Potholes Reservoir flowing to the Columbia River (Appendix C, Figures 3-5). Additions to the Refuge through the former Farmers Home Administration include three parcels owned in fee and several easements in Okanogan County along the Okanogan River, and one easement in Kittitas County south of Ellensburg. The approved core refuge boundaries currently include approximately 23,200 acres from O'Sullivan Dam to a mile west of the old Corfu site. An additional 6,000+ acres between Corfu and the Columbia River are managed under agreement with Washington Department of Fish and Wildlife (WDFW) or as scattered parcels (Appendix C, Figures 3-4).

An Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) addressing prescribed fire in the Fire Management Program were completed on November 25, 1992 and are attached in Appendix D. That document established that prescribed fire is an acceptable tool that will be used in resource management at Columbia NWR. This plan will meet the requirements of the National Environmental Protection Act (NEPA) and the National Historic Preservation Act (NHPA). Intra-service consultation was completed to meet the requirements for NEPA.

This plan is an operational guide for managing both the Refuge's wildland fire and prescribed fire programs. The plan defines levels of protection needed to ensure safety, protect facilities and resources, and restore and perpetuate natural processes, given current understanding of the complex relationships in natural ecosystems. It is written to comply with a service-wide requirement that refuges with burnable vegetation develop a fire management plan (620 DM 1). The Refuge will suppress all wildland fires using appropriate management strategies. Prescribed fire will reduce hazardous fuels and/or improve wildlife habitat through the use of prescribed fires.

Columbia NWR supports and relies upon interagency cooperation from other FWS offices within the fire management zone, as well as those state and federal agencies available from the Central Washington Interagency Communication Center. The Refuge lies within the boundaries of four Rural Fire Protection Districts in two counties, as well as those parcels in Okanogan and Kittitas counties. Fire management planning and operations at the Refuge are conducted with close inter-agency communications.

The headquarters for the Columbia NWR is located in Othello, Washington. A dedicated fire management staff consisting of an Assistant Fire Management Officer (AFMO) and a Supervisory Range/Forestry Technician work year round based out of the Refuge Headquarters. The rest of the Permanent Seasonal fire staff includes a Lead Range/Forestry Technician and two Range/Forestry Technicians. The Refuge staffs two fire engine crews, also based out of headquarters, during fire season. A Zone Fire Management Officer is located at Hanford National Monument and coordinates fire activities with the AFMO.

Wildland fires on the Refuge are suppressed using light hand on the land or Minimum Impact Suppression Techniques (MIST). Only qualified personnel using appropriate personal protective equipment are used in these situations. All prescribed fire operations conducted on the Refuge follow these same basic guidelines. All prescribed burns have a prescribed burn plan that has been approved by the Project Leader. The Project Leader is briefed prior to ignition of a prescribed fire and a GO/NO GO checklist is completed and signed by the burn boss and Project Leader.

The fire management program at Columbia NWR will comply with the Air Quality Smoke Management Guidelines identified in the Fire Management Handbook. Outdoor burning permits will be obtained from the Washington State Department of Ecology. Compliance with local and state air quality offices will be coordinated with ample advance notice.

Interagency cooperation for the core refuge lands includes working with Rural Fire Protection Districts in two (2) counties (Appendix C, Figure 6), the Central Washington Interagency Communication Center (CWICC), the Hanford Fire Department, and the Hanford Reach National Monument/Saddle Mountain NWR and Mid-Columbia River NWR, both part of the Columbia Basin Fire Management Zone.

COMPLIANCE WITH USFWS POLICY

Columbia NWR was established on September 6, 1944 by P.L.O. 243 "... as a refuge and breeding ground for migratory birds and other wildlife," and under the Migratory Bird Conservation Act 16 U.S.C. § 715d "...for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." It is a project feature of the Columbia Basin Irrigation Project (CBIP). This plan will assist in achieving resource management goals as defined in the refuge's Habitat Management Plans. It implements the approved course of action described in the Habitat Management Plans and the Wildland Fire Management Plan Environmental Assessment (EA). The EA for the Refuge's fire management programs is located in Appendix D. The FWS fire policy is based on the Departmental Manual (620 DM 1) and the Federal Wildland Fire Policy and Program Review (1995, 2001).

These management plans are in effect and dictate management actions at the refuge:

- Refuge Management Plan (1/86)
- Grazing Plan (undated, probably 1980, file #14,62(A)1)
- Grassland Management Plan (7/83)
- Adaptive Farm Management Plan (submitted 8/99)
- Hunting Plan (5/86)
- Fisheries Management Plan (2/98)
- Marsh Management Plan (3/89)
- Public Use Management and Development Plan (submitted 6/92)
- Integrated Pest Management Plan (5/97)

The Department Manual, DM 910 (USDI 1997) states the following regarding wildland fires:

> AWildfires may result in loss of life, have detrimental impacts upon natural resources, and damage to or destruction of man-made developments. However, the use of fire under carefully defined conditions is to be a valuable tool in wildland management. Therefore, all wildfires within the Department will be classified either as wildfire or as prescribed fires. Wildfires, whether on lands administered by the Department or adjacent thereto, which threaten life, man-made structures, or are determined to be a threat to the natural resources or the facilities under the Department's jurisdiction, will be considered emergencies and their suppression given priority over normal Departmental programs.
>
> Bureaus will give the highest priority to preventing the disaster fire - the situation in which a wildfire causes damage of such magnitude as to impact management objectives and/or socio-economic conditions of an area. However, no wildfire situation, with the possible exception of threat to human survival, requires the exposure of firefighters to life threatening situations. Within the framework of management objective and plans, overall wildfire damage will be held to the minimum possible giving full consideration to (1) an aggressive fire prevention program; (2) the least expenditure of public funds for effective suppression; (3) the methods of suppression least damaging to resources and the environment; and (4) the integration of cooperative suppression actions by agencies of the Department among themselves or with other qualified suppression organizations.
>
> Prescribed fires may be used to achieve agency land or resource management objectives as defined in the fire management plans. Prescribed fires will be conducted only when the following conditions are met:
>
> a. Conducted by qualified personnel under written prescriptions.

b. Monitored to assure they remain within prescription.

Prescribed fires that exceed the limits of an approved prescribed fire plan will be reclassified as a wildfire. Once classified a wildfire, the fire will be suppressed and will not be returned to prescribed fire status.@

The authority for funding (normal fire year programming) and all emergency fire accounts is found in the following authorities:

Section 102 of the General Provisions of the Department of Interior's annual Appropriations Bill provides the authority under which appropriated monies can be expended or transferred to fund expenditures arising from the emergency prevention and suppression of wildland fire.

P.L. 101-121, Department of the Interior and Related Agencies Appropriation Act of 1990, established the funding mechanism for normal year expenditures of funds for fire management purposes.

31 US Code 665(E)(1)(B) provides the authority to exceed appropriations due to wildland fire management activities involving the safety of human life and protection of property.

Authorities for procurement and administrative activities necessary to support wildland fire suppression missions are contained in the Interagency Fire Business Management Handbook.

The Reciprocal Fire Protection Act of May 27, 1955 (42 USC 815a; 69Stat 66) provides Authorities to enter into agreements with other Federal bureaus and agencies; with state, county, and municipal governments; and with private companies, groups, corporations, and individuals regarding fire activities.

Authority for interagency agreements is found in AInteragency Agreement between the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, US Fish and Wildlife Service of the United States Department of the Interior and the Forest Service of the United States Department of Agriculture@ (1996).

Federal Laws, Regulations and Authorities Relating to the Fire Management Program include:

The Protection Act of September 20, 1922 (42 Stat. 857:16 USC 594), which authorizes the Secretary of the Interior not only to protect Departmental land from fire, but also to cooperate with both Federal and state agencies, as well as private land-owners.

The Economy Act of June 30, 1932 (47 Stat. 417; 31 U.S.C. 1535), which authorizes Federal agencies to enter into contracts and agreements for services with each other.

The Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66, 67; 42 U.S.C. 1856a) as amended by The Wildfire Suppression Assistance Act of 1989 (102 Stat. 1615), which authorizes reciprocal fire protection agreements with any fire organization for mutual aid, with or without reimbursement, and allows for emergency assistance in the vicinity of agency facilities in extinguishing fires when no agreement exists.

The National Wildlife Refuge System Administration Act of 1966, as amended by The National Wildlife Refuge System Improvement Act of 1997 and The Refuge Recreation Act of 1962 (80

Stat.927) (16 U.S.C. 668dd-668ee) (16 U.S.C. 460K-460k4), which governs the administration and use of the National Wildlife Refuge System.

National Environmental Policy Act of 1969, which requires the documentation of environmental considerations for any significant actions.

Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq., which requires consultation with USFWS on effects to listed species.

Disaster Relief Act of May 22, 1974 (88 Stat.143; 42 U.S.C. 5121), which authorizes Federal agencies to assist State and local governments during emergency or major disaster by direction of the President.

Federal Fire Prevention and Control Act of October 19, 1974 et seq. (88 Stat. 1535; 15 U.S.C. 2201) as amended, which authorizes reimbursement to State and local fire services for costs incurred in firefighting on Federal Property.

Federal Grants and Cooperative Act of 1977 (Pub. L. 95-244, as amended by Pub. L. 97-258, September 13, 1982. 96 Stat. 1003; 31 U.S.C. 6301-6308), which eliminates unnecessary administrative requirements on recipients of Government awards by characterizing the relationship between executive agencies and contractors, States and local governments and other recipients in acquiring property and services in providing U. S. Government assistance.

Supplemental Appropriation Act of September 10, 1982 (96 Stat. 837), which authorizes both the Secretary of the Interior and the Secretary of Agriculture to enter into contracts with State and local government entities, including local fire districts, for procurement of services in pre-suppression, detection and suppression of fires on any unit within their jurisdiction.

Wildland Fire Suppression Assistance Act of 1989 (Pub. L. 100-428, as amended by Pub. L. 101-11, April 7, 1989)

Departmental Manual (Interior), Part 620 DM 1, Wildland Fire Suppression Management (March 29, 1990): Defines Department of Interior Fire Management Policies.

National Wildlife Refuge System Improvement Act of 1997 (16 USC 668dd et.seq. P.L. 105-57) Authorizes the Secretary of the Interior to : "(A) provide for the conservation of fish, wildlife, and plants and their habitats within the system. (B) ensure that the biological integrity, diversity, and environmental health of the System are maintained of the benefit of present and future generations of Americans."

Additional direction is provided in other parts of management policies, such as the National Wildfire Coordination Group publication "Wildland and Prescribed Fire Qualification System" (MS 310-1, 2000). The Agency Fire Management Handbook also provide that all Refuges which contain vegetation that can support fire will develop a fire management plan and program reflecting U.S. Fish & Wildlife Service policies and ecological characteristics specific to the area.

The authorities for entering into cooperative agreements are the Reciprocal Fire Protection Act of May 27, 1955 (42 U.S.C.; 8156a; 69 Stat. 66).

FIRE MANAGEMENT OBJECTIVES

While ensuring firefighter and public safety as the first priority in every fire management activity, all wildland fires will be suppressed using appropriate management strategies; the potential damage to natural and cultural resources by fire and fire suppression activities will be considered. All wildland fires, in the refuge and within the interagency Mutual Threat Unit (the MTU encompasses those lands included in a perimeter one mile from the boundary of all refuge lands, including those lands referred to as parcels) will be suppressed commensurate with values at risk, utilizing the appropriate management response. The strategy and tactics employed will be dictated by the strategies developed for the appropriate management response.

Prescribed fires may be used to meet specific resource management or fire management objectives including, but not limited to, wildlife management, vegetation management, water delivery, research accommodation, and hazard fuel reduction. The need to implement an efficient system to monitor and evaluate the effectiveness of the fire program will be addressed.

A fire prevention program will be developed to help prevent human caused fires, prevent modification of refuge ecosystems by human caused wildland fire, and prevent damage to cultural resources or physical facilities. Due consideration will be given for adjacent private property values. When practical, these efforts will be coordinated with other agencies. The prevention plan will identify fire prevention actions and programs needed to reduce the likelihood of ignitions in areas where wildland fire is unacceptable and identify who is responsible for each activity and when each will be developed.

Sections 620 DM 1 and 621 FW 1 of the DOI and USFWS Manuals, respectively, details both the Department's and Service's fire management policy objectives. These objectives describe firefighter and public safety, training and qualifications, interagency involvement, fire as an ecological factor, prescribed fire management, and cost effectiveness of the fire management program.

The Department of the Interior Manual (620 DM 1) lists the following wildland fire management objectives:

A. Provide for firefighter and public safety in every fire management activity.

B. Make full use of wildland fire and prescribed fire both as a natural process and as a tool and incorporate the role of wildland fire as an essential ecological process and natural change agent into the planning process. Fire may also be used as a tool to maintain and restore cultural landscapes or to dispose of vegetation and debris.

C. Develop fire management plans, programs, and activities which are based on the best available science; which incorporate public health and environmental quality considerations; and which support bureau land, natural, and cultural resource management goals and objectives.

D. Ensure economically viable fire management programs and activities are based on values to be protected; cost effectiveness; risk management; and land, natural, and cultural resource management objectives.

E. Initiate and maintain full Federal, Tribal, State, and local interagency coordination, with the involvement of all parties, to insure cooperation, and collaboration.

F. Standardize policies and procedures among Federal agencies and Tribes.

G. In cooperation with other wildland fire management agencies, develop and implement prevention strategies at the local, regional and national levels.

The Service manual (621 FWS 1) makes the following additions to these Departmental policies. The Service will use only trained and certifiably qualified personnel to participate in the fire management program. The Service will integrate fire, as an ecological process, into resource management plans, based upon the best available science. The Service will employ prescribed fire for managing resources and protecting against unwanted wildland fire whenever it threatens human life, property, and both natural and cultural resources. Once people are committed to an incident, the human resources become the highest value to receive protection. When the need arises to prioritize between property and natural/cultural resources, the Service will base the decision on relative protection values, commensurate with the fire management costs. The Service will provide safe, cost-effective fire management programs in support of land, natural and cultural resource management plans.

Fire is an essential part of the natural Columbia Basin ecosystem, and a primary tool available to resource managers for vegetation and habitat management. This Plan will describe actions necessary to implement Service-wide fire management policies (Fire Management Handbook) and to achieve complex resource management goals.

In support of the Service's mission, The National Wildlife Refuge System Improvement Act of 1997 specifically directs the Service to "*provide for the conservation of fish, wildlife, and plants on refuges; maintain the biological integrity, diversity, and environmental health and monitor the status and trends of fish, wildlife, and plants*" of the System.

Columbia NWR is in the process of developing a Comprehensive Conservation Plan scheduled for completion in 2007. The following programmatic goals for the refuge will be re-addressed during this planning effort:

1. Provide habitat for migratory birds, especially ducks, geese, swans, and cranes, during the spring/fall staging and winter periods.

2. Protect and restore a diversity of native habits for indigenous fish, wildlife, and plants within the Columbia Basin eco-region.

3. Protect, restore, and develop habitats for and otherwise support recovery of Federally-listed endangered and threatened species and help prevent the listing of species of management concern.

4. Provide high-quality opportunities for wildlife-dependant recreation and environmental education to enhance public appreciation, understanding, and enjoyment of refuge fish, wildlife, habitats, and cultural resources.

DESCRIPTION OF REFUGE

The Columbia NWR was established in 1944 by P.L.O. 243 and has been actively managed since 1955. Approximately 30,000 acres scattered across four counties comprises the Columbia NWR land base (Figure 3-4). Most of the refuge land is astride Crab Creek between Potholes Reservoir and the Columbia River in both Grant and Adams Counties. The land base includes 176 acres of fee and easement lands along the Okanogan River in Okanogan County and eleven acres of easement along Wilson and Naneum Creeks in Kittitas County.

Lava flows from volcanoes in the Cascade Mountains laid down layers of basalt thousands of feet thick. The retreat of glaciers and snow melt during the most recent Ice Age 11-15,000 years ago created ice dams and massive water flows that eroded through the basalt across the Columbia Basin. The resulting topography varies from gently rolling to sharply eroded scabrock flood channels with coulee and bench areas of mostly shallow soils. The mountains intercept precipitation off the Pacific Ocean, creating a semi-desert condition with adapted plants. The area was mostly sagebrush and steppe grassland, but with the infusion of water from the Columbia Basin Irrigation Project (CBIP), low areas have filled to create numerous small lakes and wetlands.

CULTURAL RESOURCES

Tremendous cultural activity centered around Crab Creek where prehistoric and early man used it as a corridor during travel through the Channeled Scablands. Two trails of historic importance, the White Bluffs and Cariboo, pass through the Refuge and were used by inhabitants and travelers. Archeological deposits dating more than 10,000 years have been detected on Refuge lands and the area retains traditional cultural significance to members of the Yakama, Nez Perce, and Colville Tribes, and the Wanapum People. Their ancestors resided on the land and used its resources; their past and present culture is tied closely with the Refuge landscape. Through time, the Refuge and its scabland features have never been a major center of habitation by man. Prehistoric humans inhabited the area seasonally and it was not until the arrival of Euro-Americans that a permanent inhabitation occurred on what is now Refuge lands. Euro-Americans first visited the area as explorers, fur trappers, military units, miners, and settlers. By 1880, cattle ranches and farms were establish on lands currently within the Refuge. The Federal Government began acquiring lands in and around the Refuge in the early 1940's as part of the CBIP. Numerous archaeological sites have been recorded on the Refuge, with documentation secured at the State Historic Preservation Office and the U.S. Fish and Wildlife Pacific Regional Office.

There are two locations within the Refuge where culturally significant structures exist. Both structures, a wooden dam and a section of the White Bluff's Trail, should be taken into consideration if any fire-related activities occur.

FISH AND WILDLIFE

Fish and wildlife present are typical of shrub steppe, wetland, and riparian areas of the northern Great Basin. The introduction of water during the 1950's through the CBIP has created changes to the landscape that are rather dramatic, with concomitant changes to fish and wildlife populations. These alterations have increased mostly wetland-dependant species while generally reducing species dependant on drier environments.

Few fish were present in the area before the introduction of CBIP irrigation raised the water table and created seepage from Potholes Reservoir and canals. Other than possibly steelhead trout migrating up Crab Creek, only small non-game fish were present. The increase in permanent lakes and wetlands opened the door for active gamefish management, and currently both trout and limited spiney ray fisheries

are managed through an agreement with the Washington Department of Fish and Wildlife (WDFW). Because several Refuge waters are linked directly to the CBIP water delivery and return flow canal system, numerous intentional and unintentional introductions have occurred, the most dramatic of which is the common carp (*Cyprinus carpio*), which significantly impacts aquatic vegetative composition and wetland function.
The tiger salamander (*Ambystoma tigrinum*) and northern leopard frog (*Rana pipiens*) are both sensitive amphibian species that occupy certain Columbia NWR lakes and wetlands mostly devoid of fish. Aquatic insects are near the bottom of the food chain in these aquatic systems. Because amphibious populations can be sensitive indicators of certain environmental degradations, their habitats sometimes require special attention. Several other amphibians and reptiles use wet and dry sites on Columbia NWR. One reptile that raises a safety issue is the western (northern Pacific) rattlesnake (*Crotalus viridis*). While this species is very timid and will shy away from an encounter, anyone bitten should seek immediate medical attention.

Mammals on Columbia NWR include at least 32 species. The Washington ground squirrel (*Spermophilus washingtoni*) is currently listed as a Federal Candidate Species for listing under the Endangered Species Act (ESA). Three colonies are known on the Refuge and will receive special consideration in all prescribed and wildland fire management decisions. Locally, this species is the key factor in the grassland guild that includes badger (*Taxidea taxus*), Burrowing Owl (*Athene cunicularia*), Prairie Falcon (*Falco mexicanus*), and Ferruginous Hawk (*Buteo regalis*), all declining species. It is likely that habitat improvements involving fire will be implemented once current and planned research on the species provides answers addressing population declines.

More than 230 species of birds have been recorded on Columbia NWR and surrounding lands. The establishing legislation specifically addresses migratory birds as the primary purpose for the Refuge, and all management planning will address these species. Seasonal closure from fall migration through early spring allows resting and feeding of up to 70,000 ducks (90+% Mallards) and 30,000 geese (90+% arctic-nesting Canada Geese.) The Sandhill Crane (*Grus canadensis*) migration, especially in the spring, is such a significant occurrence that the Refuge has joined with the Othello Chamber of Commerce and other partners to hold a Sandhill Crane Festival in Othello every year in March. Some Columbia NWR farm fields are managed specifically for waterfowl and crane viewing opportunities, mainly for Festival busses and the general public, during the spring migration.

Wading birds are not known to nest on Columbia NWR but are an important component of wetland foraging guilds at the upper end of the food chain. The largest rookery in Washington for Great Egret (*Ardea alba*) occurs north of the Refuge on Potholes Reservoir, along with Double-crested Cormorant (*Phalacrocorax auritus*), Great Blue Heron (*Ardea herodias*), and Black-crowned Night-Heron (*Nycticorax nycticorax*), which all share the rookery, forage on Refuge fish, bullfrogs, and other wetland-associated vertebrates. The White-faced Ibis (*Plegadis chihi*), although a rare wanderer at the very northern edge of distribution, has become an annual visitor pursued by birdwatchers from across the State.

Birds of prey, both diurnal and nocturnal, use cliff ledges and holes as well as trees for nesting and roosting. The Bald Eagle (*Haliaeetus leucocephalus*) has Threatened status under the Endangered Species Act (ESA). It occurs on the Refuge during the winter months, using trees and cliffs near water for foraging and resting. Management activities that concentrate waterfowl (including some fall and winter prescribed burning in grassland or cropland) benefit the Bald Eagle.

Birds associated with shrub steppe are the largest group of management-priority species that occur on the Refuge. In addition to the birds listed in the grassland guild, sagebrush-obligate species such as Sage Sparrow (*Amphispiza belli*), Brewer's Sparrow (*Spizella breweri*), Sage Thrasher (*Oreoscoptes montanus*), and shrub obligate Loggerhead Shrike (*Lanius ludovicianus*) all have experienced significant population declines associated with loss of shrub cover in eastern Washington. The Western Sage Grouse (*Centrocercus urophasianus phaios*), a population that occurs only in eastern Washington and central and southern Oregon, is a Candidate for listing under the ESA as Threatened. This species is considered extirpated as a breeding species on the Refuge but may occur infrequently on Saddle Mountain, immediately to the south. Habitat fragmentation, loss of shrub cover and degradation of the grass and forb understory have contributed to this loss. Agricultural conversion and increased fire frequency due to overgrazing and the increase in cheatgrass are mostly responsible.

Birds associated with riparian woodlands are also a management priority. Willow woodland along Crab Creek was either removed or lost to changing hydrology and water management. Peachleaf willow (*Salix amygdaloides*) was a primary component of the riparian corridor that is nearly gone, mostly replaced by the introduced and now naturalized Russian-olive (*Elaeagnus angustifolia*). Restoration efforts along Crab Creek, and protection from fire at remaining willow stands that occur mostly along springs and seeps, are intended to return cavity nesting birds like Downy Woodpecker (*Picoides pubescens*), and secondary cavity nesters such as House Wren (*Troglodytes aedon*) and Ash-throated Flycatcher (*Myiarchus cinerascens*). The flycatcher will be used to measure success of riparian restoration efforts. Russian-olive is also a concern along the Okanogan River and threatens to displace cottonwood and willow stands important to the Yellow Warbler (*Dendroica petechia*) and Willow Flycatcher (*Empidonax traillii*).

VEGETATION

The Columbia NWR contains four major terrestrial habitat types. The vegetation mosaic of the region is made up of fairly large, contiguous areas of steppe and shrub-steppe types. It is an area dominated by bunchgrass and sagebrush communities. Two dominant zonal associations are present: sagebrush-bluebunch wheatgrass, and bluebunch wheatgrass-Idaho fescue. Minor differentiations due to variations in temperature, seasonal (and total) distribution of precipitation, and soil type occur within each of these associations. In general, the zone of demarcation between the sagebrush-bluebunch wheatgrass association lies at varying distances from the Columbia River and reflects topographic, soil, and climatic differences between the dry lowlands and the relatively moist uplands.

Shrub-Steppe

Daubenmire (1970) described the shrub-steppe community in Washington. The shrub-steppe community comprises 15,805 acres of the Refuge and is a mixture of shrubs and grasses. The dominant plant depends on environmental factors such as soil type and time since last disturbance. The sagebrush-bluebunch wheatgrass association dominates the shrub-steppe. This association exists in loose, coarsely textured soils, where disturbance has been infrequent. Plants capable of tolerating the summer drought characterize this community, including an overstory of shrubs, particularly sagebrush, and an understory of perennial bunchgrass. This association consists of a shrub layer, a tall grass layer, and a short grass layer. Big sage (*Artemesia tridentata*) dominates the shrub layer. Rabbitbrush (*Chrysothamnus* spp.) and antelope bitterbrush (*Purshia tridentata*) are present in the shrub layer. The principal tall grass is bluebunch wheatgrass (*Pseudoroegneria spicatum*) with lesser amounts of needlegrass (*Stipa* spp.). Sandberg bluegrass (*Poa sandbergii/secunda*) comprises the short grass layer.

Greasewood (*Sarcobatus vermiculatus*) dominates areas with heavier soils and higher salt content found along riparian areas.

Grasslands dominated by cheatgrass (*Bromus tectorum*) represent areas that are recovering from past disturbance such as fire, grazing, or cultivation.

The shrubs remain active throughout the summer by tapping permanent moisture in the subsoil. Another important component of the shrub-steppe community is a layer of mosses and lichens known as the cryptogam layer located in the bitterbrush community (Daubenmire 1970). This assemblage of bryophytes forms a microbiotic crust that covers the area's fine soils and minimizes wind erosion. Disturbance of the cryptogam crust leaves shrub-steppe communities vulnerable to invasion by exotics; consequently, native plant species tend to be more prevalent in areas where this layer is intact within this steppe-type mosaic. Therefore, wildland fires should be controlled in these areas and not be prescribed for fire use.

The historic fire regime for the shrub-steppe was a relatively infrequent, fire return interval of 32-70 years, with low intensity fire. These fires were probably small since the fuel continuity was limited. The invasion of cheatgrass (*Bromus tectorum*) has altered the fire regime. Cheatgrass is an annual grass that produces prolific amounts of seed. These seeds invade openings and the mature plants are highly flammable. The seeds are cast onto the surface and often survive fires. Cheatgrass also has an additional competitive advantage because it is a non-native introduction without a full complement of inhibiting or controlling predators or diseases found in native species, and can germinate at low temperatures giving the species an advantage in the utilization of fall and winter moisture. Therefore, the size of contemporary fires is larger than the historic fires and the intensity is greater from the increased available fuel. Various successional stages exist in this association responding to perturbations by grazing, cultivation, or fire.

Several showy species of wildflowers, such as balsamroot (*Balsamorhiza* spp.), evening primrose (*Oenothera* spp.), yarrow (*Achillea* spp.), and brodiaea (*Brodiaea* spp.) are evident due to locally unusual soil and climatic properties. Significant to the region, the association is found on sandy, gravelly soils in the drier portions and dominated by needle-and-thread grass (*Stipa comata*) and small growth sagebrushes.

Wetlands and Emergent Marsh

Wetlands and emergent marsh comprise 3,547 acres of the Refuge and exist along the Crab Creek drainage and adjacent to the numerous water impoundments. The emergent vegetation of the complex's marshes is dominated by bulrushes (*Scirpus* spp.), cattails (*Typha* spp.), and sedges (*Carex* spp.). Saltcedar (*Tamarix ramosissima*) is currently invading some of these wetland habitats.

This habitat type is rarely damaged by fire since pereniating tissues are usually either under water or below the surface.

Riparian Woodlands

Riparian woodlands are restricted to 290 acres of a linear fringe along the shorelines of the rivers, backwaters and ponds. Black cottonwood and several species of willows comprise the native component, but extensive growth of exotic Russian-olive (*Elaeagnus angustifolia*) is evident and expanding. Prescribed fire may be used in these areas for control of Russian-olive, or other uses depending on resource management objectives.

Most tree species that grow in riparian areas do not tolerate fire occurrence. These species often have thin bark that does not protect the cambium from the heat of fires.

Croplands
Local cooperators farm 730 acres. Their crops are alfalfa or grass hay and grains. These fields are managed for food use of migratory birds. Fire removes crop litter to enhance wildlife usage and removes excessive growth along irrigation ditches. Farmers in the area often use fire to burn the stubble that remains after harvest, but this practice is decreasing.

PHYSICAL RESOURCES
Climate
Central Washington has a semiarid climate. The summers are hot while the winters are moderately cold. Temperatures range from an average minimum of about 20 degrees F above zero in January to an average maximum of 91 F in July, although extremes of 22 degrees F below zero and 113 degrees F above zero have been recorded. The average annual precipitation is 8 inches, occurring mostly in the fall and winter. Prevailing westerly winds are most frequent during the spring months and when combined with dry weather conditions produce dust storms of varying severity.

Soil Types
The Natural Resource Conservation Service and the Bureau of Reclamation have described soil types in detail. Soils for the Columbia NWR are also described in the Refuge's 1979 Environmental Assessment on the Operation of the Grazing Program. Channeled scablands in the northern portion have soils derived from loess and sand which overlie basalt, gravel, and sand. Land in the southern portion is mostly alluvial in origin and is generally fine textured soil. Characteristically, water tables are high, drainage poor, and soils contain high quantities of soluble salts.

STRUCTURES AND FACILITIES
There are a number of structures located throughout the Refuge, although most buildings are located in the shop or work center area. Those facilities identified in Firebase are listed in Table 1. The heavy equipment and other refuge vehicles are parked in common areas at the shop. Routine maintenance activities of refuge equipment occurs in these areas. A hazardous material storage building is located within the main shop at the work center. Herbicides, pesticides, cleaning chemicals, paint and petroleum products are the common hazardous materials used on the refuge.

The non-county or state road system on Columbia NWR is divided into 3 major categories, public roads, service road/fire break, and access trails (Appendix C, Figures 7-8). Vehicle access on the many miles of improved aggregate surfaced roads within the refuge is good. The access trails are primarily a native sandy surface and can become impassible once the surface is disturbed due to continual use. Therefore, use of these roads is discouraged. The improved aggregate surface of the main public and service roads allows for optimal travel.

A main powerline system parallels the O'Sullivan dam of the Potholes reservoir at the north end of the refuge. Secondary powerlines are associated with the irrigation pumps at the four farm units. A detailed map will be generated upon incorporation of the Refuge GIS system.

Table 1: Facilities and Structures

Facilities and Structures - Columbia National Wildlife Refuge

5 - Pumphouses
1 - Double Wide Trailer
1 - Carpenter Shop
1 - Equipment Storage
1 - Work Shop
1 - Storage Facility
1 - Oil Storage Facility
1 - Fuel Pumping Station (not listed in Firebase)
3+ - Interpretive Signs (only 3 listed in Firebase)
1 - Engine Bay/Fire Cache
6 - Irrigation Center Pivots (not listed in Firebase)

WILDLAND FIRE MANAGEMENT SITUATION

HISTORIC ROLE OF FIRE

Pre-settlement Fire History

Although natural fire is a factor in this ecosystem, the historic fire regime was a 32 to 70 year fire return interval (Quigley and Arbelbide 1997) of small, high-intensity fires that removed small patches of the fire-intolerant shrub overstory. The bunchgrass component of the native shrub-steppe is a discontinuous fuel bed that prevented many large fires (Paige and Ritter 1999). The introduction of cheatgrass changed this regime by providing a continuous layer of available fuel. Fires that start in cheatgrass stands often spread to surrounding habitats, resulting in the loss of shrubs from adjacent communities. The recovery of sagebrush in these communities may be very slow. Although wind can disperse sagebrush seeds up to 90 feet (30 m), most seeds fall within 3 feet (1 m) of the canopy (Meyer 1994 *in* Paige and Ritter 1999). An increase in fire size results in fire impacting specific locations more frequently. Thus, the current fire regime is a short fire return interval of large, high-intensity fires that removes large patches of the fire-intolerant shrub overstory.

Post-settlement Fire History

Organized fire suppression organizations developed in the early twentieth century nationwide. The organized suppression of wildland fires probably coincided with the development of the area for agricultural use, which both fragmented the shrub-steppe and reduced fuels through grazing. The presence of extensive stands of fire-intolerant sagebrush stands indicates there has been a long fire free-interval. Similarly, the extensive stands of exotics that invade disturbed areas indicate the size of recent fire perturbations.

Records show that most ignitions have occurred typically from late March to mid-October. Depending on the specific weather of any particular year, the seasons may be shorter or longer and, therefore, may start earlier or last longer. Usually, June through August have some dry lightning storms that pose ignition hazards across the Columbia Basin. These predictable events allow increased staffing to respond through the Step-up Plan (Appendix F).

Table 2: Historic Wildland fires

YEAR	FREQUENCY	ACRES BURNED
1981	1	0.0*
1982	0	0.0
1983	2	0.0*
1984	5	4224.0
1985	12	749.1
1986	1	103.0
1987	4	161.0
1988	2	74.5
1989	2	0.9
1990	2	176.0
1991	3	5.4
1992	6	691.3
1993	11	368.3
1994	8	22.8
1995	5	20.2
1996	4	7.1

1997	17	967.7
1998	4	22.6
1999	11	0.0*
2000	20	137.9
AVERAGE	6.0 fires / year	386.6 acres burned/ year

*According to the Shared Application Computer System (SACS), for the years 1981, 1983 and 1999, there were 1, 2 and 11 ignitions on refuge, respectively, with 0.0 acres burned. At this time, no indication is given as to how these numbers were derived.

Of the above listed fires and acres, the majority of each are human-caused ignitions. During the time frame of 1981-2000, 81 fires (67.5%) were human-caused while 29 (24.2%) were ignited by an unknown source. Refuge acres burned by these fires total 1945.8 for human caused and 5786.5 for the fires caused by an unknown ignition source. This averages out to 4.1 fires per year and 97.3 acres per year caused by human ignitions. Lightning during this time period accounted for only 9 (7.5%) ignitions and 1128.8 acres.

Prescribed Fire History

The current prescribed fire season is split into two seasons, early spring and fall (February 10 to April 10 and September 10 to October 17). Prescribed fire records available through SACS show Columbia NWR using prescribed fire starting in 1985, however Refuge narrative reports indicate that prescribed burning goes back to the beginning of crop production in the 1960's. The first recorded use of prescribed fire (planned burning) was documented in 1963 “to make available the remaining shattered grain and to facilitate seed bed preparation”. Today, the refuge uses prescribed burning for wildlife management, vegetation control, and hazard fuel reduction, with the emphasis moving towards the latter. Total Refuge acres burned through the use of prescribed fire since 1985 (from SACS) are 4438.1, with an average of 277.4 acres per year. Current annual targets are 600 acres per year. The largest prescribed fire to date was in 1998 at Royal Lake. This burn was 750 acres.

RESPONSIBILITIES

The Columbia NWR organization is shown in Figure 1. The fire management section is part of a Zone that includes the Hanford Reach National Monument/Saddle Mountain National Wildlife Refuge. A Fire Analysis Committee for the Refuge consisting of the Project Leader, Deputy Project Leader, Refuge Biologist, Zone Fire Management Officer, Assistant Fire Management Officer and Supervisory Range/Forestry Tech exists. Other staff personnel may be designated as being on the Fire Analysis Committee, at the discretion of the Project Leader. The committee shall meet prior to and following the fire season to determine objectives and needs for fire management for the ensuing year, to coordinate and critique the committee's operations and function, and review the Fire Management Plan, making revisions as deemed necessary. The Project Leader may convene the committee whenever fire and weather conditions indicate that fire presents a serious problem to the Refuge resources. When convened, the committee shall evaluate fire potential, weather and management concerns, and determine an appropriate course of action, using the Fire Management Plan and other Management Plans as guidelines.

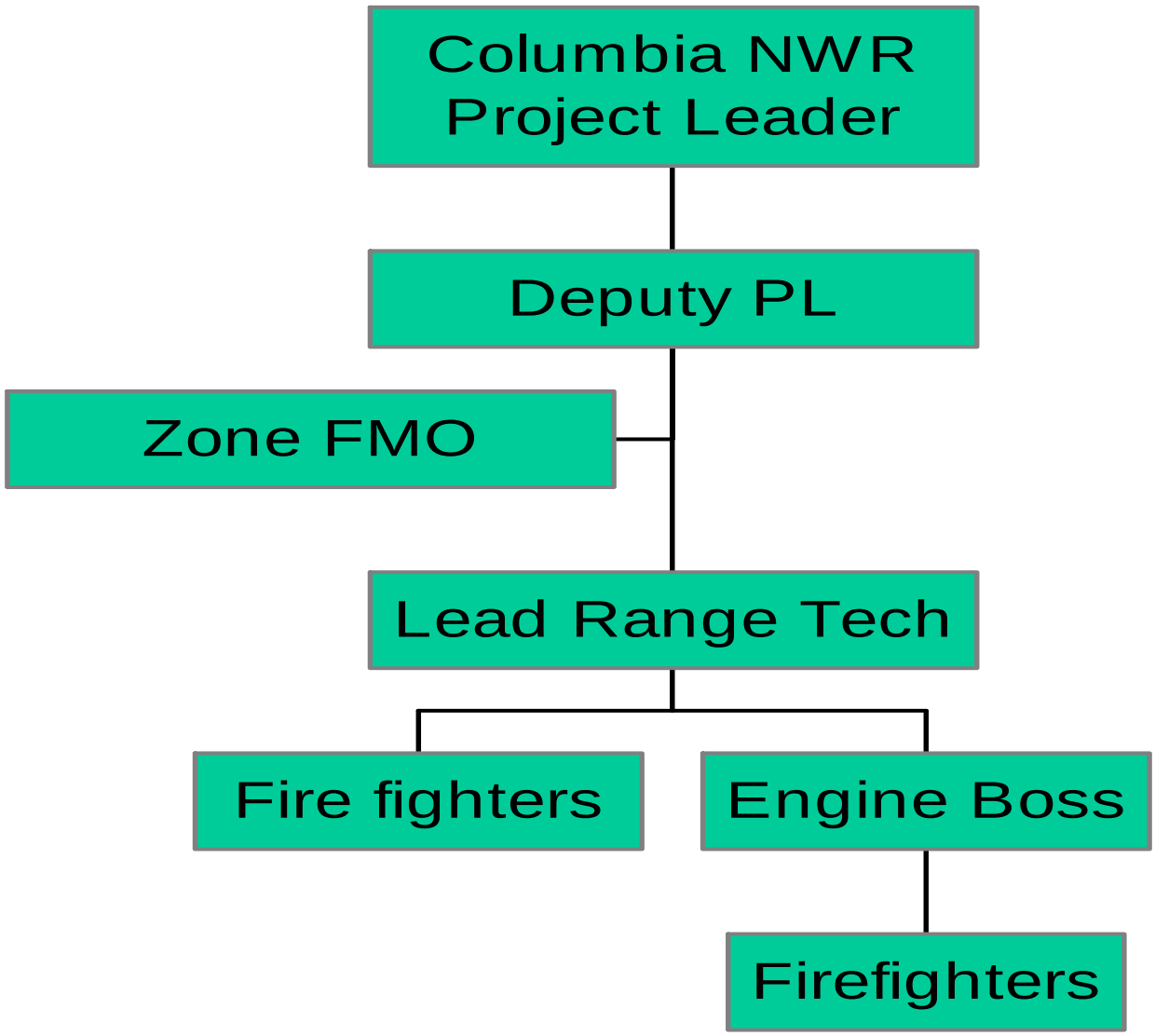
The primary responsibilities of the fire management staff are to provide initial attack fire suppression capability on the Refuge, conduct hazard fuels reduction projects, provide interagency support in fire suppression and conduct prescribed burns in support of Refuge habitat and water management programs.

A Zone FMO was assigned to Columbia NWR from 1995-1997, however, it was not until 2001 that a dedicated Assistant Fire Management Officer was placed at Refuge headquarters. The Fire Management

organization at the Refuge is currently staffed with five permanent employees. The organization consists of an Assistant Fire Management Officer, Supervisory Range/Forestry Technician, Lead Range/Forestry Technician and two Range/Forestry Technicians. The Assistant Fire Management Officer works directly under the Deputy Project Leader. The Project Leader and Deputy Project Leader are both directly involved with overseeing the fire management program. The permanent fire staff is supported by four temporary seasonal firefighters during the fire season.

Suppression capability on the Refuge consists of two ICS type 6 engines and one type 3 water tender. Both engines and the tender are equipped with "Class A" foam to increase effectiveness in all aspects of fire operations.

Figure 1: Columbia NWR Fire Management Organization



Project Leader (PL)

< Final responsibility for development and implementation of fire management program to ensure compliance with Department, Service and refuge policies.
< Initiates formal, written limited Delegation of Authority to Incident Commanders (ICS) for suppression of wildland fire (Appendix G).
< Approves Cooperative and Interagency agreements.
< Annually reviews fire management program prior to fire season.
< Approves all prescribed fire plans.
< Approves Wildland Fire Situation Analysis (WFSA) (Appendix M).

Deputy Project Leader (DPL)

< Coordinates Refuge programs to ensure personnel and equipment are made available and utilized for fire management activities including fire suppression, prescribed burning and fire effects monitoring.
< Ensures that the fire management program has access to Refuge resources when needed.
< Ensures that refuge staff consider the fire management program during Refuge related planning and implementation.
< Supervises Assistant Fire Management Officer.

Zone Fire Management Officer (FMO)

< Responsible for all fire related planning and implementation for the zone.
< Solicits program input from the zone staff.
< Integrates biological objectives into all fire management planning and implementation.
< Supervises prescribed fire planning.
< Coordinates with cooperators to ensure adequate resources are available for fire operational needs.
< Determines when ecological and political triggers are reached for wildland fire and prescribed fire implementation purposes.
< Responsible for implementation of this Plan. This responsibility includes coordination and supervision of all prevention, pre-suppression, detection, wildland fire, prescribed fire, suppression, monitoring, and post-fire activities involving Refuge lands.
< Prepares an annual report detailing fire occurrences and prescribed fire activities undertaken in each calendar year.
< Serves as a post-year's fire management activities review, as well as providing documentation for development of a comprehensive fire history record for the complex.
< Submits budget requests and monitors FIREBASE funds allocated to Columbia NWR.
< Nominates personnel to receive fire-related training, as appropriate.
< Designates the person to serve as Incident Commander (IC) for initial attack purposes.
< Assumes the position of IC at his/her discretion or designates other personnel to take over that position at his/her discretion.
< Provides guidance to Assistant Fire Management Officer.

Assistant Fire Management Officer (AFMO)

< Has many of the same duties and responsibilities as the FMO; works closely with him/her to coordinate and implement the Columbia NWR fire management program.
< Develops and implements cooperative fire agreements with adjacent agencies and land owners.
< Coordinates fire management program and activities with adjacent agencies.
< Maintains close contact with dispatch centers to assure proper communications.

< Responsible for preparation of fire reports following the suppression of wildland fires and for operations undertaken while conducting prescribed fires.
< Maintains records for all personnel involved in suppression and prescribed fire activities, detailing the individual's qualifications and certifications for such activities.
< Updates all fire qualifications for entry into the Fire Management Information System.
< Coordinates personnel to receive fire-related training, as appropriate.
< Designates the person to serve as Incident Commander (IC) for initial attack purposes.
< Prepares reports, prescribed burn plans, fire management plans, time and attendance reports.
< Assists with the budget needs analysis and prepares the final budget.
< Approves crew acquisition requests.
< Supervises Supervisory Technician.
< Ensures Step-Up Plan is followed.
< Maintains liaison with Regional Fire Management Coordinator and Zone FMO.
< Responsible for the planning and implementation of a program, which collects information for the documentation, analysis, and prediction of fire behavior and effects.
< Develops and recommends plans, and schedules management ignited fire activities for the Refuge in conjunction with the Biologist. May serve as burn boss on projects.
< Coordinates planning and implementation of fire hazard reduction projects.
< Responsible for record keeping associated with burn planning, fire occurrence reporting and fire weather.
< Identifies areas of fire management requiring research and works with Biologist in the development of project statements to accomplish this research.
< Aviation management and radio coordinator.

Wildlife Biologist

< Coordinates through Refuge Managers to provide biological input for the fire program with the FMO and AFMO.
< Initiates proposals and objectives for resource management prescribed burns.
< Assists in design and implementation of fire effects monitoring with FMO and AFMO.
< Participates, as requested, in prescribed burning and wildland fire suppression.
< Serves as the Wildland Fire Resource Advisor, as required.
< Conducts Section 7 Consultation actions, as needed for compliance with the Endangered Species Act.
< Maintains library and database on complex specific fire ecology literature, research findings, fire monitoring plot analysis, sensitive resources locations, etc.
< Maintains Resource Advisor's Kit.
< Serves as a member of Burned Area Emergency Rehabilitation teams assigned to the complex; ensures long term implementation of approved BAER plans.
< Responsible for the implementation of the science and research program as proposed within this plan.

Supervisory Forestry/Range Technician

< Serves as the day to day supervisor for seasonals and permanent seasonals and assures that project work is completed in a timely and efficient manner.
< Collection and correction of time and attendance reports.
< Serves as initial attack incident commander on both on and off-refuge fires.

< Responsible for planning, coordinating, and directing preparedness activities including fire training, physical fitness testing, fire cache and equipment inventory accountability, maintenance, and operation, cooperation with cooperative agencies.
< Ensures fire management policies are observed.
< May serve as prescribed fire burn boss, propose prescribed fire projects and write prescribed fire burn plans.
< Assists the Biologist with fire effects monitoring.
< Helps prepare a Refuge fire prevention plan, and coordinates fire prevention with other employees.
< Assists in updates of Fire Management Plan, maintains fire records, reviews fire reports (DI-1202) for accuracy, and enters fire reports into SACS.
< Maintains engines, cache and related fire equipment in state of readiness.
< Tracks task book activity for all crew personnel as delegated by the AFMO.

Lead Forestry/Range Technician

< Engine Crew Supervisor.
< Assigns and accomplishes tasks.
< Ensures crew safety.
< Implements project work.
< Prescribed fire preparation and implementation.
< Completion of crew time and attendance.
< Initiates fire reports, turns in to the Supervisory Range Technician.
< Fire Equipment service and maintenance log for all vehicles.
< Crew work log.
< Maintains inventory of refuge fire cache.
< Assumes duties of Supervisory Range Technician when absent.
< Coordinates project work with Deputy Project Leader and staff.
< Reviews, prepares, and implements Refuge safety plans.

Fire Management/Suppression Personnel

Consists of all Refuge personnel, whether permanent or seasonal, who meet the minimum standard set by the National Wildfire Coordinating Group (NWCG) for firefighters and who are fully equipped with proper personal protective equipment and gear. At a minimum, their responsibility is:

X Take and pass the minimum classroom training.
X Meet physical fitness standards required of NWCG - qualified firefighters.
X Undertake fire management duties as assigned by the Incident Commander on each suppression action or by the Prescribed Fire Burn Boss on each prescribed fire project.
X Maintain assigned fire equipment in ready state and use required PPE.
X Qualify annually with the work capacity test.

Incident Commander

Incident Commanders (of any level) use strategies and tactics as directed by the Project Leader and WFSA where applicable to implement selected objectives on a particular incident. A specific Limited Delegation of Authority (Appendix G) will be provided to each Incident Commander prior to assuming responsibility for an incident. Major duties of the Incident Commander are given in NWCG Fireline Handbook, including:

X Reports directly to FMO or AFMO on Type 3, 4 and 5 incidents.

X Reports directly to Project Leader on Type 1 and 2 incidents.
X Responsible for planning, operations, logistics, finance and General Staff functions on assigned incidents.
X Responsible for incident fire report.
X Maintains regular and prompt communications with Refuge Line Officer and Fire Staff.
X Communicates with Resource Advisor to become familiar with resource values.
X Immediately reports incident injuries and critical incidents to Project Leader and Fire Staff.
X Briefs subordinates, directs their actions and provides work tools.
X Ensures that safety standards identified in the Fire Orders, Watch Out Situations, and agency policies are followed at all times.
X Personally scouts and communicates with others to be knowledgeable of fire conditions, fire weather, tactical progress, safety concerns and hazards, condition of personnel, and needs for additional resources.
X Orders resources to implement the management objectives for the fire.
X Informs appropriate dispatch of current situation and expected needs.
X Coordinates mobilization and demobilization with dispatch and the Collateral FMO.
X Performs administrative duties; i.e., approving work hours, completing fire reports for command period, maintaining property accountability, providing or obtaining medical treatment, and evaluating performance of subordinates.
X Assures aviation safety is maintained to the highest standards.

Initial Attack Teams
Initial attack teams will consist of qualified, currently red-carded personnel in all designated positions. If more than one engine resource responds to an incident, a qualified ICT4 must be present. Depending upon fire activity, an ICT5 with crew may be sufficient to respond to a fire report. Teams will be prepared and equipped with hand and power tools as needed and will be dispatched with a day's supply of food and water, so they can continue work for 24 hours without additional support.
Employees participating in any wildland fire activities on Fish and Wildlife Service or cooperator=s lands will meet fitness requirements established in PMS 310-1, except where Service-specific fitness requirements apply.

Exceptions to fitness requirements on Initial Attack activity are available from the Regional Fire Management Coordinator per guidelines in Chapter 1.5 of the Fire Management Handbook (USFWS 2000).

INTERAGENCY OPERATIONS
Cooperative agreements with various federal, state and local agencies (Appendix H) generally provide that resources of each agency are available to assist in initial attack efforts. These agreements detail payment among cooperators, list of response areas, communications frequencies, and have been reviewed by a contract specialist and/or solicitor. Approximately 6,000 acres of USFWS owned lands that lie south of Highway 26 and west of Red Rock Coulee Road in Grant Co. were acquired through public withdrawal from the Bureau of Land Management. Most of the far west tracts are managed under a cooperative agreement signed in 1965 with the Washington Department of Fish and Wildlife as part of their Crab Creek Wildlife Recreation Area. This area is managed by the State as a Fish and Wildlife Service Coordination Area; therefore, the State represents itself as authorized and willing to assume the responsibility and cost of maintaining and operating the area. Columbia NWR continues to cooperate with the suppression of wildland fires within these lands; however, management responsibility is incurred by the State.

The land management agencies in the Department of the Interior signed an interagency agreement with the US Forest Service in 1997, which was amended in 1999. This agreement promotes cooperation and facilitates the exchange of firefighting resources among the Federal agencies. These same agencies signed a Master Cooperative Fire Protection Agreement with the states of Oregon and Washington in 1998. This second agreement facilitates the exchange of firefighting resources between federal and state agencies and establishes a mechanism for developing annual operating plans to fulfill this agreement. A subset of these agencies formed the Eastern Washington Wildfire Coordinating Group. This group used the format suggested in the Master Agreement to establish a local operating plan for lands east of the Cascade crest in Washington. The Master Agreement format will be used to establish cooperative agreements and annual operating plans for cooperating local fire protection agencies to include: Grant County 4, 10, 11, and Adams County 5 Fire Protection Districts. Documentation for establishment of dispatching services to be provided by the Hanford Fire Department will be generated. Assistance to the Bureau of Land Management will be generated on a verbal request basis under the terms of the Master Agreement.

Columbia NWR will use the Incident Command System (ICS) as a guide for fireline organization. Qualifications for individuals is per DOI Wildland Fire Qualifications and Certification System (310-1), part of NIIMS and the National Wildland Fire Coordination Group (NWCG) Prescribed Fire Qualification Guide. Depending on fire complexity, some positions may be filled by the same person.

PROTECTION OF SENSITIVE RESOURCES

Sensitive resources are categorized at four levels. The first level is life and property, which is addressed in other portions of this plan. The second level is cultural resources and are protected under regulations listed below. The third and fourth levels are biological resources which fall under ESA protection of critical habitat and for other habitats and biological resources of concern.

The Regional Archaeologist and/or his/her staff will work with fire staff, project leaders, and incident commanders to ensure that cultural resources are protected from fire and fire management activities. The "Request For Cultural Resource Compliance" (RCRC) form will be used to inform the Regional Archaeologist of impending activities, thereby meeting the regulations and directions governing the protection of cultural resources as outlined in Departmental Manual Part 519, National Historic Preservation Act (NHPA) of 1966, Code of Federal Regulations (36CFR800), the Archaeological Resources Protection Act of 1979, as amended, and the Archaeological and Historic Preservation Act of 1974. The NHPA Section 106 clearance will be followed for any fire management activity that may affect historic properties (cultural resources eligible to the National Register of Historic Places).
Impacts to archaeological resources by fire resources vary. The four basic sources of damage are (1) fire intensity, (2) duration of heat, (3) heat penetration into soil, and (4) suppression actions. Of the four, the most significant threat is from equipment during line construction for prescribed fires or wildland fire holding actions (Anderson 1983).

The following actions will be taken to protect archaeological and cultural resources:

Wildland Fires

- < Minimum impact fire suppression tactics will be used to the fullest extent possible.
- < Resource Advisors will inform Fire Suppression personnel of any areas with cultural resources. The Resource advisor should contact the Regional Archaeologist and/or his/her staff for more detailed information.
- < Available resources will be assigned to protect identified historic structures.

< Foam will be limited in areas known to harbor surface artifacts.
< Mechanized equipment should not be used in areas of known cultural significance.
< The location of any sites discovered as the result of fire management activities will be reported to the Regional Archaeologist.
< Rehabilitation plans will address cultural resources impacts and will be submitted to the Regional Archaeologist using the RCRC.
< Emergency consultation will be performed for any suppression actions that affect Threatened, Endangered or Candidate species. We are NOT guaranteeing there will be no impacts.
< All of these items will be considered EXCEPT when life and property are at risk.

Prescribed Fires

< The Refuge Fire staff will submit a completed RCRC to the Regional Archaeologist and/or his/her staff as soon as the burn area is identified (i.e., as soon as feasible).
< Upon receipt of the RCRC, the Regional Archaeologist and/or his/her staff will be responsible for consulting with the FMO and evaluating the potential for adverse impacts to cultural resources.
< When necessary, the Regional Archaeologist and/or his/her staff will coordinate with the State Historic Preservation Officer (SHPO). The SHPO has 30 days to respond. The Refuge will consider all SHPO recommendations.
< Mechanized equipment should not be used in areas of know cultural significance.
< The location of any sites discovered as the result of fire management activities will be reported to the Regional Archaeologist.

Any prescribed fire in occupied habitat of species listed as Endangered, Threatened, or Candidate must include habitat improvement in burn objectives for that species.

The Wildlife Biologist or designated Wildland Fire Resource Advisor will provide guidance on protection of these areas during wildland fire suppression. Washington ground squirrel colonies may limit the use of retardant, foam, and mechanized equipment. Suppression equipment should not be driven into ground squirrel colonies.

Areas of biological importance and sensitivity include wetlands, stands of peachleaf willow, and contiguous stands of sagebrush, especially those found in deeper soils. Wetlands, especially those associated with freshwater seeps and springs, are likely to have native amphibians sensitive to changes in water chemistry. Foam use should be avoided within 100 feet of surface waters to avoid contamination. Service guidance under ESA specifies that applications of retardant or foam inside 300 feet of a waterway "...requires that the unit administrator determine whether there have been any adverse effects to T&E species within the waterway."

Peachleaf willow is the key native canopy species along streams and other wetlands. It provides shade, elevated nest and perch sites, hosts abundant insect diversity, and matures into the primary cavity producing structure in the Lower Crab Creek drainage. Because peachleaf willow has shown intolerance to fire, protection measures should be in place for both prescribed and wildland fire. While many suppression actions would include using a creek or wetland as a natural barrier for fire containment, more aggressive actions such as containment at the upland/wetland interface or water drops would be appropriate to avoid the loss of this valuable habitat. Prescribed fire under very cool and dormant season conditions might be used in understory treatments if test burns indicate tolerance.

Sagebrush provides the overstory canopy in shrub steppe and is a requirement for several declining bird species found in the Columbia Basin. Because it is killed by fire, protection of mature stands of big sage has a high priority. Much of the understory associated with remaining sagebrush steppe is in a degraded condition where cheatgrass is dominant, and because recovery of the sage component is a slow process, it is important to prevent fires from spreading into areas that can burn more than 100 acres. The Wildland Fire Resource Advisor should be consulted immediately for fires that could potentially spread into areas where direct attack is not a viable option. The use of mechanized equipment, water drops, or retardant may be warranted at an early stage. Ideally, a scenario using backing fires through poor quality habitat, with rabbitbrush or other shrubs that resprout after fire, or areas without sagebrush cover, can contain spread to a smaller area. It is expected that chemical weed control or other restoration techniques will be necessary in such situations to prevent further spread of cheatgrass and other invasive non-native species.

WILDLAND FIRE ACTIVITIES

Fire program management includes operational procedures necessary to implement fire management at Columbia NWR. Program management includes: fire prevention, preparedness, emergency preparedness, fire behavior predictions, step-up staffing plan, fire detection, fire suppression, minimum impact suppression, minimum impact rehabilitation, and documentation.

The National Wildfire Coordinating Group has prepared a flowchart for fire management implementation, which includes wildland fire, wildland fire use, and prescribed fire. Because the Refuge does not endorse wildland fire use, a subset of the NWCG chart is used. Upon detection of a fire, an appropriate initial response is implemented using the Refuge's fire management objectives. If the initial response is unsuccessful, a Wildland Fire Situation Analysis (WFSA) is prepared and an implementation strategy is selected. If the selected alternative is unsuccessful, a new WFSA is prepared and the process continues until the strategy is successful. All fires not classified as prescribed fires are wildland fires and will be appropriately suppressed.

FIRE MANAGEMENT STRATEGIES

All unplanned wildland fires will be suppressed in a safe, cost-effective manner to produce fast, efficient action with minimum damage to resources using appropriate management strategies. Although resource impacts of suppression alternatives must always be considered in selecting a fire management strategy, resource benefits will not be the primary consideration. Appropriate suppression action will be taken to ensure firefighter safety, public safety, and protection of the resources. Heavy equipment such as crawlers, tractors, dozers, or graders will not be used within the refuge boundaries unless their use is necessary to prevent a fire from destroying privately-owned and/or government buildings, historic resources and habitat critical to the Refuge's mission. Mechanical equipment will not be used in known cultural resource areas without the area first being examined by an archeologist. The use of any heavy equipment requires approval from the Refuge Project Leader or Delegate.

Critical protection areas, such as freshwater seeps, Washington ground squirrel colonies, peachleaf willow stands, and mature sagebrush habitats, will receive priority consideration in fire control planning efforts. In all cases, the primary concerns of fire suppression personnel shall be safety, and if needed, all individuals not involved in the suppression effort may be evacuated. Vehicle access to normally closed areas of the refuge will be made using existing fire roads when possible. When off-road travel is determined to be necessary, vehicle access will be allowed with approval of the Incident Commander.

Suppression strategies should be applied so that the equipment and tools used to meet the desired objectives are those that inflict the least impacts upon natural and cultural resources. Minimum impact suppression strategies will be employed to protect all resources. Natural and artificial barriers will be used as much as possible for containment. When necessary, fire line construction will be conducted in such a way as to minimize long-term impacts to resources.

Sites impacted by fire suppression activities or by the fire will be rehabilitated as necessary, based on an approved course of action for each incident.

PREPAREDNESS

Preparedness is the process of planning and implementing activities prior to a wildland fire occurrence to ensure that the appropriate response, as directed by the Fire Management Plan, can be carried out. Preparedness activities include: budget planning, equipment acquisition, equipment maintenance, dispatch (Initial attack, extended, and expanded), equipment inventory, personnel qualifications, and training. The

preparedness objective is to have a well trained and equipped fire management organization to manage all fire situations within the monument. Preparedness efforts are to be accomplished in the time frames outside the normal fire season dates.

Structure Protection
Refuge staff will construct and perform annual maintenance of mowed firebreaks along Refuge boundaries, where structures are adjacent to the Refuge. These firebreaks will decrease the threat to private inholdings and neighboring landowners. There are two private in-holdings located within the Columbia NWR. One of these currently has a mobile travel trailer on site which can be moved if fire were threatening to come off Refuge and onto the private land. This trailer is located South of Royal Lake, in Section 24, and is surrounded mainly by cheatgrass.

WUI projects currently submitted will assist with the defense of a number of facilities surrounding Refuge lands. Service owned structures on the Refuge are built of non-flammable materials and mostly surrounded by gravel and/or dirt. These structures will be inventoried and assessed for surrounding hazardous fuels by the Refuge fire crew annually. Maintenance will be done to prevent hazardous fuels build-up around these structures if fuel loads present a threat.

Historical Weather Analysis
A weather data set from the central Hanford site (weather station located at 46º 34' North and 119º 36' West) is currently being used to indicate fire danger on the Refuge. The program FIREFAMILY PLUS processed this weather data set and generated the Burning Index (BI) graph (Figure 2). These data indicate a general trend of BI, a measure of fire intensity, that gradually increases until reaching a peak in early August, followed by a gradual decrease. A cumulative frequency analysis of BI calculated for April 1-October 30 reveals that a value of 60 represents the 90^{th} percentile. This 90^{th} percentile value is used for planning step-up actions. Most wildland fires that occur when BI is less than 60 should be controllable with station resources.

The Columbia NWR has a weather station west of Othello located at 46º 53' North and 119º 19' West. The Umatilla NWR has a weather station west of Irrigon, OR located at 45º 55' North and 119º 34' West. The Bureau of Land Management has a Remote Automated Weather Station located near Drumheller, WA at 46º N and 119º W. All of these stations show similar trends in BI, although the actual calculated values vary.

Annual Activities
Between January 1 and April 30, each year, the following tasks should be completed: recruit seasonal fire fighting personnel; update and maintain accurate employee training and qualification records; review Cooperative Agreements with surrounding fire management agencies; complete plans for any management ignited prescribed burn projects for hazard fuel reduction and resource management projects; conduct prescribed burns; order fire cache supplies and replacement equipment as needed; complete annual maintenance on fire weather station; obtain necessary physical fitness evaluations; inventory fire supplies and equipment and update list; inspect fire cache to ensure equipment is ready; and provide updates or changes to cooperators for local and regional mobilization plans.

Between May 1 and June 15, each year, complete the following tasks: check operation of all slip-on and portable pumps; outfit field vehicles, all initial attack personnel, and interagency crew participants; review fire weather station observation, recording, and weather station equipment maintenance

procedures; review established procedures for utilizing suppression and severity accounts; evaluate the need for basic firefighter training and conduct if necessary.

Between June 16 and September 30 each year, complete the following tasks: maintain state of readiness as identified in the Step-up Plan; operate all slip-on units and portable pumps at least weekly; regularly conduct readiness drills with fire staff. Between October 1 and December 31, each year, complete the following tasks: critique fire season; evaluate individual performance ratings of fire personnel and correct deficiencies and update Individual Development Plans (IDP's) as needed; prepare plans for management ignited burns; review and revise this Plan as needed.

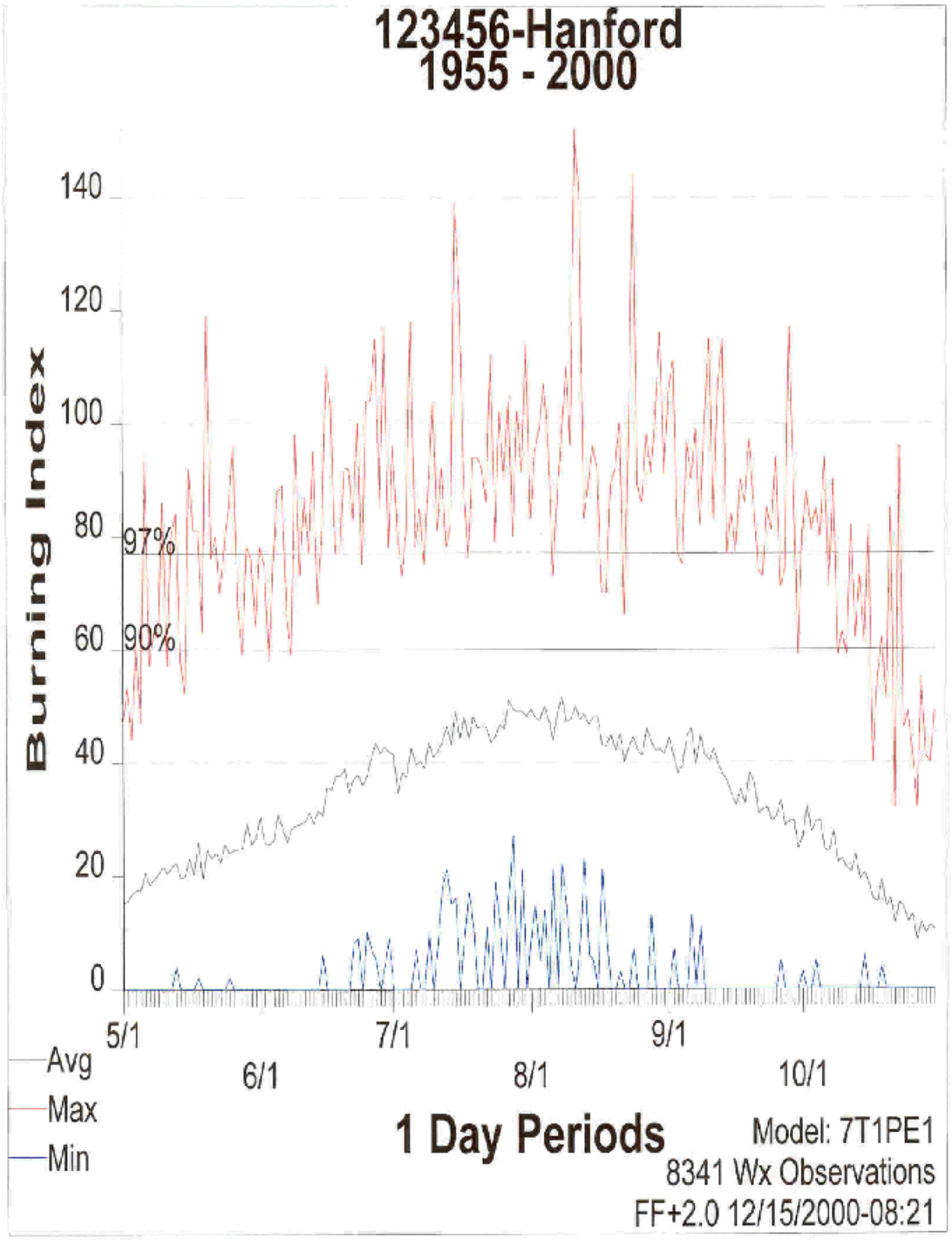


Figure 2: Burning Index Values from 1955 through 2000

Fire Prevention
An active fire prevention program will be developed in order to work in conjunction with other agencies to protect human life and property, and prevent damage to cultural resources or physical facilities.
A program of internal and external education regarding potential fire danger will be implemented. Visitor contacts, bulletin board materials, handouts and interpretive programs may be utilized to increase visitor and neighbor awareness of fire hazards. Trained employees need to relate to the public the beneficial effects of prescribed fires as opposed to unwanted human-caused fires, with emphasis on information essential to understanding the potential severity of human-caused wildland fires and how to prevent them.

A major goal of the fire management program is to reduce the threat and occurrence of human caused wildland fires. Prevention activities developed for specific areas will include education aimed at Refuge visitors, employees, and adjacent landowners; engineering (or the use of appropriate equipment, methods, and projects); and enforcement of regulations aimed at preventing human-caused fires.

Educational activities will focus on educating Refuge visitors, hunters and adjacent landowners about fire prevention regulations, appropriate prevention activities, and current fire danger ratings using media, signs, and verbal contact. Active participation by fire management personnel with staffing the local county fair booths will further promote awareness. Educating Refuge employees on fire prevention activities they can integrate into their jobs will assist in working with cooperators to develop appropriate fire prevention messages for properties adjacent to the Refuge.

Engineering activities will provide and maintain fire prevention devices (e.g., spark arrestor) on appropriate field equipment, monitor power lines or other potential sources of ignition on a yearly basis, and evaluate Refuge structures for flammable construction materials and the need for hazard fuel reduction work.

Staffing Priority Levels
The National Fire Danger Rating System (NFDRS) was developed to assess the potential of an initiating fire (Deeming et al. 1977). The rating is based upon average worst-case weather conditions to designate the approximate upper limit of expected fire behavior. A set of twenty NFDRS fuel models provide the parameters for the fire spread model that is central to the NFDRS indices. The Refuge uses fuel models A and T. Fuel model A represents western grasslands vegetated by annual grasses and forbs. Brush is sparse, occupying less than one-third of the area. Because Deeming et al. (1977) suggests that cheatgrass is an example of model A, we use it for NFDRS for this plan. Although the fuel model is static, Deeming et al. (1977) states that the quantity and continuity of the surface fuels varies greatly with rainfall. Deeming et al (1977) describes model T as, “the bothersome sagebrush-grass type…The shrubs burn easily and are not dense enough to shade out grass and other herbaceous plants. Shrubs must occupy at least one-third of the site (p. 34)”.

Table 3: Fuel bed parameters for the NFDRS fuel models used on the Refuge (Bradshaw et al. 1983)

Model	Description	Fine Fuel Loading	Medium Fuel Loading	Woody Fuel Loading	Herbaceous Fuel Loading	Fuel Bed Depth
A	Annual Grass	0.2 Tons/acre			0.3 Tons/acre	0.8 Feet
T	Sagebrush/ Grass	1.0 Tons/acre	0.5 Tons/acre	2.5 Tons/acre	0.5 Tons/acre	1.25 Feet

The Step-up Plan (Appendix F) determines the staffing priority. Step-up plans direct incremental preparedness actions in response to increasing fire danger. The plan consists of five staffing classes that describe escalations in preparedness activities. The staffing classes are predetermined responses to increased fire danger for a burning period, which is defined as that period of the day when fire burns most actively in a given fuel type. The burning index (BI), as determined by NFDRS, is the basis to rank fire danger. The BI is designed to reflect the difficulty in controlling a new fire start.

Break points between staffing classes are determined by the cumulative percentages of occurrence of the burning index during the fire season. The most critical break points occur at the 90th and 97th percentiles respectively. These two points define staffing classes 4 and 5 respectively. Staffing classes are determined using the above criteria to define the minimum level of the staffing class.

The National Weather Service in the Spokane office has a World Wide Web site at http://www.wrh.noaa.gov/spokane/fire.htm. Among the products available on line is the daily fire weather forecasts, available daily at approximately 9:00 AM and 3:30 PM, and spot weather request forms. They will also respond to written spot weather requests using the Spot Weather Request Form.

During typical wildland fire season (Memorial Day through Labor Day), a series of daily procedures occur. Based upon the Step-up Plan, the minimum staffing class is level 3. Each morning, the fire weather forecast will be obtained from the National Weather Service. A fire behavior prediction will be developed from the forecast. A daily briefing for the fire crews will be developed and will address the following: fire weather summary, fire behavior predictions for rate of spread, flame length and probability of ignition, fire danger rating indices, local preparedness level, and availability of neighboring resources. These briefing products should be completed and distributed by 10 AM. The staffing class for the remainder of the day is assessed at 2 PM. This assessment occurs through two mechanisms: a FIRE WEATHER PLUS 2000 download of data from the Columbia NWR weather station; or using WIMS to display the fire danger indices. The staffing class for the following day is based upon the afternoon weather forecast or the Fire Danger Calculator in FIREFAMILY PLUS. The AFMO is responsible for assuring that the fire danger rating is assessed for the day.

The seasonal risk requires a daily tracking of BI and comparing the values to historic average and the daily maximum value. The creation of a pocket card will allow visiting resources to see the fire danger characteristics for the Refuge.

Training

Departmental and Service policy (232 FW 6, 241 FW 7, and 621 FW 1.6) requires that all personnel engaged in suppression and prescribed fire duties meet the standards set by the National Wildfire Coordinating Group (NWCG) in the 310-1 *Wildland and Prescribed Fire Qualification System Guide.* The 310-1 manual establishes minimum training requirements, experience, and physical fitness standards. All personnel participating in both refuge and interagency fire operations (both wildland fire and prescribed fire) must meet the 310-1 standards. The Service Manual identifies five objectives for fire management training. The fire management training program will promote safe individual performance, use the fire staff to provide training to both regional and field areas, manage instructor certification, cooperate and coordinate with the interagency community to provide mutual training opportunities, and use other curricula whenever possible. Columbia NWR will conform strictly to the requirements of the wildland fire management qualification and certification system and USFWS guidelines.

The expected overhead positions for the Refuge are listed in the following table along with the level of experience and training courses. Table 4 shows fire qualifications based upon the 310-1 manual.

Table 4: Required Training and Experience

Mnemonic	Title	Required Experience	Required Training	Recommended Training
FFT2	Firefighter	None	S-130 S-190	I-100
FFT1	Advanced Firefighter	FFT2	S-131	S-281 S-211 S-212
ICT5	Incident Commander Type 5	FFT1	S-133	S-290
ENGB	Single Resource Boss-Engine	FFT1	S-230 S-290	S-231 S-270 S-234 I-200 S-260
ICT4	Incident Commander Type 4	ENGB	S-215	S-234
STEN	Strike Team Leader	ENGB	S-330 S-215	I-300 S-301
TFLD	Task Force Leader	STEN or ICT4 and 2 single resource (1 must be CRWB or ENGB)	S-330 S-390	No Additional
ICT3	Incident Commander-Multiple Resources	TFLD & ICT4 or STEN and 2 single resource (1 must be CRWB or ENGB)	S-390	S-300

Basic wildland fire training refreshers are offered annually for red-carded firefighters and records are kept in a centralized database. The minimum content of this refresher covers the Ten Standard Fire Orders, the

Eighteen Situations that Shout Watch Out and fire shelter training. The mechanism for presenting this material is at the discretion of the FMO, but generally rotates among the following training courses: SA-130 Standards for Survival; SA-290 Look up, Look down, Look around; and the Lookouts, Communication, Escape Routes, and Safety Zones Workshops. Ideally, the refresher occurs the first week that the seasonal firefighters report for work. Additional training is available from surrounding agencies in pump and engine operation, power saws, firefighter safety, fire weather and fire behavior, helicopter safety and prescribed fire objectives and activities. On-the job training is encouraged and will be conducted at the field level. The use of fire qualification task books will be used to document fire experience of trainees. The AFMO will coordinate fire training needs with those of other nearby refuges, cooperating agencies, and the Regional Office.

The Refuge supports the development of individual Incident Command System (ICS) overhead personnel from among qualified and experienced refuge staff for assignment to overhead teams at the local, regional, and national level.
Each member of the fire staff has minimum qualification standards for their position. Most prescribed fire positions rely upon suppression qualifications established by the NWCG. The Pacific Northwest Wildfire Coordinating Group usually sponsors advanced fire training courses. The Zone can sponsor advanced prescribed fire training courses on an as needed basis.

The NWCG has established training curricula for various positions. The Columbia NWR will adhere to NWCG standards for all positions. Although NWCG recommends many courses as optional for various positions, the Refuge will urge personnel to complete both the recommended and the required training courses for all wildland positions.

The Columbia NWR staff can sponsor any 100 level course. These courses may be taught by anyone having the requisite experience who is approved by the Refuge fire management staff. The 200 level courses require that the Lead Instructor have completed an Adult Learning training course. In addition, the lead instructor for a 200 level course must be qualified at the next higher level. For example, the lead instructor for S-231 Crew Boss must be Strike Team-Crew qualified. At least one member of the fire staff should be qualified to be a Lead Instructor for the 200 level courses.

Fire suppression is an arduous duty. On prescribed fires, personnel may be required to shift from implementation/monitoring activities to suppression. Poor physical condition of crew members can endanger safety and lives during critical situations.

Personnel performing fire management duties will maintain a high level of physical fitness. This requires successful completion of a fitness pack test. Personnel must complete a three mile hike with a 45 pound pack in 45 minutes or less.

Supplies and Equipment
Columbia NWR has a permanent fire cache located within the engine bay building. The Refuge will use the criteria for Normal Unit Strength outlined on page 3.1-9 of the Fire Management Handbook for minimal inventory stocking. The cache inventory can be found in Appendix I. An additional compliment of gear for ten firefighters will be kept on hand in order to supply detailers and visiting crews as necessary. Items will be issued to personnel using standard property issue forms (DI-104 or equivalent). Cache maintenance and inventory is the responsibility of the Lead Range/Forestry Technician.

Additional equipment and supplies are available through cooperators and the interagency cache system. Requests for additional personnel and equipment are currently made through CWICC by placing standard resource orders and charging them to a specific incident.

Each engine will be equipped with the minimum items listed in the Fireline Handbook. The water tender will also be equipped appropriately.

Detection

All personel assigned to or working in field locations have a responsibility for fire detection. Reporting wildland fires is one of the most important public and employee safety actions that employees can accomplish. Wildland fires need to be reported immediately. Most fires around Columbia NWR are reported by the general public to an Emergency Management Service branch of the county government. The Emergency Service then notifies the agency with jurisdictional responsibility. In Grant County, notification goes to the Multi Agency Communications Center (MACC) in Moses Lake, WA. The Othello Police Department is notified and provides dispatching for Adams County. The dispatch center then utilizes closest forces in dispatching resources to the detected fire. When a wildland fire occurs on Columbia NWR land, the response should follow the Dispatch Plan (Appendix J) and the Dispatch Card (Table 5). The FMO and PL must be notified of all wildland fire occurrences and responses to wildland fires threatening the refuge boundaries.

Dispatching

There is not a permanent dispatcher position at Columbia NWR. Day to day local dispatching functions for fire management and Refuge personnel are handled by the office personnel at the Othello Headquarters. The proposed dispatch procedure for wildland fire responses will be processed through the Hanford Fire Department dispatch center. All 911 reports of wildland fires and mutual aid to wildland fires off of the refuge, will prompt a call by the respective county dispatching center to Hanford Dispatch. Upon receiving the request, engines respond according to the established Step-Up Plan and the Dispatch Card. These response levels are based upon fire weather conditions and predicted fire behavior. Information concerning fire size up is passed from the fire to the dispatcher who fills in the appropriate fields on the corresponding office copy.

As part of the Dispatch Plan (Appendix J), the Columbia NWR has developed the following dispatch card:

Table 5: Columbia NWR Dispatch Card

RESOURCE/ STAFFING LEVEL	1	2	3	4	5
Incident Commander	Type 4	Type 4	Type 3	Type 3	Type 3
Type 6 Engine	1	2	3	4	Strike Team
Water Tender			1	1	2
Air Tanker					1
Helicopter					1

The dispatch card promotes an appropriate level of response to wildland fires commensurate with calculated fire danger.

Mutual aid agreements are in place (although currently expired) with surrounding county fire agencies for response to wildland fires off of the Refuge when requested. These also cover the Volunteer Fire Departments assisting with on Refuge incidents.

All dispatching of fire resources and handling of requests for additional resources will be coordinated through the Hanford Fire Department Dispatch Center. The Hanford Fire Department Dispatch Center will coordinate with the Benton County Emergency Operation Center (EOC) if expanded dispatch services are needed. The Benton County EOC will be authorized to place resource orders on behalf of Columbia NWR through the Central Washington Interagency Communication Center (CWICC).

The daily preparedness functions for the dispatch office includes:

1. Collecting fire weather data.
2. Inputting and recovering data from the WIMS system.
   Maintaining an updated list of available personnel and equipment in the refuge.
   Maintaining a locator file with names, addresses, phone numbers and capabilities of available resources.

The Fire Management Plan does not discriminate between human-caused and lightning caused fire. All wildland fires will be suppressed. However, detection shall include a determination of fire cause. Moreover, human-caused fires will require an investigation and report by law enforcement personnel. For serious human-caused fires, including those involving loss of life, a qualified arson investigator will be requested.

COMMUNICATIONS

Once an agreement has been signed with the Hanford Fire Department, their dispatch center will be responsible for dispatching of fire resources and handling requests for additional resources. The dispatch center will document and track all resources and coordinate national dispatch requests received through CWICC. Trainee requests are made at the beginning of fire season and as opportunities become available throughout the fire season. The dispatch center will attempt to fill these trainee slots.

The current frequency use agreements are listed in Appendix H. The format for the agreement to be used with Hanford Fire Department for dispatch services is also in Appendix H. The common frequencies used in Columbia NWR radios are listed in Appendix K.

PRE-ATTACK PLAN

The FWS has direct protection authority on all of the Refuge's lands. FWS personnel will respond or monitor wildland fire suppression for actions taken on National Wildlife Refuge lands. When FWS personnel or resources are not available, other resources will respond to wildland fires on the refuge as per agreement.

The Pre-Attack plan checklist in the Fire Management Handbook covers four of the five functional areas within the Incident Command System (omitting Finance Section). The Command issues are addressed in the WFSA process that includes a delegation of authority. The Operations issues are covered in the dispatch plan. The Logistics issues are to be developed in a Mobilization Guide and Sources of Supply document. Planning issues are addressed in the Fire Management Units (FMU's).

Upon receipt of a fire or smoke report, fill out the report of fire occurrence form. If the fire is on FWS land, or is threatening (usually restricted to burning within a mile of the boundary), then dispatch firefighting resources based upon the dispatch card. While the resources are in route to the fire, relay the fire weather forecast, expected fire behavior, adjacent resource availability, and current weather conditions. A radio log or a unit log should be initiated by the dispatcher. As soon as possible, notify both the FMO and the Project Leader about the ignition.

After the resources arrive at the fire, a field report should be requested. The IA Incident Commander (IC) (IAIC) should follow Chapter 1 of the Fire Line Handbook (FLH), which covers IA with details about duties and responsibilities, checklists, and general descriptions of both strategy and tactic. Many fires on the Refuge may require a Type 3 Incident commander (IC) during the initial attack phase because of the number of resources responding. After forming an initial response, the IAIC should report progress. Both the IAIC and management should be assessing the possibility that the fire will transition to a higher complexity using the following list:

1. The IAIC requests additional resources.
2. Fire will not be contained by the beginning of the second full operational period.
3. Fire activity has required a change in strategy or tactics.
4. The IAIC requests an Extended Attack IC.
5. Or, the project leader wants a more experienced IC.

The Dispatch Plan contains the procedures and information necessary for most fire incidents. Typically, most fires are managed during the initial attack phase. However, fires can transition into larger incidents requiring a minimum of three documents: Wildland Fire Situation Analysis, Complexity analysis, and a Delegation of Authority.

FIRE MANAGEMENT UNITS

Fire Management Units (FMUs) are areas on a Refuge which have common wildland fire management objectives and strategies, are manageable units from a wildland fire standpoint, has similar fuel and fire behavior characteristics, and can be based on natural or manmade fuel breaks. A FMU may coincide with a prescribed fire burn block or treatment area or unit, but this is not always the case. On smaller refuges the whole refuge may be treated as a single FMU. Columbia NWR is managed as a single fire management unit. During initial attack, tactics are applied to meet the FMU objectives.

Due to staff limitations, relatively small land management parcels, long response times, valuable resources, and values at risk on neighboring lands, this plan does not recommend wildland fire managed for resource benefit as an option for Columbia NWR. Wildland fires will be suppressed using the appropriate suppression response. Prescribed fires will be used to reduce hazardous fuels and to meet research or resource management objectives.

Fire Effects

Sagebrush-dominated Communities

Big sagebrush (*Artemesia tridentata*) is a dominant species throughout the Columbia NWR. Plant communities dominated by big sagebrush are found on a variety of aspects, slopes, and soil types. Various grasses, including Sandberg=s bluegrass, bluebunch wheatgrass, Thurber=s needlegrass (*Stipa thurberiana*), Idaho fescue, and cheatgrass (a non-native species) occur as co-dominants with big sagebrush. Bitterbrush and spiney hopsage (*Grayia spinosa*) occur in patches throughout big sagebrush communities.

Where sagebrush stands are dense, rangeland fire may stimulate the growth of grasses and increase their accessibility, thereby decreasing sagebrush dominance. However, if the vigor of understory plants is low or their cover is reduced too greatly, newly bared soil may become a seedbed for sagebrush rather than the desired grasses and forbs.

Other Plant Communities
Other plant communities include minor elements better classified as habitats found within the sagebrush steppe. These are areas where specific moisture regimes create fresh sub-irrigated and poorly drained saline soils.

Fresh sub-irrigated areas are typically dominated by small bulrushes (*Scirpus* spp.), sedges (*Carex* spp.) and spikerushes (*Juncus* spp.) This sedge meadow habitat typically remains moist during the growing season and can withstand moderate grazing and fire. Fire is unlikely to cause damage except when drought causes soil moisture to drop to the point that soil organic matter is consumed. While not known to occur on Columbia NWR or the cental Columbia Basin, the Threatened Ute ladies'-tresses may be found in these areas.

Saline soils typically form from extremely poor drainage or a high water table. In both cases evaporation rather than runoff or leaching causes a buildup of minerals in the soil. Two native and one introduced exotic plant dominate these areas. Black greasewood (*Sarcobatus vermiculatus*) and saltgrass (*Distichlis stricta*) dominate these sites, although exotic perennial pepperweed (*Lepidium perfoliatum*) continues to invade disturbed areas along perennial streams and lakes where a high water table maintains a constant elevation and "wicking" zone. All three of these species are tolerant of fire and will resprout, and greasewood contains resins that produce very hot and volatile flames. Pepperweed tends to increase after fire in the absence of other control measures.

The riparian zone along streams and around lakes and wetlands traditionally supports more structure than drier areas nearby. Soils with adequate drainage for a portion of the growing season typically support a community of shrubs and willows, with exotic Russian-olive invading many sites, especially at the interface of the drier upland areas. While several of the shrubs and willows growing in the riparian zone have some fire tolerance, peachleaf willow is susceptible and will be killed with fire of moderate heat or duration. Russian-olive larger than 4-5" dbh has a higher tolerance and will usually resprout unless burned early in the growing season, when leaves are beginning to appear.

Endangered, Threatened, or Sensitive Species
According to information obtained from the U.S. Fish and Wildlife Service=s endangered species program, there are currently five species that come under protection of the Endangered Species Act (ESA). A Biological Assessment and informal Section 7 consultation were completed for these five species. The Endangered Upper Columbia River steelhead (*Oncorhynchus mykiss*) occurs in the Lower Crab Creek drainage. The Threatened Bald Eagle (*Haliaeetus leucocephalus*) is widely distributed in a variety of habitats and locations during the winter. The Threatened Ute ladies'-tresses (*Spiranthes diluvialis*) has been found in Okanogan and Chelan counties along large rivers, mostly in seep and sedge meadow areas. The Western sage grouse (*Centrocercus urophasianus*) is listed as a Candidate for Threatened status, and is believed to be extirpated as a breeding species in the Columbia Basin outside of Douglas and Yakima counties. The Washington ground squirrel is listed as a Candidate for Threatened status, and occurs on the Refuge in at least three colonies that cross boundaries with private or other ownership. These two Candidate species are most likely to be impacted by wildland fire due to potential loss of shrub cover or increase in invasive exotic plants. Numerous other sensitive species also are

dependant on shrub and steppe habitats, including badger (*Taxidea taxus*), Burrowing Owl (*Athene cunicularia*), Prairie Falcon (*Falco mexicanus*), and Ferruginous Hawk (*Buteo regalis*) in steppe and Sage Sparrow (*Amphispiza belli*), Brewer's Sparrow (*Spizella breweri*), Sage Thrasher (*Oreoscoptes montanus*), and Loggerhead Shrike (*Lanius ludovicianus*) in shrub areas.

Fuel Types

The fuel loading in the shrub-steppe region is typical of the stylized fuel models. For fire behavior purposes, a set of fuel models exist (Anderson 1982). Where grass is the primary carrier of fire spread, we use models 1 and 2 of the three models that exist. In the short grass, Fuel Model 1, fire spread is governed by the fine, porous, and continuous herbaceous fuels that have cured, or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one-third of the area. Annual and perennial grasses, generally below knee level in height, are typical of this fuel model. Post fire shrub-steppe habitat and agricultural fields are typical examples.

In the sagebrush/grasslands, Fuel Model 2, fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, in addition to litter and dead-down stemwood from the open shrub overstory contributes to the fire intensity. Fires in this fuel type spread slower than those in fuel model 1. Open shrub lands that cover one-third to two thirds of the area may generally fit this model. This is typical of shrub-steppe habitat.

Rarely, brush becomes the primary carrier of fire spread and fuel model 6 would apply. In this fuel model, fire is carried through the dormant shrub layer, but requires moderate winds, greater than 8 mph at mid-flame height, to spread from crown to crown. This fuel model generates greater rates of spread and longer flame lengths than model 2. Shrub-steppe habitat fits this fuel model when the carrier of the fire is not grass.

Table 6: Fuel Bed Loading

Model	**Description**	**Fine Fuel Loading**	**Medium Fuel Loading**	**Heavy Fuel Loading**	**Herbaceous Fuel Loading**	**Fuel Bed Depth**
1	Short Grass	0.74 Tons/acre				1.0 Feet
2	Grassy Understory	2.0 Tons/acre	1.0 Tons/acre	0.5 Tons/acre	0.5 Tons/acre	1.0 Feet
6	Dormant Brush	1.5 Tons/acre	2.5 Tons/acre	2.0 Tons/acre		2.5 Feet

Table 7: Expected Fire Behavior

Parameter	**Short Grass-Average**	**Short Grass-Extreme**	**Sage Brush-Average**	**Sage Brush-Extreme**
INPUTS				
Fuel Model	1	1	2	2

1-Hour Fuel Moisture Content - (FMC)	7	4	7	4
10 Hour FMC			8	5
100 Hour FMC			9	6
Live FMC			100	50
Mid-Flame Wind Speed (mph)	6	8.9*	6	18
Slope (%)	20	20	20	20
OUTPUTS				
Rate of Spread (chains/hour)	134	345	49	473
Flame Length (feet)	5	9	7	22

*Maximum reliable wind speed

These fire behavior outputs indicate the potential for fire control problems. Even under average burning conditions, fires are too intense to use direct attack methods with hand tools. Under these average conditions the modeled line production rate is 335 AND 102 chains per hour for short grass and sagebrush, respectively, to contain a fire that has burned freely for 30 minutes.

The following tables show the range of fire behavior for various fine fuel moisture and wind conditions in the three major fuel models. Only fuel model 2 has a live fuel component. We feel that the above table indicates reasonable conditions (i.e., when fine fuels are dry, live fuel moisture should also be low). Generally, lower live fuel moisture's result in higher fire behavior characteristics.

Table 8: Rate of Spread: Fuel Model 1 (Short Grass)

Rate of Spread	0 mph (eye level wind speed)	5 mph (eye level wind speed**)**	10 mph (eye level wind speed)	15 mph (eye level wind speed)
3 % Fine Fuel Moisture	8 Chains/Hour	122 Chains/Hour	*446 Chains/Hour**	*446 Chains/Hour**
6 % Fine Fuel Moisture	6 Chains/Hour	96 Chains/Hour	*270 Chains/Hour**	*270 Chains/Hour**
9 % Fine Fuel Moisture	4 Chains/Hour	71 Chains/Hour	*136 Chains/Hour**	*136 Chains/Hour**

*Italics indicate that the maximum reliable windspeed limit was reached where wind is too great for the available fuel to support reliable fire spread. Values shown in italics are the maximum reliable outputs for the wind and fuel moisture conditions.

Table 9: Fire Behavior: Fuel Model 1

Flame Length	0 mph (eye level wind speed)	5 mph (eye level wind speed)	10 mph (eye level wind speed)	15 mph (eye level wind speed)
3 % Fine Fuel Moisture	1.5 Feet	5.5 Feet	10 Feet	10 Feet

6% Fine Fuel Moisture	1.3 Feet	4.6 Feet	7.5 Feet	7.5 Feet
9% Fine Fuel Moisture	1.0 Feet	3.7 Feet	5.0 Feet	5.0 Feet

Table 10: Rate of Spread: Fuel Model 2 (Litter and understory (sagebrush))

Rate of Spread	0 mph (eye level wind speed)	5 mph (eye level wind speed)	10 mph (eye level wind speed)	15 mph (eye level wind speed)
3% Fine Fuel Moisture	4 Chains/Hour	48 Chains/Hour	162 Chains/Hour	336 Chains/Hour
6% Fine Fuel Moisture	3 Chains/Hour	39 Chains/Hour	132 Chains/Hour	273 Chains/Hour
9 % Fine Fuel Moisture	3 Chains/Hour	34 Chains/Hour	116 Chains/Hour	240 Chains/Hour

Table 11: Fire Behavior: Fuel Model 2

Flame Length	0 mph (eye level wind speed)	5 mph (eye level wind speed)	10 mph (eye level wind speed)	15 mph (eye level wind speed)
3 % Fine Fuel Moisture	2.4 Feet	7.8 Feet	13.5 Feet	18.9 Feet
6 % Fine Fuel Moisture	2.1 Feet	6.6 Feet	11.6 Feet	16.2 Feet
9% Fine Fuel Moisture	1.9 Feet	6.1 Feet	10.6 Feet	14.9 Feet

Table 12: Rate of Spread: Fuel Model 6 (Dormant Brush)

Rate of Spread	0 mph (eye level wind speed)	5 mph (eye level wind speed)	10 mph (eye level wind speed)	15 mph (eye level wind speed)
3 % Fine Fuel Moisture	4 Chains/Hour	48 Chains/Hour	162 Chains/Hour	336 Chains/Hour
6 % Fine Fuel Moisture	3 Chains/Hour	39 Chains/Hour	132 Chains/Hour	273 Chains/Hour
9 % Fine Fuel Moisture	3 Chains/Hour	34 Chains/Hour	116 Chains/Hour	240 Chains/Hour

Table 13: Fire Behavior: Fuel Model 6

Flame Length	0 mph (eye level wind speed)	5 mph (eye level wind speed)	10 mph (eye level wind speed)	15 mph (eye level wind speed)

3 % Fine Fuel Moisture	2.4 Feet	7.8 Feet	13.5 Feet	18.9 Feet
6 % Fine Fuel Moisture	2.1 Feet	6.6 Feet	11.6 Feet	16.2 Feet
9 % Fine Fuel Moisture	1.9 Feet	6.1 Feet	10.6 Feet	14.9 Feet

Wildland fires in Fuel Models 3 and 4 are rare. These areas occur in wetlands, and will normally only experience fire during prescribed fire activities. An exception to this is in the early spring when local farmers begin burning ditches, before the soil becomes moist. On occasion, these fires do have a tendency to escape and become wildland fires. Fuel Model 3 is characterized by coarse grass that is higher than knee level. Because fire may spread at the top of the fuel bed, these fires may cross the open water through the cattails and reeds that are typical for this fuel type. In Fuel Model 4, the brush is head high with heavy amounts of dead intermingled with live fuels. Areas of greasewood along marshes and wetlands develop fire behavior similar to this fuel model. Both of these fuel models may exhibit fires with both high intensity and high rates of spread.

SUPPRESSION TACTICS

Wildland fires will be suppressed in a prompt, safe, aggressive, and cost-effective manner to produce fast, efficient action with minimum damage to resources. Suppression involves a range of possible actions from initial attack to final suppression. All wildland fires will be suppressed.

Personnel and equipment must be efficiently organized to suppress fires effectively and safely. To this end, the FMO or AFMO assumes the command function on major or multiple fire situations, setting priorities for the use of available resources and establishing a suppression organization.

There will be only one Incident Commander responsible through the FMO to the Project Leader. The Incident Commander will designate all overhead positions on fires requiring extended attack. Reference should be made to a Delegation of Authority.

Initial attack on wildland fires is the primary responsibility of the fire staff. Assignment of refuge personnel will be determined on the basis of individual fire qualifications, availability and existing or projected fire complexity. The Wildland Fire Situation Analysis, or the complexity analysis in the Fire Management Handbook, will be used to determine when overhead teams should be requested.

Equipment, fire crews and overhead personnel are available through cooperating agencies locally, local interagency fire caches and the National Interagency Fire Coordination Center (NIFC). Incident Commanders from off of the Refuge will receive a copy of the “Delegation of Authority".

Minimum Impact Suppression Tactics (MIST) will be applied, where applicable The Fire Management Handbook defines MIST as the aggressive application of those strategies and tactics that effectively meet management objectives with the least cultural and environmental impact. However, at no time should MIST be used if suppression objectives cannot be accomplished. MIST has a significant impact on the mop-up phase of suppression as a fire is managed with time rather than against time. The intent of MIST is to suppress a wildland fire with the least impact to the land. Fire conditions and good judgment dictate the actions taken. Consider what is necessary to halt fire spread and contain it with the fireline or designated perimeter boundary. The MIST implementation guidelines are as follows:

Safety

Safety is of utmost importance.
Constantly review and apply the Watch Out Situations and Fire Orders.
Be particularly cautious with:

- C Burning snags allowed to burn.
- C Burning or partially burned live and dead trees
- C Unburned fuel between you and the fire.
- C Identify hazard trees with either observer, flagging and/or glow-sticks.
- C Be constantly aware of surroundings, expected fire behavior, and possible fire perimeter 1 or 2 days hence.

X Fire Lining Phase

- C Select procedures, tools, equipment that least impact the environment.
- C Seriously consider using water as a firelining tactic (fireline constructed with nozzle pressure, wet lining).
- C In light fuels, consider:
  - C Cold-trail line.
  - C Allowing fire to burn to natural barrier.
  - C Burning-out and use of gunny sack or swatter.
  - C Constantly rechecking cold-trailed fireline.
  - C If constructed fireline is necessary, using minimum width and depth to check fire spread.
- C When using indirect attack:
  - C Do not fall snags on the intended unburned side of the constructed fireline, unless they are a safety hazard to crews.
  - C On the intended burn-out side of the line, fall only those snags that would reach the fireline should they burn and fall over. Consider alternative means to falling, i.e., fireline explosives, bucket drops.
  - C Review items listed above (aerial fuels; brush, trees, and snags).

X Mop-Up Phase

- C Consider using hot-spot detection devices along perimeter (aerial or hand-held).
- C Light fuels:
  - C Cold-trail areas adjacent to unburned fuels.
  - C Do minimal spading; restrict spading to hot areas near fireline.
  - C Use extensive cold-trailing to detect hot areas.

Initial Attack

Upon receipt of a fire or smoke report, fill out the report of fire occurrence form. If the fire is on FWS land, or is threatening (usually restricted to burning within a mile of the boundary), then dispatch firefighting resources based upon the Dispatch Card. While the resources are en route to the fire, relay the fire weather forecast, expected fire behavior, adjacent resource availability, and current weather conditions. A radio log or a unit log (ICS 214) should be initiated. As soon as possible, notify both the FMO and the Project Leader about the ignition.

Step 1: Determine an initial attack plan immediately upon arrival at the fire. This should be done quickly and be based on your initial size-up of the fire. The intent is to get work started in suppressing the fire as soon as possible. Determine:

Locations of escape routes and safety zones.
Special hazards such as burning snags, power lines, etc.
Good anchor points such as roads, burned area, etc.
Where to attack the fire, i.e. at the head, flanks or rear.
How to attack the fire, i.e., direct or indirect.
Type of control line needed.
Are there existing barriers that can be used?
When will the next units arrive?
Additional resource needs.
Locations of escape routes and safety zones.

Step 2: Brief the crew and begin work. Make sure crew understands their work assignment. PROMPT DECISIVE ACTION DURING THE EARLY STAGES OF A FIRE OFTEN DETERMINES THE SUCCESS OR FAILURE OF THE INITIAL ATTACK.

When safe, and after control lines have been anchored at the heel and brought forward, begin the attack at the head of the fire to quickly stop the forward spread. Remember that Watch Out Situation #10 is, "You are attempting frontal assault on the fire." Never begin your attack on the fire by going directly to the head. Exceptions to attacking the head:

Fire intensity is such that work at the head of the fire is unsafe. Fire is burning toward a natural barrier that will check the spread. A high value resource must be protected along another portion of the fire perimeter.
The fire is likely to burn into volatile fuels along another area of the fire perimeter that will result in an increased rate of spread.

Step 3: After resources have been deployed and control action started, continue assessment of the fire, and gather information for determining fire cause. Consider the following:

X Safety - watch for danger areas and evaluate escape routes.
X Size of the fire.
X Length of the fire perimeter.
X Location of the head.
X Values to be protected ahead of the fire.
X Current and expected weather.
X Fire behavior - as expected?
X Fire intensity and rate of spread.
X Fuel type - at location and proximity.
X Topography.
X Time of day.

Step 4: Review the following checklist and take action IMMEDIATELY if the answer to any question is "NO":

X Do you have current fire weather forecast for the fire location?
X Is the observed fire weather consistent with the forecast?
X Can you control the fire with the resources available (on the incident, as well as those en route) under expected conditions?
X Have you developed a plan to attack the fire? (Direct vs. indirect. Anchor points, escape routes, head or flank attack, priority areas).
X Have you communicated the plan to all personnel assigned to the incident, including new arrivals?
X Lookouts in place, or you can see all of the fire area?
X Can you communicate with everyone on the fire and with dispatch?
X Escape routes and safety zones are established. If you are using the black, is it completely burned and without a reburn potential?
X Safety and the standard fire orders are being followed?
Have you reported the status of the fire to dispatch?
X Will you control the fire before the next operational period?
X Do you have a complete list of what resources have been ordered for the fire?
X If the fire will not be controlled before the next operational period, or the size of the organization exceeds the IC's capability to manage, have you informed agency headquarters?

After the initial resources arrive at the fire, a field report should be requested by dispatch. The IA Incident Commander (IC) (IAIC) should follow Chapter 1 of the Fire Line Handbook (FLH), which covers IA with details about duties and responsibilities, checklists, and general descriptions of both strategy and tactic. Many fires at the Refuge require a Type 3 Incident Commander (IC) during the initial attack phase because of the number of resources responding. After forming an initial response, the IAIC should report progress.

Extended Attack
Both the IAIC and management should be assessing the possibility that the fire will transition to a higher complexity using the following list:

1. The IAIC requests additional resources.
2. Fire will not be contained by the beginning of the second full operational period.
3. Fire activity has required a change in strategy or tactics.
4. The IAIC requests an Extended Attack IC.
5. Or, the project leader wants a more experienced IC.

During the transition period, the IAIC, FMO and PL have a number of responsibilities. The IAIC should do the following tasks:

1. Continue actions including shift planning, resource ordering, and assignment of resources.
2. Prepare the IC briefing.
3. Establish, in conjunction with office personnel, a check-in procedure for incoming resources.

The FMO should complete the following tasks during the transition period:

1. Prepare a complexity analysis.
2. Recommend an IC.
3. Prepare a Wildland Fire Situation Analysis (WFSA).

4. Establish an expanded dispatch operation.
5. Prepare an Incident Management Team briefing package.

The PL should complete the following tasks during the transition period:

1. Based upon the FMO recommendation, select and order an IC.
2. Based upon the WFSA prepared by the FMO, complete and approve the WFSA.
3. Prepare a Delegation of Authority.
4. Assign a Resource Advisor to the IMT.
5. Approve a procurement protocol for the IMT.
6. Consider using a Unified Command and convening a Multi-Agency Coordination (MAC) group.
7. Approve an Incident Command Post (ICP) location.
8. Negotiate supplemental agreements, as necessary.
9. Prepare and deliver an Agency Administrator's briefing.

Suppression Conditions

As the dispatch card indicates, the engines from cooperating agencies provide a critical resource for fire suppression. Often, the cooperators are notified before the FWS is and are able to respond to the scene quicker than we can. During the summer months, the fuel is cured and during the summer months often dry, fuel moisture averages around 4%. Monthly windspeeds average 6-8mph, but daily observations with windspeeds over 20 mph is common. We have addressed these conditions in the fire behavior section above. Extensive, available, flashy fuel with strong wind is a prescription for large fire and extreme fire behavior. These conditions suggest that direct attack should be the exception while the use of indirect attack through burnout from existing barriers is the preferred strategy.

We generally avoid the use of any heavy equipment, but the use of foam, fugitive fire retardant and helicopters are all available resources. Of these, foam is most readily available while the aircraft require approximately 30 minutes to be deployed.

General management constraints applicable to all suppression actions include:

< Whenever consistent with safe, effective suppression techniques, the use of natural barriers will be used as extensively as possible, although protection of peachleaf willow stands will remain a priority. The use of backfire techniques, burnout lines improvement, and wetting agents (ground and airborne) is authorized outside of wetland areas. Fire retardant agent should not be used in wetland areas. Fugitive fire retardant agent must be on the approved list for utilization by the Forest Service and Bureau of Land Management.

< All extended attack and project fire operations will have a Refuge employee designated and available to assist suppression forces in the capacity of Resource Advisor.

< Stream or wetland crossings will be limited to set locations.

< Except for spot maintenance to remove obstructions, no improvements will be made to ways, trails, water sources, or clearings. All sites where improvements are made or obstructions removed will be rehabilitated to pre-fire conditions, to the extent reasonably possible.

< Earth moving equipment such as tractors, graders, bulldozers or other tracked vehicles will not be used for fire suppression (if special circumstances warrant extreme measures to ensure protection, the Project Leader or his/her designee can authorize the use of heavy equipment).

< Fireline location will be outside of highly erosive areas, steep slopes, and other sensitive areas. Following fire suppression activities, firelines will be re-contoured and water-barred.

< Riparian areas which have been completely burned will be rehabilitated and seeded.

Initial Attack

< The dispatch card describes the tactics to be considered during initial attack.

< The values at risk in an individual FMU change the level of initial attack from non-aggressive indirect attack methods to aggressive direct attack.

< Initial attack will consider firefighter safety above all other risks; property values and natural resource values have equal weighting in considering risk of initial attack. Initial attack will then be commensurate with the values at risk.

Extended Attack

< Definition: A fire will become an extended attack fire when the initial attack strategy is not successful at containment within 24 hours.

< A Type 3 incident is declared when a third engine responds, or when multiple resources are assigned to a fire.

< The dispatch plan describes the process for requesting additional resources to manage an extended attack.

< Where possible, closest resources will provide the best response. Often, the closest resource is a county fire protection district. Appendix H lists the cooperative agreements for various protection districts adjacent to the Columbia NWR. These agreements are also addressed in the Dispatch Plan.

< Dispatch channels should be followed to obtain resources, whenever possible.

Wildland Fire Situation Analysis

A WFSA must be prepared for fires that cannot be contained by the beginning of the second full operational period or when implementing a strategy different from the Dispatch Card. The Incident Commander, in conjunction with both the FMO and PL, will prepare the WFSA. Approval of the WFSA resides with the Refuge Project Leader.

The purpose of the WFSA is to allow for a consideration of alternatives by which a fire may be controlled. Damages from the fire, suppression costs, safety, and the probable character of suppression actions are all important considerations.

Public safety will require coordination between all refuge staff and the IC. Notices should be posted to warn visitors, trails may be closed, traffic control will be necessary where smoke crosses roads, etc. Where wildland fires cross roads, the burned area adjacent to the road should be mopped up. Every attempt will be made to utilize natural and constructed barriers, including changing fuel complexes, in the control of wildland fire. Rehabilitation efforts will concentrate on the damages done by suppression activities rather than on the burned area itself.

AIRCRAFT OPERATIONS

Aircraft may be used in all phases of fire management operations. All aircraft must be Office of Aircraft Services (OAS) or Forest Service approved. An Aviation Policy Department Manual will be provided by OAS. The use of aircraft should use the Bureau of Land Management's Form 9400-1a entitled Aircraft Flight Request/Schedule. This form provides detailed information on the flight and establishes critical control procedures such as flight following. A hazard analysis checklist is included that provides guidance for safety procedures.

Helicopters may be used for reconnaissance, bucket drops and transportation of personnel and equipment. Natural helispots and parking lots are readily available in most cases. Clearing for new helispots should be avoided where possible. Improved helispots will be rehabilitated following the fire.

As in all fire management activities, safety is a primary consideration. Qualified aviation personnel will be assigned to all flight operations. As part of the risk management process, aviation users should ask themselves the following questions:

< Is this flight necessary?
< Who is in charge?
< Are all hazards identified and have you made them known?
< Should you stop the operation or flight because of : Change in condition? Communications? Confusion? Personnel? Weather? Turbulence? Conflicting priorities?
< Is there a better way to do it?
< Are you driven by an overwhelming sense of urgency?
< Can you justify your actions?
< Are there other aircraft in the area?
< Do you have an escape route?
< Are there any rules being broken?
< Are communications getting tense?
< Are you deviating from the assigned operation or flight?

The OAS has produced a card that lists the Five Steps to a Safe Flight. Step one is to check both aircraft and pilot for an approved and current data card. Step two is prepare a flight plan and establish flight following procedures. Step three is to ensure that personal protective equipment is in use. Step four is to brief the pilot on the mission and discuss the flight hazards. Step five is to give, or obtain a passenger briefing that includes aircraft hazards, seat belt, Emergency Location Transmitter and survival kit, first aid kit, cargo stowing procedures, fire extinguisher, shut-offs for fuel and electricity, Oxygen equipment, emergency procedures, and smoking. Qualified aviation personnel (those that have completed, at a minimum, S-217 Interagency Helicopter Operations) will be assigned to all flight operations. The Department requires that all aviation personnel complete the OAS course B-3, Basic Aviation Safety every three years. Fireline supervisors should also complete S-270 Basic Air Operations.

The Refuge needs to develop an aviation safety plan. This plan should address aviation hazards, pilot briefings and maps. Aviation hazards consist of static features including power lines and towers, and dynamic features like military training routes. Managing the airspace during an incident would require cooperation with the Departments of Energy and Defense. Typically, a temporary flight restriction is placed over an incident by the Federal Aviation Administration. The Air Operation Branch Director then controls the incident airspace.

The Pacific Northwest Mobilization Guide lists numerous aviation resources including airport information, aircraft on contract, and procedures. This Guide is updated annually by the Pacific Northwest Wildfire Coordinating Group. The following cities are located close to the Refuge and have commercial airfields:

Table 14: Local Commercial Airfields

CITY	AIRFIELD NAME	MNEMONIC

Pasco	Tri-Cities Airport	PSC (with OMNI)
Richland	Richland	RLD
Kennewick	Vista Field	S98
Desert Aire	Desert Aire	M94
Othello	Othello	S70
Prosser	Prosser	S40
Warden	New Warden	2S4
Moses Lake	Grant County International	MWH (with OMNI)
Wenatchee	Pangborn Memorial	EAT (with OMNI)
Ellensburg	Bowers	ELN (with OMNI)
Yakima	Yakima	YKM (with OMNI)

COMPLEXITY ANALYSIS

A complexity analysis is integral to the WFSA process. A properly executed complexity analysis indicates what level of management team is needed to manage an emerging incident. The Step-Up Plan calls for the FMO to complete a Complexity Analysis each day when the staffing class is four or five.

DELEGATION OF AUTHORITY

When an Incident Management Team takes over management for an incident, or whenever anyone other than a Refuge employee manages an incident on Refuge grounds, then a Delegation of Authority should be prepared. The Delegation of Authority provides:

- X Delegated responsibility and authority for incident management under prescribed terms and conditions.
- X Terms, conditions, and limitations of the authority granted.
- X Local fire policy.
- X Delineation of line of authority.
- X Priorities for incident control.
- X Direction for unified command.
- X Documentation requirements.
- X Direction for media relations.
- X Direction for incident management reporting.
- X Termination conditions.
- X Other terms and conditions established by the local jurisdiction administrator.

This formal process creates the performance standards for the team. The Delegation of Authority should identify an Agency and/or Resource advisor, the suppression objectives for the incident, the initial attack responsibilities during the delegation, a set of basic guidance documents, a set of cost constraints, an indication of suppression strategies and tactics, and indicate any special management areas.

REHABILITATION AND RESTORATION

When suppression action is taken, rehabilitation is appropriate. The most effective rehabilitation measure is prevention of impacts through careful planning and the use of minimum impact suppression techniques.

Rehabilitation will be initiated by the Incident Commander, FMO, or Project Leader. Rehabilitation will be directed toward minimizing or eliminating the effects of the suppression effort and reducing the potential hazards caused by the fire. These actions may include:

1. Backfill control lines, scarify, and seed.
2. Install water bars and construct drain dips on control lines to prevent erosion.
3. Install check dams to reduce erosion potential in drainage's.
4. Restore natural ground contours.
5. Remove all flagging, equipment and litter.
6. Completely restore camping areas and improved helispots.
7. Repair roads and fences.
8. Consider and plan more extensive rehabilitation or re-vegetation to restore sensitive impacted areas and minimize the spread of exotic weeds.

A set of standard treatments for slopes, channels, and roads are pre-approved and listed in the Fire Management Handbook on pg. 5.2-1.

If revegetation or seeding is necessary, only native plant species will be used. In most cases at least one herbicide treatment to limit moisture-robbing competition from exotic annuals will be needed.

If emergency rehabilitation measures are needed or if rehabilitation is needed to reduce the effects of a wildland fire then the refuge can request appropriate funding through the Burned Area Emergency Rehabilitation (BAER) fund. The BAER fund is administered through the National Park Service (NPS) representative at the National Interagency Fire Center and national BAER team leader.

Rehabilitation plans for each fire will be reviewed by the Fire Analysis Committee. A final plan will be submitted to Region for establishing an account. Rehabilitation should be initiated prior to complete demobilization or as soon as possible following the incident.

REQUIRED REPORTING

The IC will be responsible for documenting decisions and completing the fire report (e.g., ICS-214, DI-1202). The FMO and AFMO will be responsible for any additional required reports. All fires should be reviewed and the level of review depends upon the circumstances. Simple "hotline" reviews occur as an incident evolves while a national level review involves multiple personnel and a published document. The Fire Management Handbook lists the review procedure, a suggested outline for the report, and an extensive list of sample questions for the review.

FIRE INVESTIGATION

Fire management personnel will attempt to locate and protect the probable point of origin and record pertinent information required to determine fire cause. They will be alert for possible evidence, protect the scene and report findings to the fireline supervisor.

Wildland fire that is tied to some type of human activity is a possible trespass case subject to civil or criminal penalties. Prompt and efficient investigation of all suspicious fires will be carried out. However, fire management personnel should not question suspects or pursue the fire investigation unless they are currently law enforcement commission and Wildland Fire and Arson investigation qualified.

Personnel and services of other agencies may be utilized to investigate wildland fire arson or fire incidents involving structures. All fire investigations should follow the guidelines outlined in 4.1-2 of the Fire Management Handbook (2000). Qualified fire investigators are available from both federal and local agencies. They may be ordered through normal resource ordering procedures.

PRESCRIBED FIRE ACTIVITIES

PRESCRIBED BURN PROGRAM OBJECTIVES

Prescribed fires are intentionally ignited under predetermined weather and fuel moisture conditions that permit managers to exert substantial influence over the spread and intensity levels that the fire can achieve. These fires are ignited for purposes of accomplishing resource management objectives. The prescribed fire objectives for Columbia NWR include, but are not limited to: enhancing wildlife and plant species populations, reducing hazardous fuels, eliminating exotic or alien species, promoting biological diversity, preserving endangered species, and disposing of vegetative waste and debris. Fire is a vital ecosystem process as well as a valuable tool for protecting and maintaining Refuge infrastructure.

All prescription parameters, ranges, objectives, fire frequency rotations and firing methodology are clearly stated in the individual project plan for each management ignited prescribed fire and will vary from project to project. Burn plans will be updated to reflect any variations.

The first documented prescribed fires on Columbia NWR were in 1963. Today the Refuge pursues an active prescribed fire program with annual targets of 600 acres per year. Specific management needs for the Refuge, as a whole and for specific areas, will be determined annually.

In all uses of prescribed fire, there are consistent management requirements. These include measurable objectives, qualified personnel, quantified ranges of conditions under which burns will be conducted, a description of actions which will be taken if these conditions are exceeded, a monitoring and documentation process, and a review and approval process.

Although there are some risks to the use of prescribed fire, those risks are minimized by the implementation of these requirements. The failure to prudently use prescribed fire may carry significantly greater risks and long term ecological consequences than a fire program that does not employ prescribed fire.

Prescribed fires involve the use of fire as a tool to achieve management objectives. Research burning may also be conducted when determined to be necessary for accomplishment of research project objectives. Actions included in the prescribed burn program include: the selection and prioritization of prescribed burns to be carried out during the year, prescribed burn plans, burn prescriptions, burn operations, documentation and reporting, and burn critiques. Measures to ensure the successful implementation of the prescribed fire program are to:

X Conduct a vigorous prescribed fire program with the highest professional and technological standards.

X Identify the prescribed burn type most appropriate to specific situations and areas.

X Efficiently accomplish resource management objectives through the application of prescribed fire.

X Continually evaluate the prescribed fire program to better meet program goals by refining prescriptions treatments and monitoring methods, and by integrating applicable technical and scientific advancements.

X Prepare prescribed burn plans with review by the Refuge Biologist, a qualified Prescribed Burn Boss, and approval by the Project Leader.

X Conduct prescribed burns with an adequate number of qualified personnel to conduct the burn as well as to mop-up.

The prescribed fire program includes the potential use of mechanical as well as chemical treatments to reduce hazardous fuels. Prescribed fire may be required to follow these treatments.

FIRE MANAGEMENT STRATEGIES

Prescribed fire will be used to reduce hazard fuel accumulation, restore fire to fire-dependent ecological communities, improve wildlife habitat, and to maintain cultural/ historic scenes where appropriate. All prescribed fire activity will comply with applicable Federal, state, and local air quality laws and regulations.

All prescribed fire projects will have a burn plan approved by the Project Leader. Each burn plan will be prepared using a systematic decision-making process, and contain measurable objectives, predetermined prescriptions, and using an approved environmental compliance document. Appropriate NEPA documentation (Appendix D) exists for this Fire Management Plan. Therefore, additional NEPA documentation will be necessary only for prescribed fire projects not meeting the criteria outlined in this Plan.

Prescribed Fire Burn Plans must include components such as a GO/ NO-GO Checklist, contingency actions to be taken in the event the prescription is exceeded, and the need for alerting neighbors and appropriate public officials to the timing and the planning of the burn. A burn plan format meeting all required needs is located in Appendix L.

Fire monitoring will be used to evaluate the degree to which burn objectives are accomplished. The Fire Monitoring Plan for Columbia NWR may be found in Appendix E. Monitoring can assist managers in documenting success in achieving overall programmatic objectives and limiting occurrence of undesired effects.

This plan calls for full suppression of all wildland fires, both natural and human-caused, on any Refuge land. Any prescribed fire outside prescription will be designated a wildland fire and will be appropriately suppressed.

The Refuge reserves the option to utilize an interagency team approach for complex burns carried out on the boundaries and close to developed areas or burns of large acreage. The most highly qualified and experienced personnel in the regional interagency community would be requested to serve on this team.

Hazard Fuel Reduction

Hazard fuels management activities will be undertaken in and around developed areas, along Refuge boundaries, and continuous areas of Russian-olive or other exotic species to reduce the fire hazard of natural fuels as weather and risk assessments show a likelihood of damage from wildland fire.

Prioritization will be first for firefighter, public and visitor safety associated with use areas and travel corridors, and second for protection of property.

Resource Management

The Columbia NWR was established to provide habitat for migratory birds. The natural flora and fauna found during the migration period may all be adversely impacted by fire that exceeds prescriptions in either intensity or spatial area.

There are three main goals for the use of fire in resource management. One is to maintain the fire dependency of the ecosystem being treated. The second is to help achieve a specific management action. The third goal is to support daily operations that involve water movement.

The following are specific objectives for prescribed fire:

- X Reduce the amount of hazardous fuels to reduce the threat of wildland fire occurrence or spread.
- X Set back succession, often including the removal of woody species.
- X Stimulate growth of desirable plants and improve plant vigor.
- X Open canopy to create foraging areas.
- X Reduce competition for moisture or sunlight.
- X Reduce non-native species seed bank in soil.
- X Recycle nutrients tied up in vegetation or litter.
- X Prepare seed bed for planting.
- X Stimulate germination of seed.
- X Promote re-sprouting of undesirable plants for more concentrated and efficient herbicide application.
- X Remove cover and litter to reduce interception of herbicide during treatment on undesirable plants.
- X Improve access to dense growth areas for maintenance equipment use.
- X Remove the plant density and litter associated with conveyance ditches for more efficient water delivery.

FIRE MANAGEMENT PLANNING

Annual Planning Process

Specific management needs for the refuge as a whole and for specific areas will be determined annually. Specific burn objectives, fire frequency rotation, firing methodology, and prescriptions will vary from year to year. Burn plans will be updated to reflect any variations. The Project Leader will approve all prescribed fire plans and determine if alterations to pre-approved plans warrant further approval.

The Fire Analysis Committee will convene before April 1 each calendar year. The committee will identify prescribed fire burn projects and determine resource management objectives for proposed prescribed fire burn projects. The AFMO will enter these projects into FIREBASE to obtain the required project numbers. The Complexity Analysis in FIREBASE will determine the qualifications needed to carry out the burn project (i.e. RXB3 for complexity values less than 115 and RXB1 for complexity values exceeding 280). The Regional Office staff will consider submitted projects for approval. Approved projects will have a project ceiling established to be used for maintaining fiscal integrity.

The AFMO will consult with the PL to prioritize the projects for implementation prior to September 30 of each year. The AFMO will develop a schedule for plan preparation and have burn plans for the following season completed prior to January 31 so they may be reviewed before implementation. Accomplishment reports will be submitted into FIREBASE upon completion of each project.

The FMO will be responsible for completing an annual fire summary report. The report will contain the number of fires by type, acres burned by fuel type, cost summary, personnel utilized, and fire effects.

Burns may be conducted during any season of the year depending on the specific management objectives of the burn. However, due to the normal life cycle of this area, burns are bimodal, meaning that spring

burning is done prior to green-up and fall burning is accomplished after maturation. Little or no wetland associated burning is accomplished during the summer period as the vegetation is green.

Prescribed Burn Plan
The Prescribed Burn Boss will conduct a field reconnaissance of the proposed burn location with the Zone FMO, AFMO, Wildlife Biologist, and/or Project Leader to discuss objectives, special concerns, and gather all necessary information to write the burn plan. After completing the reconnaissance, a qualified Burn Boss will write the prescribed burn plan.

All prescribed fires will have prescribed burn plans that meet not only the elements listed in 621 FW 3 but also the Prescribed Fire Plan Elements listed in the Fire Management Handbook (pp. 2.1-2 to 2.1-4). Prescribed Burn Plans will follow the format contained in Appendix L. The prescribed burn plan is a site specific action plan describing the purpose, objectives, prescription, and operational procedures needed to prepare and safely conduct the burn. The treatment area, objectives, constraints, and alternatives will be clearly outlined. No burn will be ignited unless both the Prescribed Fire Burn Boss and the Project Leader sign the GO/NO GO checklist. Each burn plan will be reviewed by the Project Leader, Wildlife Biologist, Zone FMO/AFMO, and Burn Boss. The Project Leader has the authority to approve the burn plan. The term "burn unit" refers to a specific tract of land to which a prescribed burn plan applies.
All prescribed fires, prior to implementation must have a written plan which is reviewed and approved by the Project Leader. Habitat management burns, hazard fuels reduction, debris removal, roadside and ditch burning must have a written plan. The Department of Interior, Departmental Manual, chapter on Wildland Fire Suppression and Management (910 DM 1), section b (2) states: "No prescribed fire may be allowed to burn without suppression action unless a current and valid prescription has been approved by the responsible line officer". All prescriptions must address:

1. The land use objectives for the area.
2. Historical fire occurrence.
3. Expected fire behavior.
4. Natural role of fire.
5. Buffer and safety zones.
6. Energy release component (ERC).
7. Constraints which may be required due to regional and national fire activity.
8. Predetermined limit on the number of fires burning in the planning area at one time.
9. Perimeter and acreage burned limit.
10. Analysis of the cumulative effects of weather and drought on fire behavior.
11. Potential impacts upon visitors, users, and local communities, both on and off site.
12. Considerations of environmental, economic, and social effects, both on and off site.

Strategies and Personnel
Execution of prescribed burns will only be implemented by qualified personnel. The Prescribed Burn Boss will fill all required positions to conduct the burn with qualified personnel. All personnel listed in the burn plan must be available for the duration of the burn or the burn will not be initiated.

The Fire Management Handbook lists thirteen prescribed fire situations that shout watch out:

- X You are burning with a plan that has not been approved by the appropriate line officer.
- X You are not a qualified burn boss but have been told to go ahead and burn.
- X The objective of the burn is not clear.
- X There are areas of special concern within the burn that cannot be burned.
- X Private land or structures adjoin the burn.

X You are uncomfortable with the prescription.
X You have not requested a spot weather forecast.
X You decide a test fire is unnecessary
X You decide all your people are old hands and no briefing is necessary
X Escape probability is small, so you don't bother with escape planning.
X You, or the firing boss, are beginning to lose control of your torch people.
X Mop-up and patrol instructions are not specific, or understood by the mop-up boss.
X You haven't lost one in a long time and are starting to feel smug.

Weather and fuel moisture conditions must be monitored closely in planned burn units to determine when the prescription criteria are met. Fuel moisture samples of 10-, 100-, and 1000-hour down and dead logs (where applicable) and of live plants (where applicable) may be monitored each week and percent moisture contents figured to help determine when the prescription criteria are met. When all prescription criteria are within the acceptable range, the Prescribed Burn Boss will select an ignition date based on current and predicted weather forecasts. A thorough briefing will be given by the Prescribed Burn Boss and specific assignments and placement of personnel will be discussed. An updated spot weather forecast will be obtained on the day of ignition and all prescription elements will be rechecked to determine if all elements are still within the approved ranges. If all prescription elements are met, a test fire will be ignited to determine on-site fire behavior conditions as affected by current weather. If conditions are not satisfactory, the test fire will be suppressed and the burn will be rescheduled. If conditions are satisfactory the burn will continue as planned.

Each prescribed fire plan must include a contingency plan in the event the prescribed fire escapes. If the prescribed burn escapes the predetermined burn area, all further ignition will be halted except as needed for suppression efforts. Suppression efforts will be initiated, as discussed in the preburn briefing. The FMO and Project Leader will be notified immediately of any control actions on a prescribed burn. If the burn exceeds the initial suppression efforts, the burn will be declared a wildland fire and suppressed using guidelines established in this plan. Once a wildland fire declaration has been made, the project cannot return to a prescribed fire designation. A WFSA will be completed according to guidelines addressed in the wildland fire activities section, and additional personnel and resources ordered as determined by the Incident Commander. If the fire continues to burn out of control, additional resources will be called from the local cooperating agencies via the servicing dispatch office. A management overhead team may be requested to assume command of the fire.

Prescribed burns shall be conducted under the direction and control of a Prescribed Fire Burn Boss. The project Burn Boss will be certified for that position according to standards currently used by the FWS and the NWCG. All positions required to conduct the burn will be filled with qualified personnel. All positions listed in the plan must be filled for the duration of the burn or it will be postponed.

Monitoring and Evaluation

Monitoring of prescribed fires is intended to provide information for quantifying and predicting fire behavior and its ecological effects on Refuge resources while building a historical record. Monitoring measures the parameters common to all fires: fuels, topography, weather and fire behavior. In addition, ecological changes such as species composition and structural changes will be monitored after a fire. This information will be very useful in fine-tuning the prescribed burn program.

Monitoring is performed on prescribed burns on the Columbia NWR to ensure that burn plan prescriptions are met, to see if first order fire effects fall within the intent of the burn plan objectives, and

to make sure that smoke drift and dispersal is as predicted. All wildland fires will be appropriately suppressed. However, monitoring wildland fires may be appropriate and potentially valuable in mapping and documenting the growth of the fire, measuring on-site weather and fuel loading to provide the fire staff with present and expected fire behavior and effects.

During prescribed burning, monitoring should include mapping, weather, site and fuel measurements and direct observation of fire characteristics such as flame length, rate of spread and fire intensity. Operational monitoring provides a check to insure that the fire remains in prescription and serves as a basis for evaluation and comparison of management actions in response to measured, changing fire conditions, and changes such as fuel conditions and species composition. Burn plan prescription parameters are monitored utilizing belt weather kits and fire behavior field reference guides. Results of monitoring are recorded on fire behavior forms and stored with the individual burn records maintained by the AFMO.

During prescribed burns, monitoring can serve as a precursor to invoking suppression action by determining if the fire is in prescription, assessing its overall potential, and determining the effects of the prescribed burn.

All fires may be monitored regardless of size. The AFMO will establish specific fire information guidelines for each fire to update intelligence about the fire. Highest priority for monitoring will be assigned to large fires or fires which threaten to leave the Refuge.

Monitoring is used to establish quantifiable objectives, observing and measuring the key indicators to evaluate whether objectives were met. Although little site specific data on the effects of fire for Columbia NWR exists, general conclusions can be made from the Fire Effects Information System. The Columbia NWR will use the fire monitoring protocols described in Appendix E. Individual prescribed fire plans may use more quantitative monitoring programs. The Refuge anticipates developing a more extensive monitoring program. Protocols will be established to determine if burn objectives are being met and long term monitoring will be conducted to determine vegetation responses.

Required Reports

All prescribed burn documentation will be completed by the Prescribed Fire Burn Boss. A monitor will be assigned to collect all predetermined information and complete all necessary forms before, during, and after the burn. All records will be archived in the Refuge's fire records and stored in the Fire Management Office for future use and reference.

The Prescribed Fire Burn Boss will prepare a final report on the burn for the Zone FMO, Project Leader and Fire Analysis Committee. Information will include a narrative of the burn operation, a determination of whether or not the objectives were accomplished, weather and fire behavior data, a map of the burn area, photographs of the burn, number of hours worked, and final cost of the project.

Each prescribed fire documentation package will include the following:

- X Critique documentation
- X Prescribed Burn Plan including project maps
- X Documentation of all management decisions concerning the project.
- X On-site Weather Observations
- X Open Burning Permits
- X Spot Weather Forecasts
- X Unit logs and other narrative summary

X Individual Fire Report Form (DI-1202)
X Biological reference for control of exotic species in areas where exotics are present and obvious
X Documentation of monitoring

PRESCRIBED BURN CRITIQUE

The participants will critique each prescribed burn. A report detailing the actual burn will accompany any recommendations or changes deemed necessary in the program. This report will be submitted to the refuge Project Leader and FMO. A post-season critique of the fire management program, including the prescribed burn program, will be held each year by the Fire Analysis Committee at the conclusion of the fall fire season.

AIR QUALITY / SMOKE MANAGEMENT GUIDELINES

The FWS fire management activities which result in the discharge of air pollutants, (e.g., smoke, carbon monoxide, and other pollutants from fires) are subject to, and must comply with, all applicable federal, state, interstate, and local air pollution control requirements. These requirements are specified by Section 118 of the Clean Air Act, as amended (42 USC 7418). It is not the primary intent of the Clean Air Act to manage the impacts from natural sources of impairment (i.e., wildland fire use for resource objectives and wildland fires). Smoke from these fires is an inevitable by-product. Fires are not considered point sources of emissions, but tend to be spatially distributed singular events, and temporary impacts to visibility and visitor enjoyment must be recognized, expected, and managed. This may include temporary closures or warnings during the progress of management approved prescribed fires. Pertinent areas that will demand attention include:

The corridor through Unit 3 (McManamon Road).
The O'Sullivan Dam Road (SR262) north of Marsh Unit 1.
State Road 26 west of Othello.

The fire management program at Columbia National Wildlife Refuge will comply with Air Quality-Smoke Management Guidelines listed in The Fire Management Handbook 621 FW. The fire management program will also comply with interstate, state, and local air pollution control regulations, as required by the Clean Air Act.

The State of Washington has implemented a Clean Air Act (70 RCW Chapter 70.94). The refuge must comply with the Washington Clean Air Act. The Washington Administrative Code 173-425-030 includes the following definitions:

"(16) Outdoor burning means the combustion of material of any type in an open fire or in an outdoor container without providing for the control of combustion or the control of emissions from the combustion. For the purposes of this rule, 'outdoor burning' means all types of outdoor burning except agricultural burning and silvicultural burning."

"(1) Agricultural burning means outdoor burning regulated under chapter 173-430 WAC, including, but not limited to, any incidental agricultural burning or agricultural burning for pest or disease control."

"(23) Silvicultural burning means outdoor burning relating to the following activities for the protection of life or property and/or the public health, safety, and welfare: (a) abating a forest fire hazard; (b) prevention of a forest fire hazard; (c) instruction of public officials in methods of forest fire fighting; (d) any silvicultural operation to improve the forest lands of the state; and (e) silvicultural burning used to improve or maintain fire dependent ecosystems for rare plants or animals within state, federal, and private natural area preserves, natural resource conservation areas, parks, and other wildlife areas."

"(9) Land clearing burning means outdoor burning of trees, stumps, shrubbery, or other natural vegetation from land clearing projects (i.e., projects that clear the land surface so it can be developed, used for a different purpose, or left unused)."

"(11) Natural vegetation means unprocessed plant material from herbs, shrubbery, and trees, including grass, weeds, leaves, clippings, prunings, brush, branches, roots, stumps, and trunk wood."

"(25) Tumbleweed burning means outdoor burning to dispose of dry plants (typically Russian Thistle and Tumbleweed Mustard plants) that have been broken off, and rolled about, by the wind."

"And (27) Weed abatement fires means any outdoor burning to dispose of weeds that is not regulated under chapter 173-430 WAC, which applies to agricultural burning."

The Washington Clean Air Act says, "The department of natural resources shall have the responsibility for issuing and regulating burning permits required by it relating to the following activities for the

protection of life or property and/or for the public health, safety, and welfare: (a) abating a forest fire hazard; (b) prevention of a fire hazard; ...(e) silvicultural burning used to improve or maintain fire dependent ecosystems for rare plants or animals within state, federal, and private natural preserves, natural resource conservation areas, parks and other wildlife areas (RCW 70.94.660(1))."

The Revised Code of Washington defines forest land to include, "Sagebrush and grass areas east of the summit of the Cascade mountains may be considered forest lands when such areas are adjacent to or intermingled with areas supporting tree growth (RCW 76.04.005(8)." Despite this, the Department of Natural Resources has recommended that the Department of Ecology regulate Refuge smoke management.

The Department of Ecology in Spokane makes daily determinations about allowing burning in individual counties. A permit may be obtained by first sending in the Refuges burn plans for review. A confirmation is sent back to the Refuge along with the burn plans. The confirmation and permit state stipulations as to under what conditions a plan may be executed. On the day of the intended burn, a call is placed to the Spokane office to verify burning conditions for that day. Requests are either approved or denied at 0900 the day of the intended burn.

The Columbia NWR Assistant Fire Management Officer will contact local and state authorities to ascertain all procedures prerequisite to compliance with regulations or permits, will obtain any necessary permits or ensure in writing that regulatory requirements will be met.

A copy of this Plan will be forwarded to the appropriate authorities, if necessary. Personnel from the permitting agencies will be allowed on-site during prescribed fire operations for observational purposes if necessary for their agency needs.

Prescribed burning will be conducted only on days that are acceptable to the permitting agency. Any monitoring activities will be coordinated with the permitting agency and information collected will be made available to them as requested.

All burn plans will have clear objectives and will monitor impacts of smoke on the human and natural environments. Current and predicted weather forecasts will be utilized along with test fires to determine smoke dispersal. Prescribed burns in proximity to structures will be ignited only after careful considerations are given to levels of visitation and impacts upon visitation and local residents.

FIRE RESEARCH

Fire research needs address habitat parameters that can be affected by prescribed or wildland fire. A proposal has been submitted for funding through the Joint Fire Science Program (JFSP) for review in August 2001. The project title "Management of fuel loading in the shrub steppe", with Dr. Steven Link of WSU Tri-Cities, compares post-burn application of low levels of three different herbicides for cheatgrass control, and has applications for wildland fire and prescribed fire restoration (Appendix N). Another proposal planned for submission to JFSP in October 2001 by Dr. Benjamin Zamora of WSU Pullman, looks at repeated fire application to achieve cheatgrass reduction in degraded steppe habitat.

Other research needs address specific control or survival strategies for species on the Refuge:

- < Determine the conditions under which peachleaf willow can survive understory burning.
- < Determine the conditions under which Russian-olive can be killed using prescribed fire.
- < Determine how fire can be used in the control of perennial pepperweed.
- < Determine the effects of fire on habitat important to the Washington ground squirrel.

PUBLIC SAFETY

Because wildland fires are dynamic and may be hazardous, they must be given very high priority during critical conditions. Employees responsible for, and involved in, any wildland fire management activity must always consider the safety of human life above all other values. Assuring visitor safety takes priority over other activities at all times; being able to provide a consistent and accurate evaluation of fire behavior is the basis for contingency plans, contacts, and briefings that ensure public and personnel safety. The following are the Columbia NWR's public and employee safety considerations:

X Limited opportunities to find safety zones for escaping from a fast moving wildland fire on Refuge trails and road systems. Refuge visitors will likely not be able to recognize a safe area so emphasis will be to sweep potentially effected areas as quickly as possible.

X Certain areas will be closed to use when the risks to visitors is too high or there are not enough personnel to handle the situation any other way. Information concerning fire danger will be disseminated through trailhead and Bulletin Board signing. Any time human life may be endangered, all necessary means will be taken to warn or evacuate visitors and neighboring landowners and other users.

Smoke on roadways may create a vehicle visibility hazard, from a fire burning nearby or at night under light wind conditions. Smoke plume trajectories from large fires may be plotted using computer programs, weather information and onsite monitoring. Expected impacts to off-Refuge communities and roadways will be evaluated and information shared with the respective agencies. If needed, vehicular or air patrols will be used to monitor smoke plumes.

The AFMO will inform the Project Leader of all potentially hazardous fires within the Refuge. The Project Leader will then coordinate public and interagency notifications and implement suppression actions to mitigate the fire's impact within and outside the Refuge. The extent of public notice will depend on the specific fire situation. The following actions should be considered:

X When fire affects travel along any roads on Refuge lands, law enforcement will be dispatched to stop or control traffic. The State Patrol and Sheriffs office will be informed and assistance requested as needed. When evacuation of an area is recommended, the Project Leader and FMO will be informed immediately.

X When heavy smoke impacts visitor use areas, Refuge personnel will be sent to inform people of the situation and assure them of the safety of remaining where they are, or assist them to safety. As part of initial and continuing size-up, the incident commander will determine the proximity to the fire of any visitors or other land users, inform them of potential hazards, and aid in evacuation if needed. If the parties do not cooperate, law enforcement assistance may be requested through dispatch.

X When needed, information on location, behavior, expected dangers, areas to avoid, and other precautions will be posted on refuge bulletin boards, at kiosks, post offices and local businesses. When the risks from a wildland fire are high, precautionary signs will be posted on trails leading into a fire area. Areas will be closed if deemed necessary by the Fire Analysis Committee, and approved by the Project Leader. The Prescribed Fire Burn Boss will ensure that closure and/or informational signs on prescribed burns are properly posted.

PUBLIC INFORMATION AND EDUCATION

Although the general public has in recent years become more informed about the role of fire in the ecosystem, many concerns and fears remain. To reduce these public concerns and gain acceptance and support for the fire management program, the public must be kept informed of fire management goals, policies and activities. On the Columbia NWR, fires can spread very quickly and visibly, necessitating that timely, accurate information concerning both management ignited and wildland fires be provided to Refuge visitors and adjacent land owners.

Press releases regarding fire danger levels, closures, special precautions, and prescribed fires will be issued by the Project Leader to newspapers, radio and television stations. Supplemental handouts, signing and personal contacts may also be conducted. The Project Leader or his/her designee, when necessary, will function as Information Officer, and provide for effective communication between Refuge personnel, the public, and the media. The fire management program will be incorporated into the Refuge's overall interpretive program and explained when possible and appropriate. At higher staffing classes and/or during periods of high fire activity, an Information Officer may be ordered from outside the Refuge.

Prior to prescribed fires, the Prescribed Fire Burn Boss will inform project personnel on details of the burn. Landowners or agencies located near the prescribed burn will be contacted. On the day of the burn, all staff should be notified as to the burn's location and any special safety warnings to pass on to visitors, i.e., caution to watch for smoke on the road, or advice not to hike in the area. Key visitor use or access sites where visitors could likely observe or approach the burn area should have temporary signs indicating a management fire is occurring. This provides for public safety and education, and decreases the likelihood that visitors will report or attempt to put out a prescribed fire accomplishing resource objectives.

Post-season activities will include those tasks necessary to adequately assess how the local public and cooperators received the efforts. This will be accomplished through coordination meetings with neighbors, contacts with local groups, media, and the State Air Pollution Control Bureau. The purpose of this feedback is to revise plans, procedures and educational efforts regarding overall fire management for the refuge. The Assistant Fire Management Officer will cooperate with the Project Leader on the following programs:

X Development of a brief interpretive handout which will discuss the basic objectives of both using Management Ignited Prescribed Fire.
X Develop an outline and materials for a program that contains a prevention message and describes the fire program.
X Maintaining a file of public comments received concerning prescribed burns, and using them to improve communication efforts targeted at increasing support for the fire management program.

FIRE CRITIQUES AND ANNUAL PLAN REVIEW

FIRE CRITIQUES

Fire reviews will be documented and filed with the final fire report. The AFMO will retain a copy for the refuge files.

ANNUAL FIRE SUMMARY REPORT

The FMO will be responsible for completing an annual fire summary report. The report will contain the number of fires by type, acres burned by fuel type, cost summary (prescribed burns and wildland fires), personnel utilized, and fire effects.

ANNUAL FIRE MANAGEMENT PLAN REVIEW

The Fire Management Plan will be reviewed annually. Necessary updates or changes will be accomplished prior to the next fire season. Any additions, deletions, or changes will be reviewed by the Project Leader and Regional Fire Management Officer to determine if such alterations warrant a re-approval of the plan. Substantive revisions will be submitted with a new plan cover sheet for signatures and dates. Examples of revisions not requiring the Regional Director's approval include:

1. Grammatical corrections.
2. Page renumbering
3. Deletions, corrections or additions to appendices.
4. Table of contents corrections
5. Updated interagency agreements.
6. Changes in sections relating to emergency and cooperating agency telephone numbers and names of employees or contacts.

Revised pages will be dated in the lower right hand corner of the page. Copies of all revised pages will be promptly forwarded to all other offices maintaining copies of the plan.

CONSULTATION AND COORDINATION

The following agencies, organizations and/or individuals were consulted in preparing this plan:

Roddy Baumann, Prescribed Fire Specialist, Pacific Region, USFWS, Portland, OR.

Randy Hill, Biologist, Columbia NWR, USFWS, Othello, WA.

Rob Larrañaga, Deputy Project Leader, Columbia NWR, USFWS, Othello, WA.

Dr. Steven Link, Restoration Ecologist, Washington State University - Tri Cities, Richland, WA.

Dennis Macomber, Fire Management Consultant, Portland, OR.

Amanda McAdams, Fire Planner, Pacific Region, USFWS, Portland, OR.

Julie Martin, Lead Forestry Technician, Columbia NWR, USFWS, Othello, WA.

Tom Romanello, Assistant Fire Management Officer, Sheldon-Hart NWRC, Lakeview, OR.

Thomas Skinner, Fire Management Officer, Mid-Columbia NWR, USFWS, Pasco, WA.

Dr. Benjamin Zamora, Asst. Professor of Natural Resource Sciences, Washington State University, Pullman, WA.

APPENDICES

APPENDIX A: REFERENCES CITED

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APPENDIX B: DEFINITIONS

Agency Administrator. The appropriate level manager having organizational responsibility for management of an administrative unit. May include Director, State Director, District Manager or Field Manager (BLM); Director, Regional Director, Complex Manager or Project Leader (FWS); Director, Regional Director, Park Superintendent, or Unit Manager (NPS), or Director, Office of Trust Responsibility, Area Director, or Superintendent (BIA).

Appropriate Management Action. Specific actions taken to implement a management strategy.

Appropriate Management Response. Specific actions taken in response to a wildland fire to implement protection and fire use objectives.

Appropriate Management Strategy. A plan or direction selected by an agency administrator which guide wildland fire management actions intended to meet protection and fire use objectives.

Appropriate Suppression. Selecting and implementing a prudent suppression option to avoid unacceptable impacts and provide for cost-effective action.

Bureau. Bureaus, offices or services of the Department.

Class of Fire (as to size of wildland fires):
Class A - 3 acre or less.
Class B - more than 3 but less than 10 acres.
Class C - 10 acres to 100 acres.
Class D - 100 to 300 acres.
Class E - 300 to 1,000 acres.
Class F - 1,000 to 5,000 acres.
Class G - 5,000 acres or more.

Emergency Fire Rehabilitation/Burned Area Emergency Rehabilitation (EFR/BAER). Emergency actions taken during or after wildland fire to stabilize and prevent unacceptable resource degradation or to minimize threats to life or property resulting from the fire. The scope of EFR/BAER projects are unplanned and unpredictable requiring funding on short notice.

Energy Release Component (ERC) A number related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. It is generated by the National Fire Danger Rating System, a computer model of fire weather and its effect on fuels. The ERC incorporates thousand hour dead fuel moistures and live fuel moistures; day to day variations are caused by changes in the moisture content of the various fuel classes. The ERC is derived from predictions of (1) the rate of heat release per unit area during flaming combustion and (2) the duration of flaming.

Extended attack. A fire on which initial attack forces are reinforced by additional forces.

Fire Suppression Activity Damage. The damage to lands, resources and facilities directly attributable to the fire suppression effort or activities, including: dozer lines, camps and staging areas, facilities (fences, buildings, bridges, etc.), handlines, and roads.

Fire effects. Any consequences to the vegetation or the environment resulting from fire, whether neutral, detrimental, or beneficial.

Fire intensity. The amount of heat produced by a fire. Usually compared by reference to the length of the flames.

Fire management. All activities related to the prudent management of people and equipment to prevent or suppress wildland fire and to use fire under prescribed conditions to achieve land and resource management objectives.

Fire Management Plan. A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational procedures such as preparedness plans, preplanned dispatch plans, prescribed fire plans and prevention plans.

Fire prescription. A written direction for the use of fire to treat a specific piece of land, including limits and conditions of temperature, humidity, wind direction and speed, fuel moisture, soil moisture, etc., under which a fire will be allowed to burn, generally expressed as acceptable range of the various fire-related indices, and the limit of the area to be burned.

Fuels. Materials that are burned in a fire; primarily grass, surface litter, duff, logs, stumps, brush, foliage, and live trees.

Fuel loadings. Amount of burnable fuel on a site, usually given as tons/acre.

Hazard fuels. Those vegetative fuels which, when ignited, threaten public safety, structures and facilities, cultural resources, natural resources, natural processes, or to permit the spread of wildland fires across administrative boundaries except as authorized by agreement.

Initial Attack. An aggressive suppression action consistent with firefighter and public safety and values to be protected.

Maintenance burn. A fire set by agency personnel to remove debris; i.e., leaves from drainage ditches or cuttings from tree pruning. Such a fire does not have a resource management objective.

Natural fire. A fire of natural origin, caused by lightning or volcanic activity.

NFDRS Fuel Model. One of 20 mathematical models used by the National Fire Danger Rating System to predict fire danger. The models were developed by the US Forest Service and are general in nature rather than site specific.

NFFL Fuel Model. One of 13 mathematical models used to predict fire behavior within the conditions of their validity. The models were developed by US Forest Service personnel at the Northern Forest Fire Laboratory, Missoula, Montana.

Prescription. Measurable criteria which guide selection of appropriate management response and actions. Prescription criteria may include safety, public health, environmental, geographic, administrative, social, or legal considerations.

Prescribed Fire. A fire ignited by agency personnel in accord with an approved plan and under prescribed conditions, designed to achieve measurable resource management objectives. Such a fire is designed to produce the intensities and rates of spread needed to achieve one or more planned benefits to natural resources as defined in objectives. Its purpose is to employ fire scientifically to realize maximize net benefits at minimum impact and acceptable cost. A written, approved prescribed fire plan must exist and NEPA requirements must be met prior to ignition. NEPA requirements can be met at the land use or fire management planning level.

Preparedness. Actions taken seasonally in preparation to suppress wildland fires, consisting of hiring and training personnel, making ready vehicles, equipment, and facilities, acquiring supplies, and updating agreements and contracts.

Prevention Activities directed at reducing the number or the intensity of fires that occur, primarily by reducing the risk of human-caused fires.

Rehabilitation (1) Actions to limit the adverse effects of suppression on soils, watershed, or other values, or (2) actions to mitigate adverse effects of a wildland fire on the vegetation-soil complex, watershed, and other damages.

Suppression. A management action intended to protect identified values from a fire, extinguish a fire, or alter a fire's direction of spread.

Unplanned ignition. A natural fire that is permitted to burn under specific conditions, in certain locations, to achieve defined resource objectives.

Wildfire. An unwanted wildland fire.

Wildland Fire. Any non-structure fire, other than prescribed fire, that occurs in the wildland.

Wildland Fire Situation Analysis (WFSA). A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, economical, political, and resource management objectives as selection criteria.

Wildland/urban interface fire A wildland fire that threatens or involves structures.

APPENDIX C: FIGURES

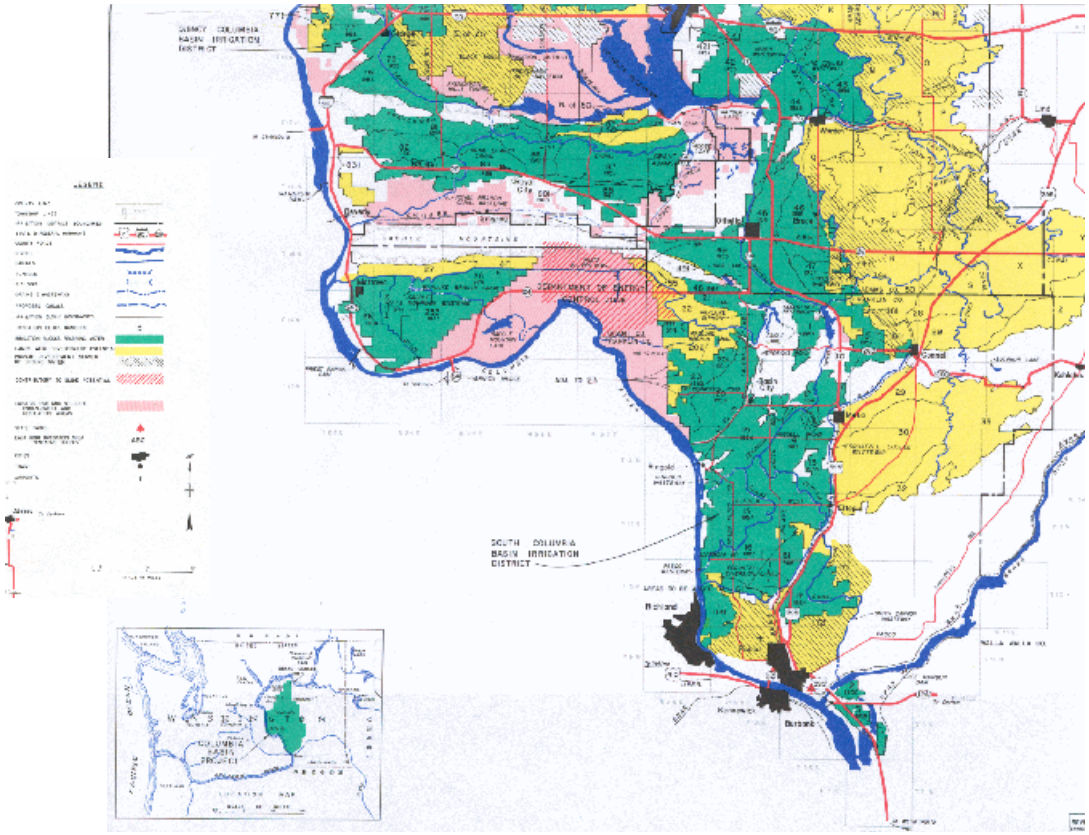
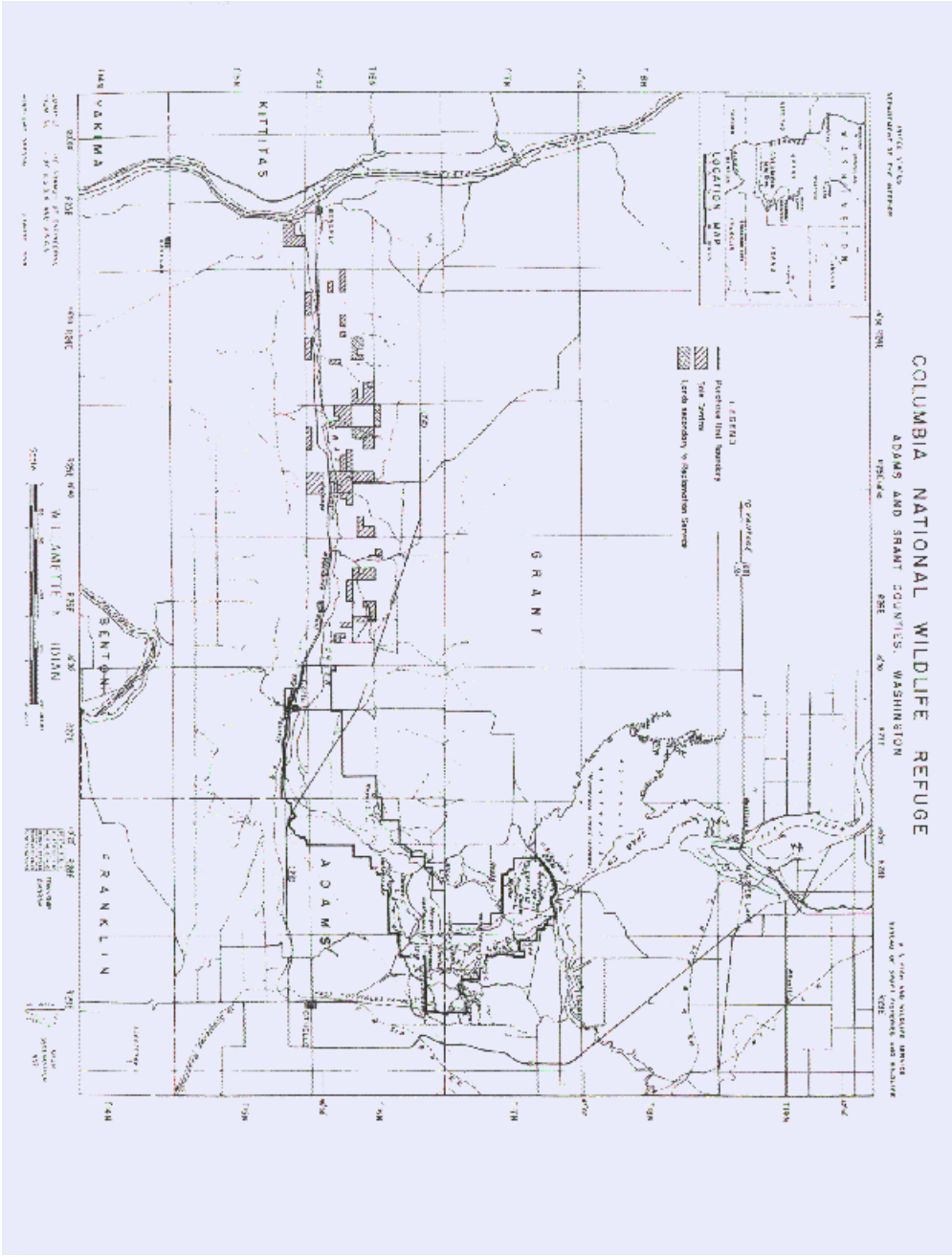


Figure 3: Columbia NWR Vicinty Map

Figure 4: Columbia NWR Vicinity Map


COLUMBIA NATIONAL WILDLIFE REFUGE
ADAMS AND GRANT COUNTIES, WASHINGTON
KITTITAS
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GRANT
ADAMS
FRANKLIN
BENTON
WALLA WALLA
IDAHO
LOCATION MAP

Figure 5: Columbia NWR Vicinity Map

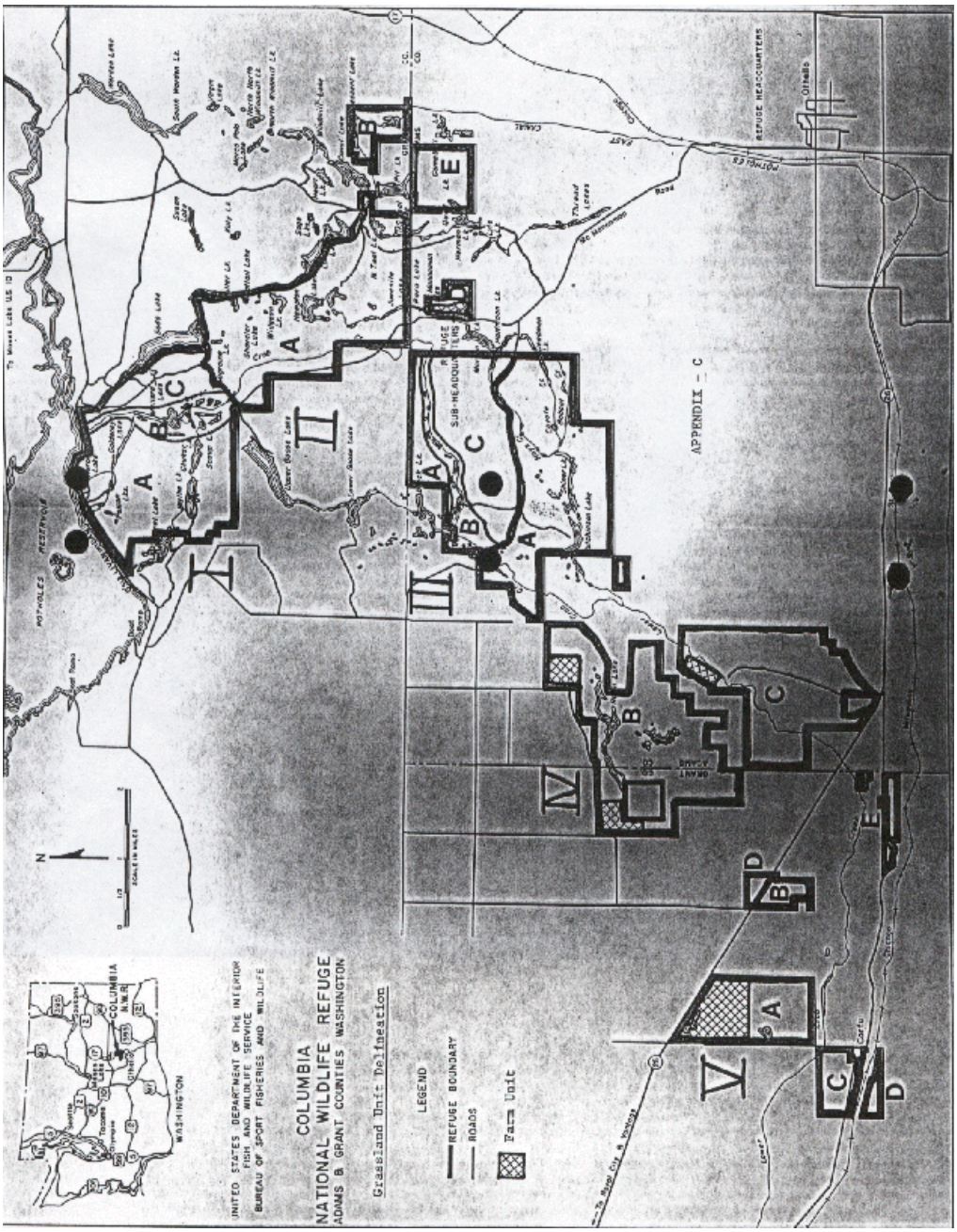


Figure 6: Volunteer Fire Department Coverage Area Map

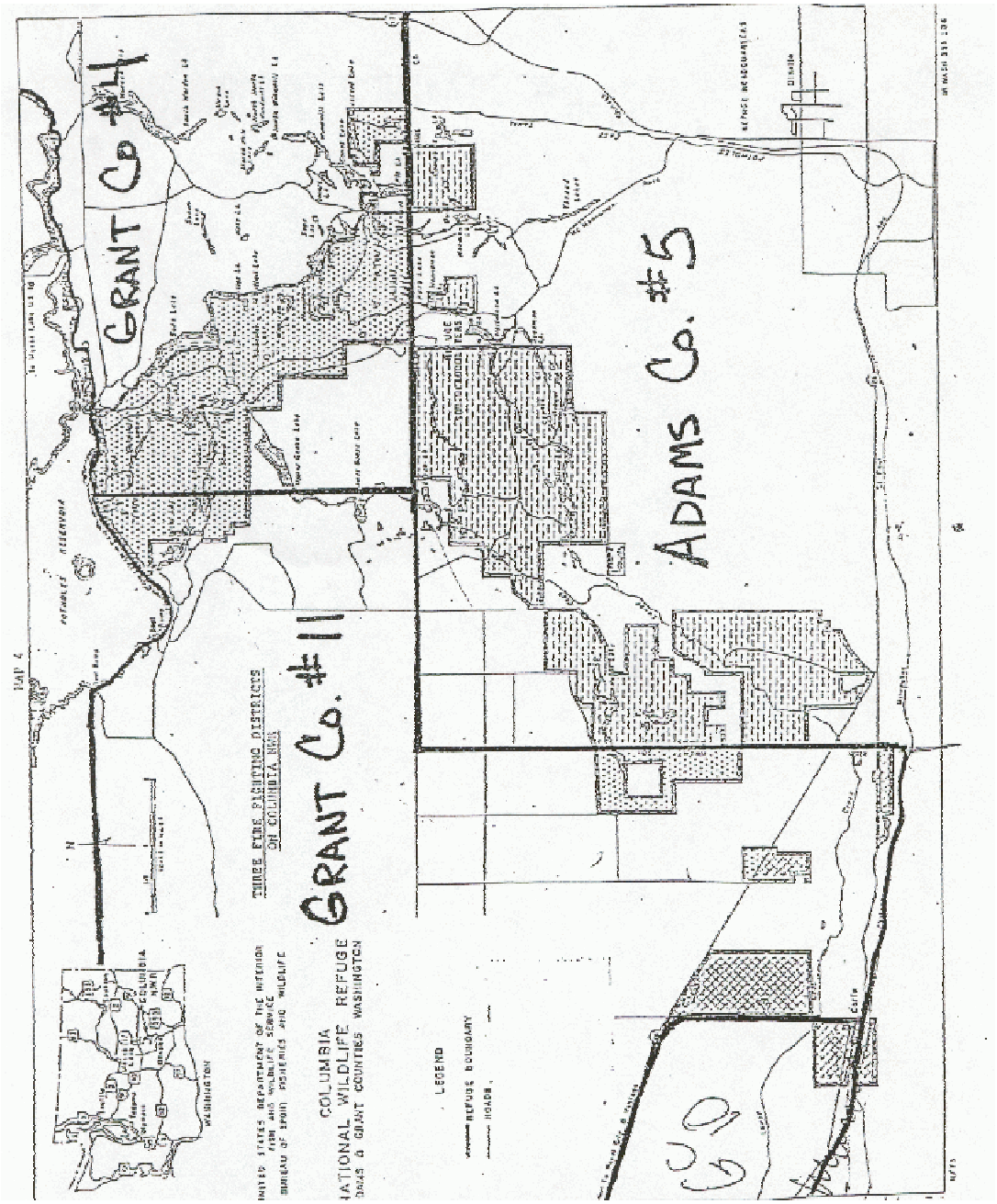


Figure 7: Columbia NWR Road System

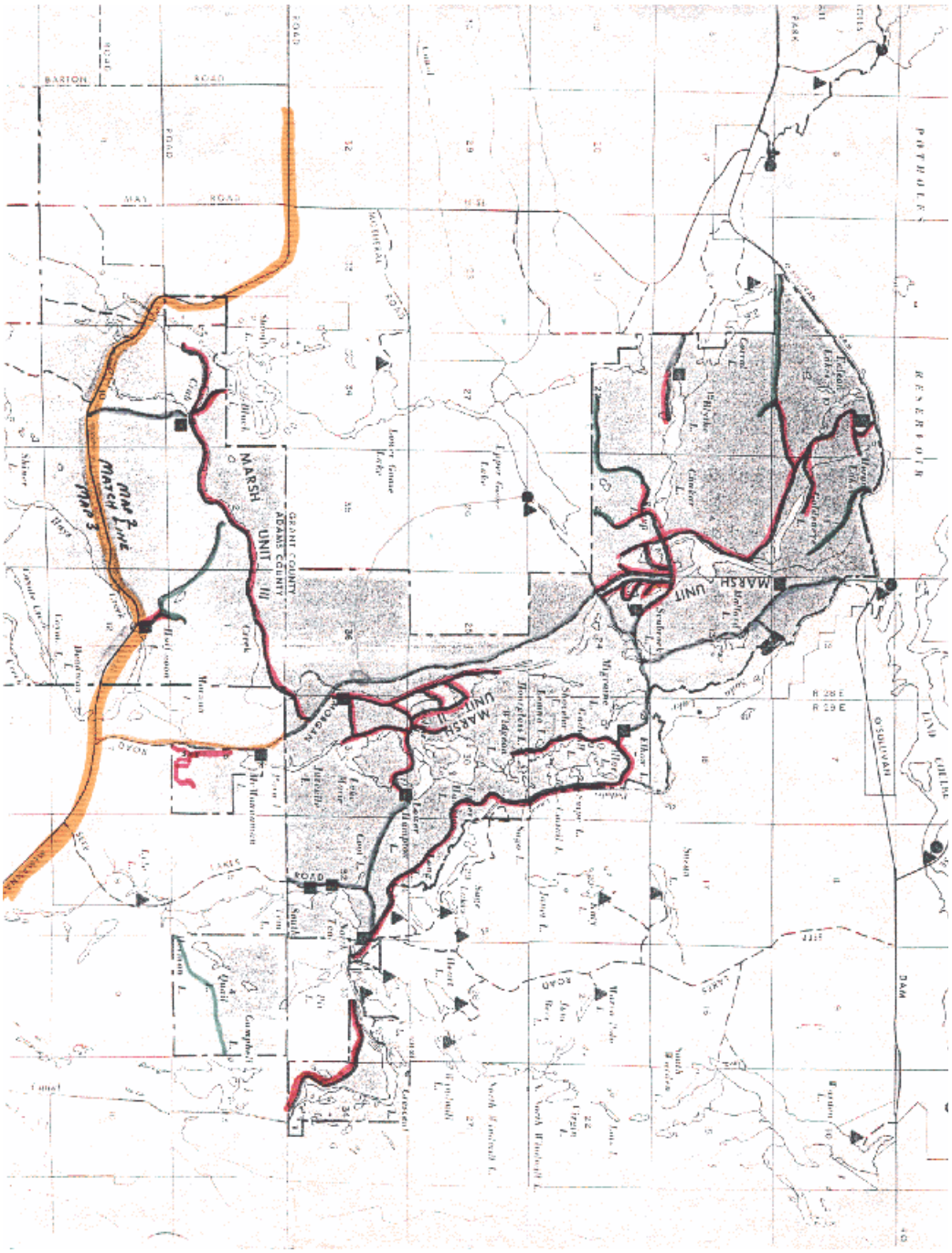
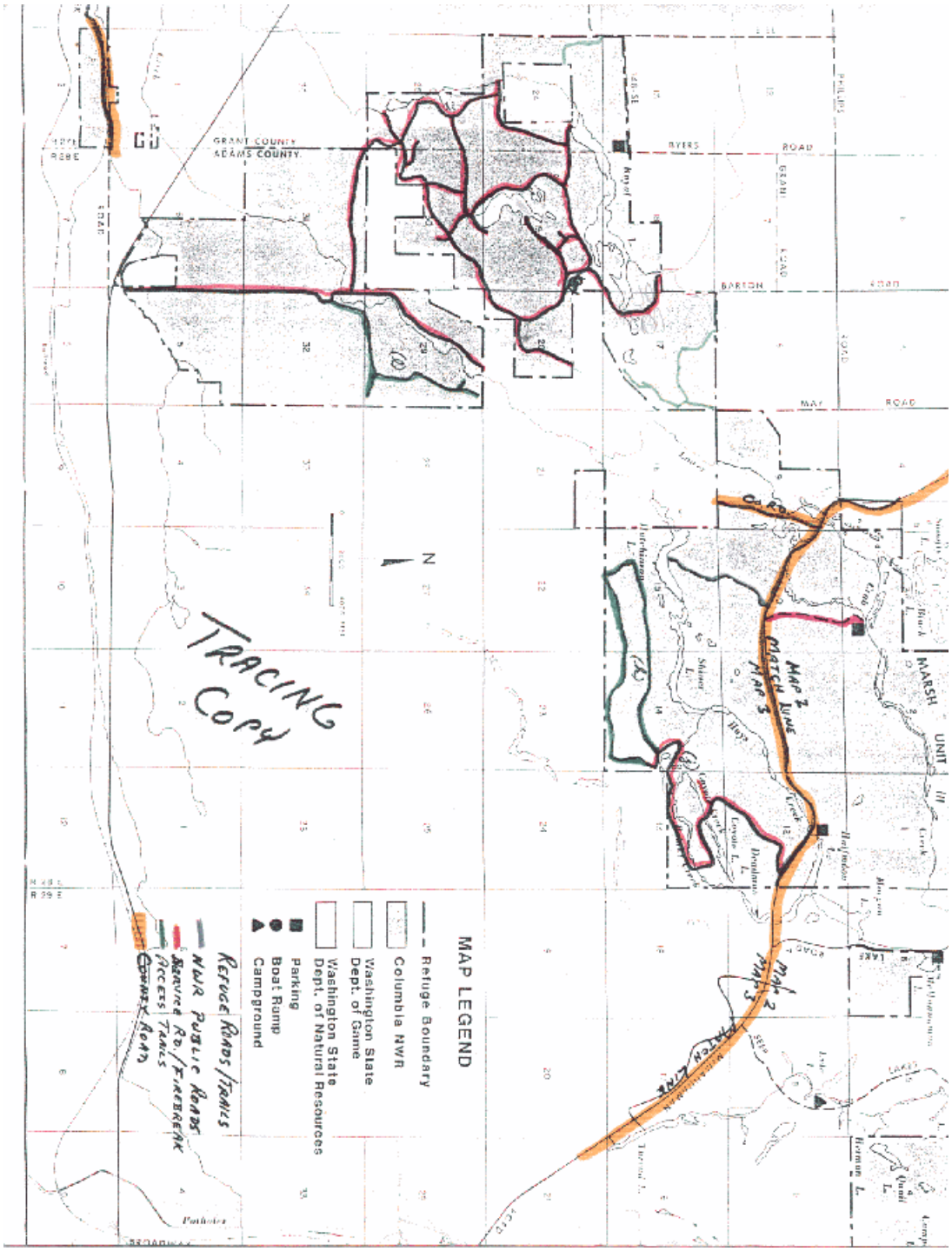


Figure 8: Columbia NWR Road System Map



APPENDIX D: COMPLIANCE

ENVIRONMENTAL ASSESSMENT

PRESCRIBED FIRE
(Descriptive Title for Proposed Action)

COLUMBIA NATIONAL WILDLIFE REFUGE COMPLEX
(FWS Unit Proposing Action)

OTHELLO, WASHINGTON
(Location of Action)

RANDY HILL
(Author of Document)

11/25/92
(Date Prepared)

Section I: PURPOSE AND NEED FOR ACTION

1. Why is action being considered? (Discuss problems, opportunities, needs)

Fire management is required for responsible management of our public lands. Prescribed fire can set back unwanted succession, remove standing cover for easier maintenance, invigorate decadent vegetation, and remove hazardous fuel loads to prevent potentially catastrophic wildfires on public and adjacent private lands.

2. How does the action relate to Service objectives?

Service objectives include: to preserve a natural diversity and abundance of fauna and flora on refuge lands; to perpetuate the migratory bird resource; to preserve, restore, and enhance in their natural ecosystems all species of animals and plants that are endangered or threatened with becoming endangered; and to provide an understanding and appreciation of fish and wildlife ecology and man's role in his environment, and to provide refuge visitors with quality recreational experiences oriented toward wildlife. Fire management is an important component in meeting the first three of these objectives, and can contribute to the fourth through improving recreational experiences such as hiking, hunting and birdwatching.

3. What is the action supposed to accomplish?

Prescribed fire management will direct coordination, safety procedures, equipment needs, communication, personnel and training in order to successfully carry out prescribed burning activities. The benefits of these activities for vegetation management are included in 1. and 2. above.

Section II: ALTERNATIVES INCLUDING THE PROPOSED ACTION
(Identify one of the alternatives as the preferred alternative.
Add alternatives as necessary.)

A. No Action Alternative

1. Describe this alternative.

Only mechanical means would be available for vegetation management, including mowing, cutting and pulling. Residual vegetation, including undesirable weedy species and decadent desirable species, would accumulate and reduce productivity and value as wildlife habitat. Additionally, succession to woody shrubs and trees would occur. fire suppression activities would be reactive rather than proactive, allowing hazardous conditions for potentially catastrophic wildfires.

2. To what extent would this alternative satisfy the problems, opportunities or needs identified in Section I?

The three objectives listed in Section I could be partially met without the use of fire. However, maintenance of vegetation would be much more costly and less effective if limited to existing mechanical means. Protecting natural diversity and ecosystem management would be much more difficult if fire could not be used, requiring costly hand control of vegetation. Equipment and labor for removal of hazardous fuels to prevent catastrophic fires would be very costly and probably would occur only minimally if at all.

3. What are the principal environmental (biophysical) effects associated with Implementation of this alternative? (Summarize effects from Section !Y.)

Equipment access problems preclude efficient use of equipment for managing vegetation, and hand labor is impractical for large scale management to maintain diversity and vegetative composition. Periodic pest control is not achieved, and proactive fire pre-suppression is less effective or cannot be attained in important habitats that are not fire-tolerant without significant soil disturbance.

4. What are the principal socioeconomic effects associated with implementation of this alternative? (Summarize effects from Section IV.)

Cost effectiveness could not be achieved, and safety risk due to catastrophic wildfire would be greater if prescribed burning was not used.

5. Would implementation of this alternative likely result in significant controversy? Explain.

Yes. Environmental organizations are watching closely how public lands are managed, especially whether other uses are conflicting with proper management of these lands. Habitat degradation is one concern of environmental groups, and the inability to manage lands in an ecologically sound, cost-effective manner likely will be criticized.

B. PRESCRIBED FIRE MANAGEMENT (Descriptive title for alternative)

1. Describe this alternative.

This is the preferred alternative. Prescribed fire would be used to reduce hazardous fuel loads, undesirable weedy species, decadent vegetation and invasive woody species. Unwanted residual vegetation would be burned for more efficient entry and use of maintenance equipment to help facilitate water management.

2. To what extent would this alternative satisfy the problems, opportunities or needs identified in Section 1?

While prescribed fire would not solve all vegetation control problems, it is a main tool required for the maintenance of healthy stands of desirable vegetative cover. It is the only natural vegetation management scheme (other than deep flooding in marsh impoundments) that we can use to selectively control or enhance plants over a large area.

3. What are the principal environmental (biophysical) effects associated with implementation of this alternative? (Summarize effects from Section IV.)

With the exception of minor short-term air quality reduction, all effects listed are positive and include pest control, animal and plant species diversity and abundance, and plant vigor. Soil disturbance would not occur.

4. What are the principal socioeconomic effects associated with implementation of this alternative? (Summarize effects from Section IV.)

Cost effectiveness would be favorable for diversity maintenance and equipment access, and fuel reduction capability would be available for greater public safety.

5. Would implementation of this alternative likely result in significant controversy? Explain.

No. In our local community, agriculture and the associated lifestyle dominate the area. Agricultural burning is a common and accepted practice if air quality is not significantly degraded. There is always opposition from a few individuals (as there was when livestock grating was terminated in the early 1980's) that would like to graze cattle on the refuges rather than burning off potential forage.

C. GRAZING (Descriptive title for alternative)

1. Describe this alternative.

Vegetation management would be accomplished through seasonal grazing in selected areas. Electric or permanent fences would be installed in these areas to control access.

2. To what extent would this alternative satisfy the problems, opportunities or needs identified in Section I?

Some control of unwanted vegetation would occur. However, many undesirable species would not be grazed, or would be eaten and have seed dispersed in manure. Undesirable woody species generally are not eaten. Grazing will not control dried tumbleweeds. Grazing in our upland areas also removes the mycorrhizal layer that helps protect the soil surface from erosion and woody species invasion. ?here is some advantage to grate on areas that cannot be burned.

3. What are the principal environmental (biophysical) effects associated with implementation of this alternative? (Summarize effects from Section IV.)

Grazing negatively impacts soil and only affects vegetation selectively, often removing desirable species but not undesirable plants. Noxious weeds are spread by livestock, Grazing will remove fine fuels (mostly grasses) that will spread wildfire; however, native perennial grasses are not subject to frequent wildfire problems, and past grazing has increased the spread of cheatgrass, the main carrier of wildfire on the refuges.

4. What are the principal socioeconomic effects associated with implementation of this alternative? (Summarize effects from Section IV.)

Grazing has benefits to those awarded grazing leases.

5. Would implementation of this alternative likely result in significant controversy? Explain.

Yes. Adjacent landowners would like to graze refuge lands. However, grazing on Columbia NWR was terminated more than ten years ago to improve habitat conditions. While there may be occasional situations where grazing could be used to manage marsh area habitats, the reestablishment of grazing as a primary tool in managing vegetation was ruled out according to the Environmental Assessment completed in 1979.

D. HERBICIDE_____(Descriptive title for alternative)

1. Describe this alternative.

Herbicide would be used to control undesirable vegetation and maintain firebreaks. This would include listed noxious weeds, undesirable invasive plants and successional woody species.

2. To what extent would this alternative satisfy the problems, opportunities or needs identified in Section I?

As much as could be afforded or would be allowed, herbicide would control undesirable species. It would not remove residual vegetation for nutrient cycling or access by maintenance equipment. While spot spraying is very effective, broad scale use of herbicide is non-selective and very restricted in aquatic situations, and is very expensive.

3. What are the principal environmental (biophysical) effects associated with implementation of this alternative? (Summarize effects from Section IV.)

The selectivity of chemicals available (use is very restricted) for vegetation control is limited (currently the State does not allow a broadleaf herbicide to be used near water), and the ecological effects of herbicide use remain unclear, especially effects on water quality and wildlife. Dead or decadent vegetation is not removed with chemicals, nor is seed of noxious weeds.

4. What are the principal socioeconomic effects associated with implementation of this alternative? (Summarize effects from Section IV.)

Safety and cost effectiveness are major concerns, and policy has directed the phasing out of chemicals for vegetation management. While herbicides can kill vegetation, a dried plant remain as a carrier of wildfire, a public safety concern.

5. Would implementation of this alternative likely result in significant controversy? Explain.

Yes. While limited use of herbicides is an accepted strategy for noxious weed control, all pesticide use is coming under increased scrutiny and regulation. The widespread use of herbicides is quickly becoming an option of the past, and is not environmentally sound, practical or cost effective.

Section III: AFFECTED ENVIRONMENT

Succinctly describe the area in which the proposed action is to occur. If the action will occur on a National Wildlife Refuge or National Fish Hatchery, attach the Refuge/Hatchery public information leaflet to help orient the reader to the general vicinity. For site-specific proposals, include page-sized maps of the general area and the project site. Particular mention should he made of the presence (or absence) of any endangered or threatened species or their critical habitat, historic or cultural resources, parklands, prime or unique farmlands, wetlands, 100-year floodplains, wild and scenic rivers, or other ecologically critical areas (e.g., wilderness areas, research natural areas, etc.)

Prescribed burning at Saddle Mountain NWR currently is planned only for fuel hazard reduction. Prescribed burning on Columbia NWR is planned mostly for isolated wetlands, marsh management units and nearby upland areas along Crab Creek. Farm Unit fields and standing grain also are burned before replanting. Occasional upland burning in cheatgrass areas near Marsh Unit IV could occur for enhanced goose browse. Wildfires in marsh or nearby upland areas may be allowed to burn if thought to be beneficial and under control. Other burning may occur for seedbed preparation in areas proposed for restoration of native vegetation.

Areas of recurring prescribed burns are shown on the attached maps. Wetlands are not identified individually on the CNWR map, but most are shown as impoundments on individual marsh unit maps.

Section IV: ENVIRONMENTAL CONSEQUENCES

Develop the analysis for this section by referring to the checklists in Appendices A and B. For each alternative, discuss any item answered "Yes" in either the Significance Checklist or the General Environmental Checklist. Where adverse effects are identified, discuss any proposed mitigating measures. (Add pages to this section as necessary.)

Alternative A: The SIGNIFICANCE CHECKLIST identifies only cost effectiveness as an effect of no action (mechanical only). Under the GENERAL ENVIRONMENTAL CHECKLIST, differences from the preferred alternative include no air quality degradation, biological/ecological impacts that cannot be mitigated without extremely costly, localized hand labor, a lack of pest control, and less wildfire control due to a reactive rather than proactive plan. The costs and effectiveness of no action (mechanical with no fire) methods make this option unfeasible for blanket application, although it can be used in some situations for vegetation management.

Alternative B: This is the preferred alternative. No items apply on the SIGNIFICANCE CHECKLIST. On the GENERAL ENVIRONMENTAL CHECKLIST, prescribed fire would have a temporary, minor impact on air quality. It would have positive impacts on plant and animal species diversity and abundance, pest control, cost effectiveness, and human safety (fuel hazard reduction). Fire is a main agency-accepted natural control measure for management of wildlife habitat and Natural Areas.

Alternative C: The SIGNIFICANCE CHECKLIST identifies regional interest, widespread controversy, and establishing a precedent as items to consider. These items are identified in the GENERAL ENVIRONMENTAL CHECKLIST as controversies surrounding the impacts of grazing to soil compaction and erosion, a change in plant and animal species diversity and abundance, the spread of noxious weeds, and land use plans and policies on the refuge. Specifically, grazing on Columbia NWR was evaluated in a 19)9 Environmental Assessment, and at that time was rejected because of the poor condition of rangeland in most grazed areas of the refuge. With the possible exception of limited short-term grazing in portions of Marsh Units 3, 4, and 5, livestock grazing on the refuge was terminated in the early 1980s, and most internal fences have been removed.

Alternative D: Both checklists indicate major conflict with using herbicide as the primary tool for vegetation management. Issues of safety, water quality, and cost effectiveness are of major concern. These issues are reflected in the continuing restriction placed on our use of herbicide by Washington Department of Ecology and the U.S. Fish and Wildlife Service. Even our limited approved use for spot control of noxious weeds is becoming costprohibitive, and the trend is toward phasing out chemical use in the foreseeable future.

Section V: CONSULTATION AND COORDINATION WITH OTHERS

List below parties contacted during the planning process. Summarize results of consultation or coordination with these parties, If the EA was circulated for public comment, also provide a summary of any significant issues raised and how they were resolved.

Washington Department of Wildlife
Washington Department of Ecology
Washington Department of Natural Resources
Adams County Fire Protection District #5
Adams County Planning and Building Department
USDA Soil Conservation Service

WDW supports prescribed burning program, especially to Invigorate decadent stands of grasses and emergent vegetation. They suggest that we not burn off too much residual cover at once, and to protect native trees for migrant/nesting birds.

WDOE is the regulatory agency for air quality, and our annual burning will be submitted for approval through them. They will review this EA.

WDNR supports burning as a natural ecological process. They use burning for fuel hazard reduction, and for seedbed preparation for planted or natural revegetation areas. They suggest not having a fire so hot as to burn off the nutrient-rich soil surface layer, Herbicide use, especially in watershed areas, has been greatly reduced in the last decade, and is now very restricted in wet areas.

Adams Co. FPD is supportive of our burning and fire management program in general.

Adams Co. Planning was in agreement with our methods, and approved of our use of fire in specific maintenance and marsh improvement work.

SCS uses prescribed fire for seedbed preparation and to invigorate crested wheatgrass and other grasses in Conservation Reserve Program plantings.

Section VI: CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis contained in this document, I find that implementation of the proposed action:

__X__ Is compatible with the major purposes for which the area was established.

_____ Is not compatible with the major purposes for which the area was established.

_____ Would constitute an action significantly affecting the quality of the human environment and, therefore, recommend an EIS be prepared. (Forward EA to RO for review.)

__X__ Would not constitute an action significantly affecting the quality of the human environment and therefore, recommend a Finding of No Significant Impact (FONSI) be prepared. (Associate Manager signs FONSI on next page)

[signature] 11/25/92
Project Leader Date

[signature] 12/4/92
Associate Manager Date

NOTE: If it is uncertain whether an EIS or FONSI should be prepared, the Associate Manager may forward the EA to the AFWE-SE for review. Additionally, the RD will retain NEPA sign off authority on those actions involving major planning efforts; those actions with potential regional or national policy implications for FWS; those actions involving major controversial issues of regional or national significance; and those actions involving land acquisition of any form.

FORM RW1-1 (10/90)

FINDING OF NO SIGNIFICANT IMPACT

FIRE MANAGEMENT
(Title of Project)

COLUMBIA NATIONAL WILDLIFE REFUGE COMPLEX
(Name and Address of FWS Facility)

The U.S. Fish and Wildlife Service proposes to

use fire management as a means of controlling vegetation and wildfires on refuge lands.

FWS has analyzed a number of alternatives to the proposal, including the following: (List)

NO ACTION

GRAZING

HERBICIDE

The proposal was selected over the other alternatives because:

it is an accepted practice in the community, is a natural ecological process, is cost effective, and contributes to the ecological health of the natural vegetative communities.

Implementation of the preferred alternative would be expected to result in the following environmental and socioeconomic effect: (List)

Short-term loss of nesting cover would be replaced by higher quality cover for the following 3-10 years. Noxious and invasive weedy species would be reduced. A short-term minor degradation in air quality would be offset by healthier robust vegetative growth. Socioeconomic impacts would be positive with better wildlife viewing opportunities, greater hunting potential to draw visitors to the Othello area, and safety from wildfire through fuel hazard reduction.

FORM RW1-1 (10/90)

Measures to mitigate and/or minimize adverse effects have been incorporated into the proposal. These measures include: (List)

Burning will not occur when weather conditions preclude safe burning. Safety measures are included in the refuge Fire Management Plan.

The proposal is not expected to have any significant effects on the human environment because:

Fire activities are carried out during low use winter and early spring periods when winds will disperse smoke.

The proposal has been thoroughly coordinated with all interested and/or affected parties. Parties contacted include:

Washington Department of Wildlife
Washington Department of Natural Resources
Washington Department of Ecology
Adams County Planning and Building Department
Adams County Fire Protection District #5
USDA Soil Conservation Service

Therefore, it is my determination that the proposal does not constitute a major Federal action significantly affecting the quality of the human environment. As such, an environmental impact statement is not required. An environmental assessment has been prepared in support of this finding and is available upon request to the FWS facility identified above.

Reference: Prescribed Fire

Regional Director

12/4/92
Date

FORM RW1-1 (10/90)

Appendix A
SIGNIFICANCE CHECKLIST

This checklist is intended to help determine whether a given alternative would affect environmental features of special legal or policy significance. The list of 23 questions can be answered with a “yes” or “no” response. For any item answered “yes,” discuss under the appropriate alternative in Section IV. The more items answered "yes," the stronger the likelihood that an EIS is necessary.

WOULD IMPLEMENTATION OF THE ALTERNATIVE BE EXPECTED T0 AFFECT OR INVOLVE:

1. Federally listed threatened or endangered species or their critical habitats? (If “yes,” Section 7 internal consultation is required.)
   no
2. Properties either listed in or eligible for listing in the National Register of Historic Places? (If “yes,” consult with State Historic Preservation Office.)
   no
3. Either surface or subsurface disturbance? (If “yes,” consult with SHP0.) no
4. Major loss or alteration of natural wetlands that would adversely affect biological productivity, habitat diversity, flood storage capacity, or aquifer recharge capacity? (If “yes,” see FWS floodplain/wetland
   regulations in November 20, 1979, issue of Federal Register.)
   no
5. Areas within the 100-year floodplain, in terms of increasing the flood hazard potential? (If “yes,” see November 20, 1979, issue of Federal Register.)
   no
6. Natural resources within the officially designated boundary of the State coastal zone? (If “yes,” consult with State Coastal Zone Management Office.)
   no
7. Discharge of dredged or fill materials in waters of the U.S. or adjacent wetlands? (If “yes,” Corps of Engineers’ Section 404 permit is required.)
   no
8. Structures or facilities within, under or above a navigable waterway? (If “yes,” Corps of Engineers’ Section 10 permit is required.)
   no
9. River segments designated for inclusion within the National Wild and Scenic Rivers System? (If “yes,” consult with National Park Service.)
   no
10. Any area included within the National Wilderness Preservation System?
    no
11. Use of toxic or environmentally hazardous substances, such as pesticides, herbicides, rodenticides, etc? (If “yes,” consult with Environmental Contaminant Specialist, OR.)
    no no no yes

FORM RW1-1 (10/90)

12. Significant degradation of water quality? (If “yes,” consult with State water quality agency and/or U.S. Environmental Protection Agency.)
no no no yes
13. Significant degradation of air quality? (If “yes,” consult with State air quality agency and/or EPA.)
no
14. Society as a whole?
no
15. National interests?
no
16. State or regional interests?
no no no yes
17. Long-term irreversible or irretrievable commitments of resources?
no
18. Public health or safety hazards?
no no no yes
19. Widespread controversy?
no no yes yes
20. Highly uncertain effects with unique or unknown risks?
no no no yes
21. Establishment of a precedent for future actions with significant effects, or a decision in principle about a future consideration?
no no yes yes
22. Other actions with Individually insignificant but cumulatively significant impacts?
no no no yes
23. Potential violation of Federal, State or local law or requirements imposed for the protection of the environment?
no no no yes?

Appendix B
GENERAL ENVIRONMENTAL CHECKLIST

This checklist is Intended to facilitate effect analysis for the various alternatives under consideration. The list of physical, biological and social considerations can be answered with a “yes” or “no” response. For any item answered “yes,” discuss under the appropriate alternative in Section IV.

Would implementation of the alternative be expected to affect any of the physical, biological or social considerations listed below?

PHYSICAL CONSIDERATIONS

A. Climate
no

B. Air Quality
no yes no no

C. Topography
1. Relief no
2. Cuts/Fills no

D. Geology
1. Earthquake/Landslide no
2. Minerals no
3. Energy Resource Depletion/Conservation no
4. Radioactive and Toxic Substances/Heavy Metals no no no yes
5. Erosion/Deposition no no yes no
6. Siltation no no yes no
7. Soil Quality no no yes no

E. Hydrology
1. Surface and Ground Water Quality/Quantity no no no yes
2. Absorption/Drainage no
3. Flooding no
4. Hydro/Geothermal Energy Source no

BIOLOGICAL CONSIDERATIONS

A. Vegetation
1. Species of Special Concern no no no yes
2. Critical Wildlife Habitat no
3. Species Diversity/Abundance yes
4. Noxious Weeds/Exotic Plants/Pathogens yes

B. Wildlife
1. Species of Special Concern no
2. Species Diversity/Abundance yes
3. Game/Non-Game Species yes
4. Pests/Pathogens/Vectors/Predators/Feral or Exotic Animals
no yes yes no

FORM RW1-1 (10/90)

SOCIAL CONSIDERATIONS

A. Cultural
   1. Archaeologic/Historic Sites — no
   2. Educational/Recreational Opportunities — yes
   3. Public Access — no

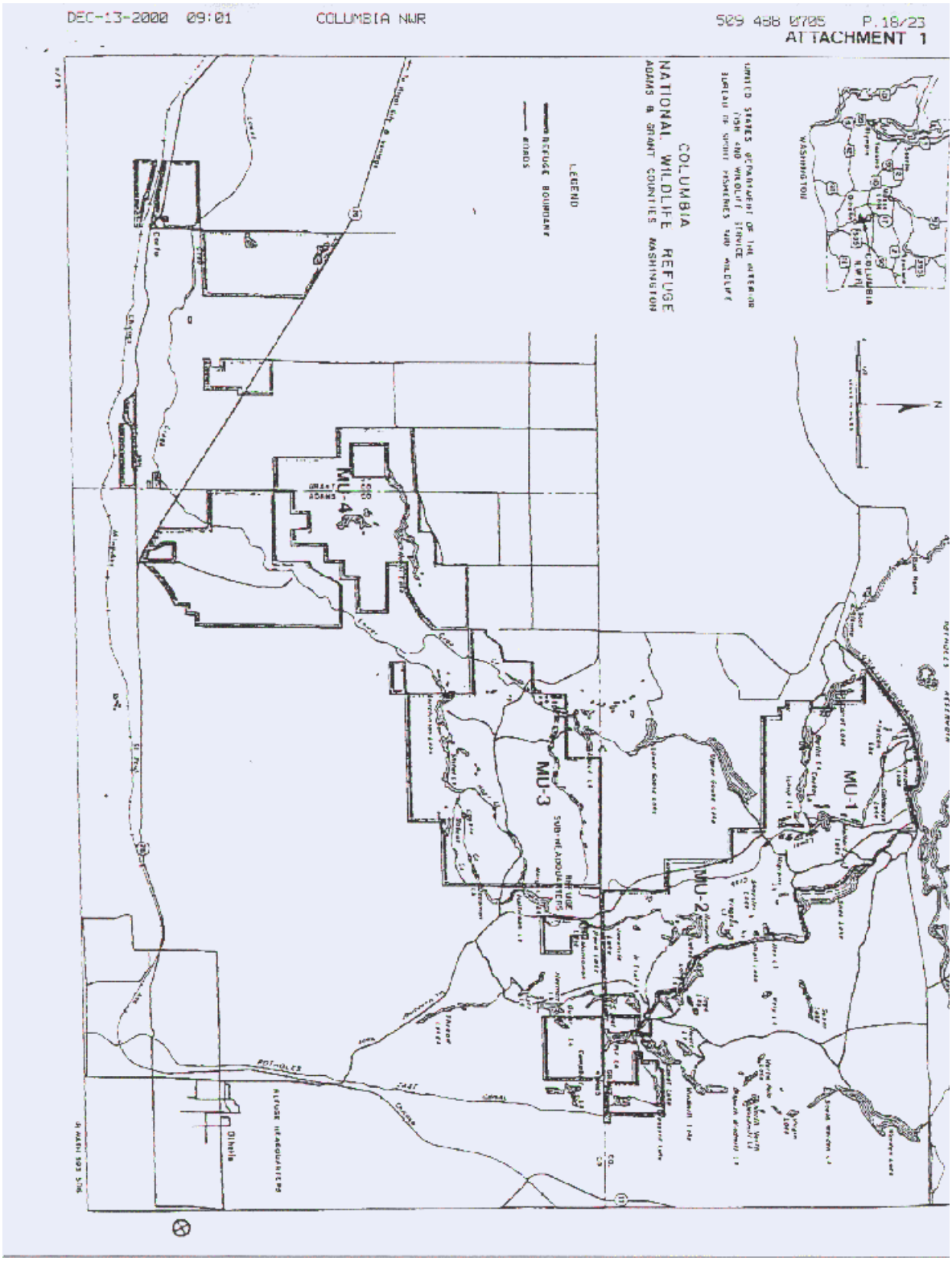
B. Economic
   1. Cost — yes
   2. Employment — no
   3. Commercial/Industrial Buildings — no
   4. Taxes/Property Values — no

C. Land Use
   1. Plans/Policies/Controls — yes
   2. Development/Growth — no
   3. Farmland/Open Space, Natural Areas — yes
   4. Transportation Facilities/Public Utilities — no

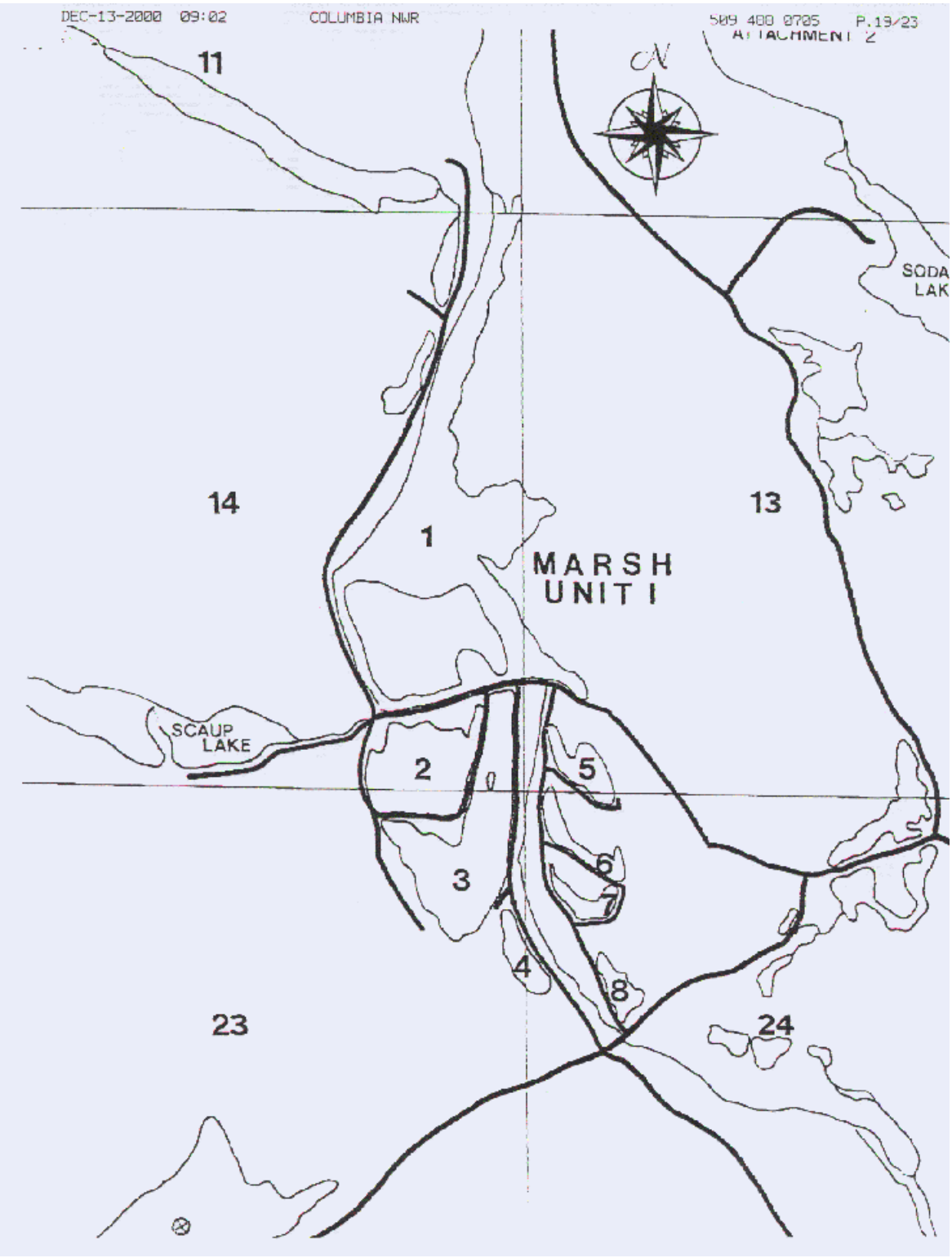
D Social
   1. Quality of Life — no
   2. Community Cohesion — no
   3. Residents/Residences — no
   4. Population Change — no
   5. Human Health/Safety — no yes no no
   6. Public Services — no
   7. National Defense — no

E. Aesthetics
   1. Scenery — no
   2. Noise — no
   3. Odor — no

FORM RW1-1 (10/90)



FORM RW1-1 (10/90)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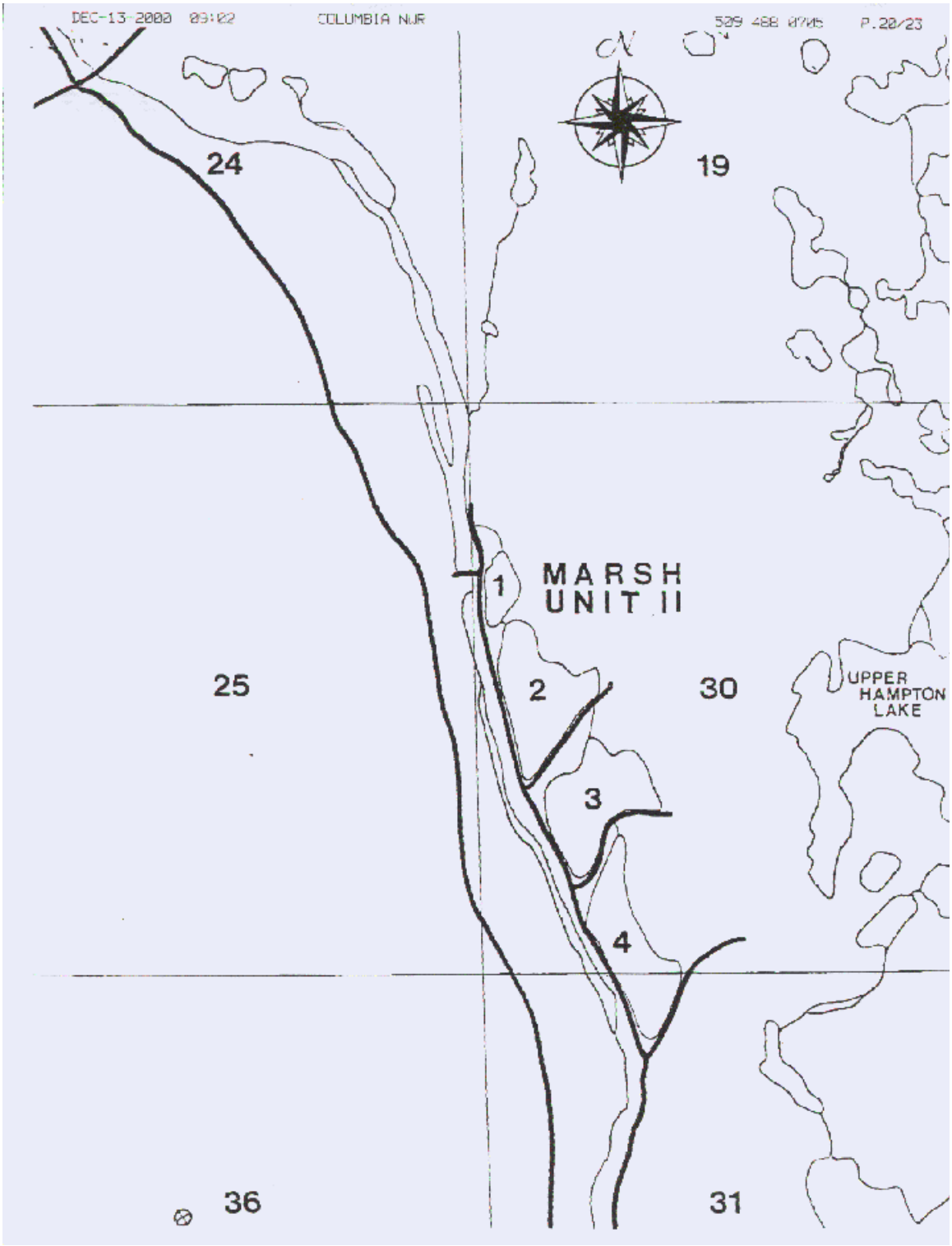
509 488 0705 P.19/23
ATTACHMENT 2
11
N
SODA
LAK
14
13
1
MARSH
UNIT I
SCAUP
LAKE
2
5
6
3
4
8
23
24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P.20/23
N
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19
MARSH
UNIT II
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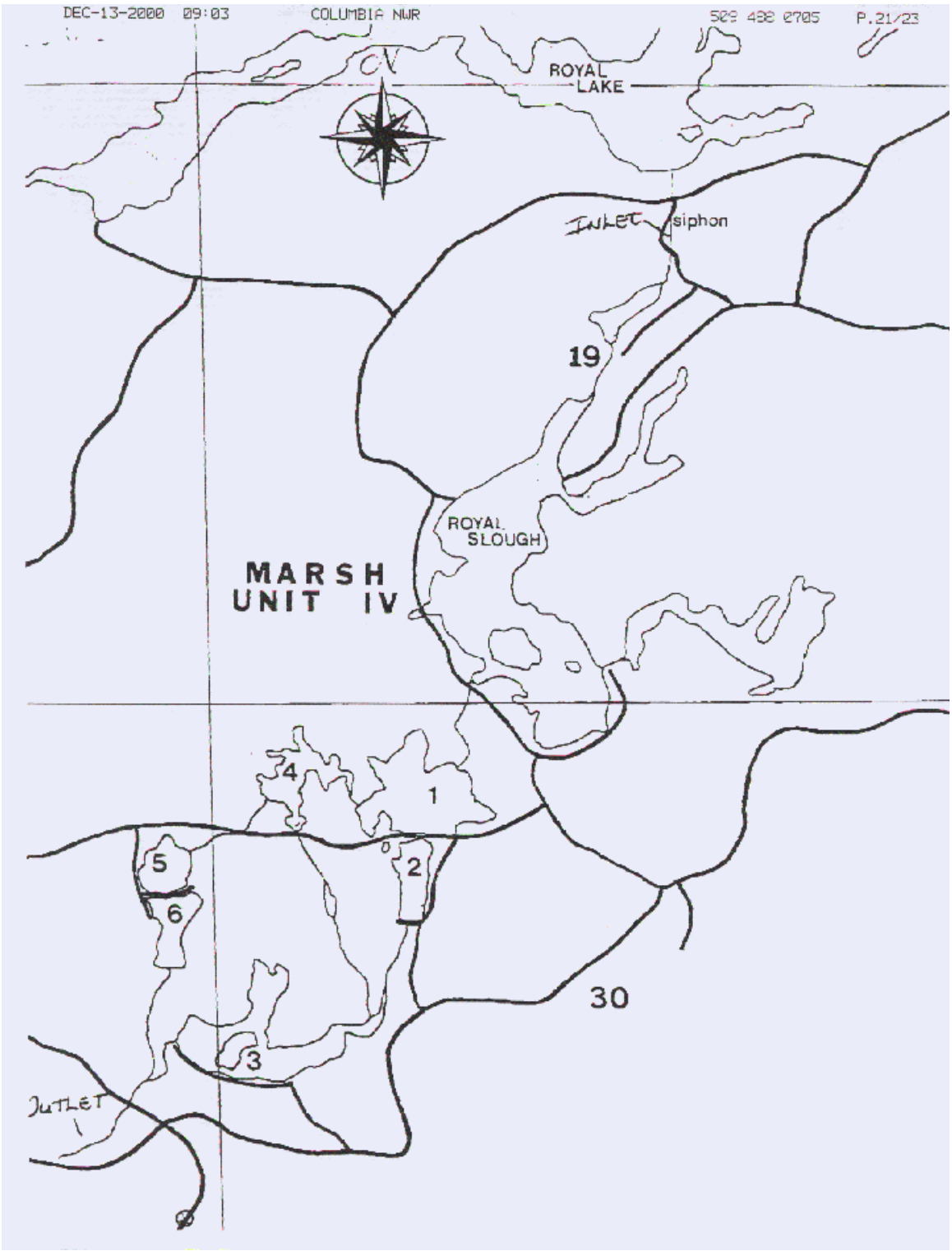
2
3
4
25
30
UPPER
HAMPTON
LAKE
36
31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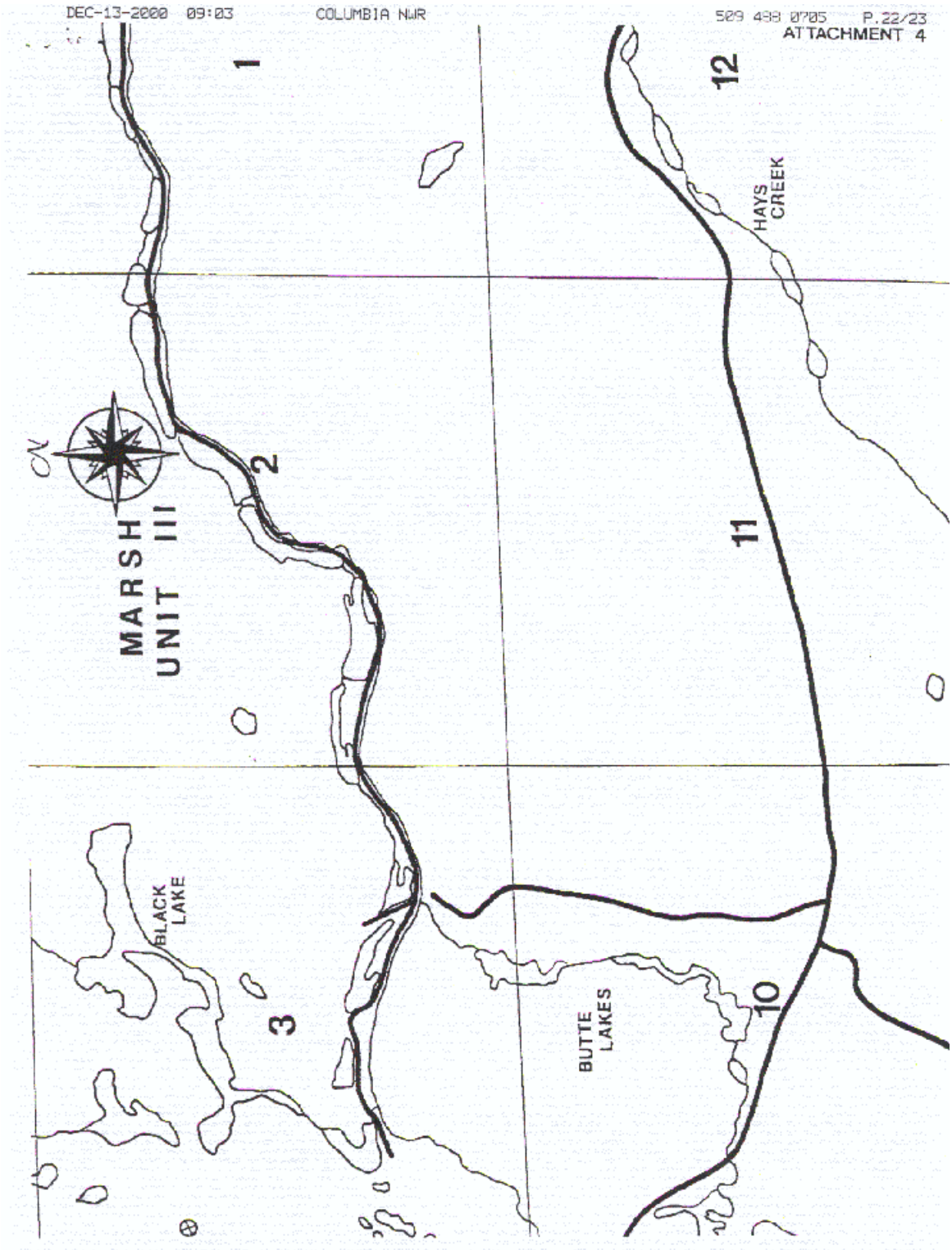
P.21/23
CV
ROYAL LAKE
INLET
siphon
19
ROYAL SLOUGH
MARSH UNIT IV
4
1
5
2
6
30
3
OUTLET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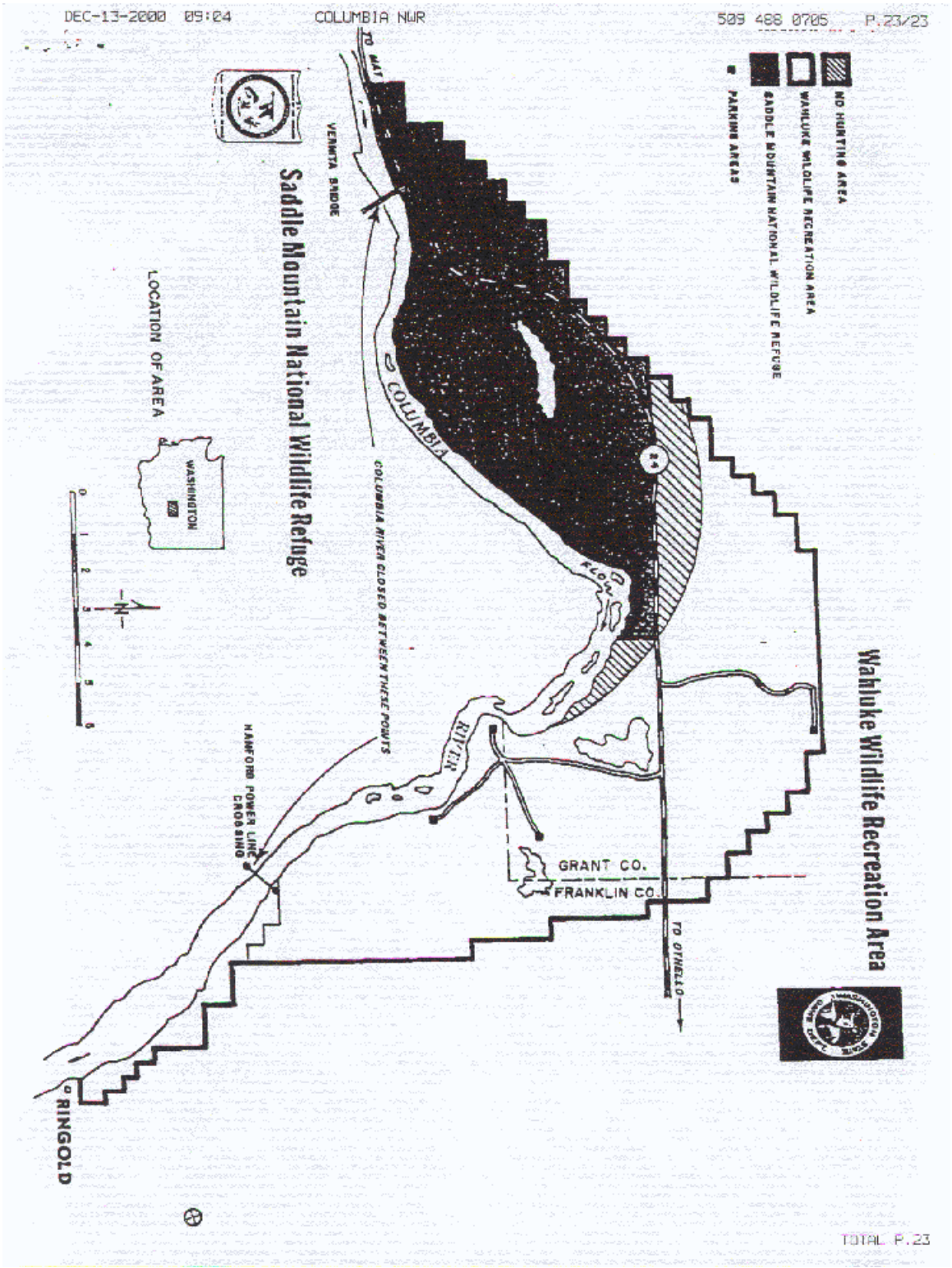
ATTACHMENT 4
MARSH UNIT III
N
1
2
3
10
11
12
HAYS CREEK
BLACK LAKE
BUTTE LAKES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COLUMBIA NWR
509 488 0705
P.23/23
NO HUNTING AREA
WAHLUKE WILDLIFE RECREATION AREA
SADDLE MOUNTAIN NATIONAL WILDLIFE REFUGE
PARKING AREAS
TO MAT
VERNITA BRIDGE
COLUMBIA
COLUMBIA RIVER CLOSED BETWEEN THESE POINTS
Saddle Mountain National Wildlife Refuge
LOCATION OF AREA
WASHINGTON
HANFORD POWER LINE CROSSING
RIVER
GRANT CO.
FRANKLIN CO.
TO OTHELLO
Wahluke Wildlife Recreation Area
RINGOLD
TOTAL P.23

APPENDIX E: FIRE EFFECTS MONITORING STANDARDS

FIRE EFFECTS MONITORING STANDARDS
COLUMBIA NATIONAL WILDLIFE REFUGE

LEVEL 1. Minimum Monitoring Standards (MMS) For Prescribed Burn Sites.

Monitoring goals are to provide documentation and evaluation of areas before burning and at periodic intervals after prescribed burning. This level is most useful in determining successional development in hydric and mesic habitats, and can be used in wildfire rehabilitation or restoration for upland sites. The objectives are to document and evaluate the achievement of specific goals and objectives specified in individual burn plans.

BEFORE BURNING

(Biological Program responsibility, possibly using fire crew)

1. Request a project number from the FMO.

2. Obtain maps that describe the geographic location, size, and vegetation types in that project area. The 1976 maps printed at 8" per mile have mylar overlays with cover typing from the 1980 NUS surveys, and even include their vegetation transect locations. Marsh unit maps from the 1989 Marsh Management Plan also are handy. For most of our prescribed burning, 7.5' quad maps are not of large enough scale for accurate or useful mapping. Use the Global Positioning System (GPS) receiver to record the boundaries of the planned burn area.

3. Establish one or two permanent photo-points to describe change in aspect of vegetation and landscape in the project area. Establish permanent photo-points within dominant vegetation type and fuel type for which burn objectives were established. Use elevated positions such as dike tops, and locations where a permanent metal marker will not interfere with routine maintenance such as mowing. Record on vegetation monitoring form,and on a refuge map that will stay with the vegetation monitoring files.

Photographs should be taken during the time of day that avoids shadows, and in a direction that avoids glare from direct sunlight (generally taken from behind). Once a form is first filled out, follow-up photos will be taken at or near the time of day (same sun position) as the first photo taken. Photographs taken during the peak of the growing season are preferred if the burn objective calls for change in forb cover. Photos taken out of the growing season are acceptable if burn objectives relate primarily to change in tree, shrub, or grass cover.

4. Establish a witness post at photo-point sites. Witness posts should be comprised of a five-foot steel fence post, driven one foot into the ground. They should be painted to be easily visible. Mark witness with aluminum tags that indicate date of establishment and plot number(s), delineate plot locations on a map of the project area, and record the compass bearing of the photo to facilitate future monitoring. Record the witness post using the GPS unit.

Photographic equipment should consist of a 35-mm camera fitted with a 50-mm lens and 64 or 100 ASA slide film. Take one picture from the witness post for each photo direction required, with the camera body sitting on the top of the witness post (4' off ground). Use a different form for each photo direction. Photos should capture a scene that consists of approximately 2/3 low horizon and 1/3 above the plane being photographed. To maximize depth of field, adjust to the largest possible f-stop number (smallest aperture) at 1/60th or 1/125th second shutter speed. All photographs should include a Robel pole and photo-board marked with the project number, vegetation type, plot

number, and date. Place the 0.5 x 1.0-m board at a standard 5-m distance from the witness post. All photo points are to be mapped and included in the project file, and include coordinates derived from the GPS unit. Slides should be labelled with plot #, location and view when they arrive from processing. Each photo taken also should be recorded in a photo log book that will accompany the camera.

DURING BURNING

(Fire Program responsibility)

1. Use the standard fire weather and behavior monitoring sheet or the prescribed natural fire field data sheet to record fire weather and behavior observations such as wind speed, wind direction, RH, and temperature, throughout the burn period. Try to attribute fire behavior to weather, topography, frequency of fuels, and fuel type. Be aware that fire behavior predictions and observations frequently cannot predict fire effects, (eg., a smoldering fire can generate considerable heat and significant fire effects but is not part of the fire behavior prediction system).

2. Observations should be recorded every 30 minutes beginning with ignition. In addition an observation should be taken whenever there is an observable change of conditions on the burn site.

3. Estimate average rate of spread and flame-lengths where possible for head, flanking and backing fires. Any observations on residence time, especially where shrubs or trees occur, are especially helpful in analysis of the burn.

4. Log this information into the project file for that burn site.

AFTER BURNING

(Fire Program responsibility)

1. Map the fire on mylar overlaid onto the appropriate eight inch to the mile photo (1976), marsh unit map, or 7.5' Quad. Detail in mapping is very important (e.g., include areas within the perimeter that did not burn; few fires burn completely.) Maps will facilitate estimation of interspersion and monitoring using Global Information System technology if it becomes available to the refuge. All mapping of prescribed burns will be facilitated with use of aerial photography and/or the GPS. Consult with the Fire Management Officer about site-specific mapping protocol.

2. The following procedures should be used to determine frequency of photo-monitoring:

A. Take pictures from photo-points within two weeks after the fire to describe fire severity, vegetation consumption, scorch height, and pattern of burn. Note crown consumption of tall grasses and shrubs for later analysis of fire effects.

B. Take pictures from photo-points at selected years (consult biologist)post-burn at the same time of year that the pre-burn photo was taken. Frequency of sampling will depend on the length of succession development for a vegetation type, although most will be within 4 years. As a guideline, take pictures that portray vegetation development during early, mid,and late succession stages. Consult with the biologist for information regarding site-specific monitoring schedules.

3. Log this information into the project file for that burn site.

LEVEL II. Quantitative Fire Effects Monitoring.

Monitoring goals are to assess the area before and after prescribed burning and determine when habitat conditions are declining, indicating burning is needed. This level is most useful in uplands and meadows adjacent to marsh areas where ground nesting cover requires periodic invigoration in the absence of grazing. The objectives are to document and evaluate the achievement of specific goals and objectives specified in individual burn plans.

BEFORE BURNING

(Biological Program responsibility, possibly using fire crew)

1. Level I MMS.

2. Quantitative physical measurements based on the height and density of ground cover using Robel pole technique (attached sheets fig. 14, VI-4, and VI-5). This might be performed in conjunction with qualitative measurements. Robel transects measure horizontal cover density and vegetation height, and are recorded on the Site Analysis Form (VI-C). Each transect is 125 meters, with reading every 5 meters from the four cardinal points. Horizontal cover density is measured as the maximum height that a Robel pole is 100% obscured from an observer sighting from the top of a meter tall gauging pole at a distance of 4 meters from the Robel pole (record as v.ob.) Vegetation height is measured as the maximum height of vegetation between the gauging pole and the Robel pole (record once for each of 25 points as S Mx.Ht.) All measurements are to the nearest 0.5 decimeters. The date of the transect should be recorded on the vegetation monitoring form, and should coincide with photo monitoring.

DURING BURNING

1. Level 1 MMS.

AFTER BURNING

(Biological Program responsibility)

Repeat Robel pole measurements and photos during the summer of the burn, and beginning the third year after burning.

Level III. QUALITATIVE FIRE EFFECTS MONITORING

Monitoring goals are to evaluate vegetative composition and structure change through time in fire management treatment areas, and determine the short-term and long-term effects of fire and other treatments on vegetative composition. This monitoring is more time consuming but best documents actual plant community changes in all habitat situations, and best documents mesic and hydric community changes that may not be apparent in photo or height and density transects. Monitoring objectives are to provide documentation and evaluation of achievement of specific goals and objectives identified in individual burn plans.

BEFORE BURNING

(Biological Program responsibility, possibly using fire crew)

1. Level I and Level II MMS

2. Qualitative physical measurements to determine species composition are collected in conjunction with Robel pole measurements (and photo monitoring), and the date of the transect should be recorded on the vegetation monitoring form. The frequency of occurrence of a plant species in 100 square plots, each 0.1 meters square, is recorded at the four cardinal points at all 25 Robel pole points along the transect, on the Frequency monitoring form (attachment VI-D). The plot is attached to the bottom of the 1 meter gauging pole that is attached to the Robel pole, and consists of a two-pronged fork (see figure VI-4).

3. Quantitative physical measurements also include ground cover and litter depth. Ground cover is measured as the percentage of land surface covered by either litter or standing vegetation. Record ground cover on the Site Analysis Form (VI-C) by identifying whether bare ground, litter, or live vegetation exists at each point of the frequency plot. Litter depth measures residual vegetation at the soil surface. It is measured using a centimeter ruler placed perpendicular to the soil surface at the left frequency plot point for each of the 25 points along the transect. Litter depth also is recorded on the Site Analysis Form.

DURING BURNING

1. Level I MMS.

AFTER BURNING

Repeat Level I, II, and III measurements and photos during the summer of the burn, and beginning the third year after burning.

MATERIALS REQUIRED FOR FIRE EFFECTS MONITORING

1. Site map.

2. Compass.

3. Clipboard.

4. Pencils.

5. Data forms.

6. Waterproof marker.

7. Dry-erase marker and dry-erase board.

8. Cover board

9. Robel pole marked in decimeter increments and header plaque.

10. Flagging to temporarily mark plot location.

11. 35mm camera with 50mm lens.

12. 64 or 100 ASA film.

13. Metal fence post and post pounder.

14. Aluminum tags and wire for marking plot locations on metal fence posts.
15. Pickup.

INFORMATION TO ENGRAVE ON ALUMINUM TAGS

Purpose_____ (Monitoring Plot)

Location_____ (e.g., MU, pond #)

Habitat Type_____ (see Vegetation Monitoring Form)

Plot #_____ (1,2,3,...)

LITERATURE CITED

Miller, Melanie & Jean Findley. 1994. Plants. In: Fire Effects Guide; PMS 481; NIFC: NFES #2394. Boise, ID: National Wildfire Coordinating Group, Prescribed Fire and Fire Effects Working Team: VI-1>29

Stinson, Ken & Melanie Miller. 1994. Evaluation. In: Fire Effects Guide (as above): X-1>10

USDI, Fish and Wildlife Service. 1992. Habitat Monitoring and Inventory Plan; Malheur National Wildlife Refuge; Princeton, OR. 78pg

USDI, Fish and Wildlife Service. 1995. Prescribed Fire Management Handbook; 621 FW 3 (Release 3/1/95); 2.3-21

USDI, Fish and Wildlife Service. 1995. Fire Management Plan; Sheldon-Hart Mountain NWR, Lakeview, OR

APPENDIX F: STEP-UP PLAN

This step-up plan uses weather data collected at the Columbia NWR. A data set from 1993 to the present exists for this station. We used FIREFAMILY PLUS to analyze the data. An analysis of both fuel models A and T results in a step-up plan. A cumulative frequency distribution on burning index yields staffing classes. The 97th percentile establishes staffing Class 5, the 90th percentile establishes staffing Class 4. Staffing Classes 2 and 3 are based upon ¼ and ½ of the 90th percentile value, respectively. Staffing Class 1 is the remaining days.

Staffing class	Model A	Model T	Actions
1 LOW	**BI < 8**	**BI < 12**	Preparedness: ensure that one type 6 engine is fully equipped with suppression tools. Pump may need to be winterized after usage. Recruit firefighters by April 1 for upcoming fire season. Review cooperative agreements by April 1.
2 MODERATE	**6 ≤BI< 17**	**12 ≤BI< 24**	Preparedness: ensure that one type 6 engine is fully equipped with tools and water. Perform weekly drills to assure that pump works to minimum specifications. Fire personnel complete annual fitness test. Prepare and issue red cards by May 1. Inspect all refuge vehicles for inclusion of serviceable fire suppression tools. Work schedule for fire personnel not altered (i.e. compressed schedule or standard tour of duty).
3 HIGH	**17 ≤BI< 34**	**24 ≤BI< 47**	Preparedness: all slip-on units will be operational. Perform daily drills to assure that pump works to minimum specifications. Ensure all refuge vehicles have serviceable fire suppression tools. Work schedule for fire personnel between May 15 and September 30 is 0930-1800. Fire personnel expected to be available for dispatch during days off. When in Staffing class 3, raise staffing class to level 4 for national holidays (Memorial Day. Independence Day, Labor Day) or during red flag warning days.
4 VERY HIGH	**34 ≤BI< 40**	**47 ≤BI< 59**	Preparedness: in addition to actions at level 3, request emergency preparedness support from Regional Office for additional staffing. Duty hours extended to 0930-2000 if between May 15 and September 30. Days off canceled. However, personnel will work no more than fourteen days without a day off and not more than twenty-one days without two days off. Non-fire staff personnel with red cards requested to be available for suppression support including one-hour availability during off-shift hours. When in Staffing class 4, raise staffing class to level 5 for national holidays (Memorial Day. Independence Day, Labor Day) or during red flag warning days. Extend hours to 2200 for Independence Day. When lightning is predicted, patrol until one hour after lightning storms have dissipated. Request additional personnel, as needed, to avoid exceeding more than 16 hours on-duty for each 24 hour period.

Analyze burning index for both fuel models using Columbia Weather Station. Staffing Class will be assigned based on the highest staffing class for each fuel model.

APPENDIX G: DELEGATION OF AUTHORITY

Delegation of Authority
for
Columbia National Wildlife Refuge

As of (TIME), (DATE), 20xx, I have delegated authority to manage the _____ fire, number _____, Columbia National Wildlife Refuge, to Incident Commander _____ and his/her Incident Management Team.

The fire which originated as _____ occurring on (DATE), 20xx, is burning in the (GEOGRAPHIC REGION). My considerations for management of this fire are:

1. Fight fire aggressively but with safety as first priority.
2. I would like the fire managed under a control strategy with suppression actions done with as little environmental damage as possible.
3. Consider the fragile soil and vegetative condition of the area. Implement rehabilitation methods early and keep rehabilitation of disturbed roads and fireline in mind.
4. Key cultural features are:
5. Key resource considerations are:
6. Restrictions for suppression actions are:
    a. No foam within 100 feet of wetlands
    b. Off of road vehicle traffic will be authorized only by the Incident Commander
    c. Heavy equipment will not be used in areas identified as key resource or cultural areas.
d. My agency resource advisor will be _____.
e. Managing the fire cost-effectively for the values at risk is a significant concern.
f. Providing training opportunities for the refuge personnel is requested to strengthen our organizational capabilities.

_____

Project Leader Date Time

_____

Incident Commander Date Time

AGREEMENT NUMBER

1448-13510-97-J034

COOPERATIVE AGREEMENT
Between
U.S. Fish and Wildlife Service
Columbia-Saddle Mountain National Wildlife Refuge
and
Adams County 5 Fire Protection District

1. Purpose

This Cooperative Agreement is entered into between the U.S. Fish and Wildlife Service, Columbia-Saddle Mountain National Wildlife Refuge complex, hereinafter referred to as the Service, and the Adams County 5 Fire Protection District, hereinafter referred to as the District, for the purpose of providing adequate fire protection and wildfire suppression for Service lands located within the Adams County 5 Fire Protection District in Adams County of Washington.

2. Authority

A. Fire Protection Act of September 20, 1922 (Stat 857, 16 U.S.C. 594).

B. Reciprocal Fire Protection Act of May 27, 1955 (69 Stat 66,67, 42 U.S.C. 1856,1856a and b)

3. Scope of Work

A. The Adams County 5 Fire Protection District agrees to

1. Provide fire fighting equipment and labor as is available, for the suppression of fires on lands within the boundaries of the Refuge located in the Adams County 5 Fire Protection District, Adams County, Washington.

2. Notify the Refuge as soon as possible when a fire occurs and the District responds to a fire on Refuge lands. Notification of one person from the Refuge shall be made by State Radio or telephone. Exhibit 1 lists personnel and telephone numbers of Refuge personnel.

B. The Service Agrees to

1. Provide, at its own expense, first response and initial attack with such equipment and labor as is available on wildland fires occurring within the boundaries of the Refuge and on adjacent private lands.

2. Assist in wildland fire suppression on lands surrounding the Refuge, not covered by this agreement, when requested by the District and deemed practical by the Refuge Manager. This assistance will be provided to the District at the Service's expense.

4. Schedule of Reimbursable Costs

A. Upon receipt of an itemized billing, the Refuge shall reimburse actual suppression costs to the District, according to item 3 A., at the agreed upon service rates provided in Exhibit B.

B. The minimum compensation for any contract period is two hours of work time for each person on the fire and one hour for each equipment unit.

5. Period of Performance

A The terms of this agreement shall remain in effect from the date of execution through September 30, 2000.

B. This Agreement shall be reviewed annually by the service and the District to determine whether any revisions are necessary.

6. Financial Administration

A. Cost Accounting 13510-9261-XXXX

B. The District shall submit an itemized bill to the Refuge Manager with each line item showing the number and type of units, unit cost, number, classification and names of fire fighters, and total costs. Personnel must be current enrolled members of the Adams County 5 Fire Protection District. The Refuge may request written verification of District personnel.

C. The Refuge shall add funds to this agreement for each fire m order to reimburse the District and obligate funds as necessary.

7. Project Officers

U.S. Fish and Wildlife Service	Adams Co 5 FPD
Columbia-Saddle Mountain National Wildlife Refuge	220 S Broadway

David Goeke, Refuge Manager
Telephone (509)488-2668

P.O.Box 336
Othello, WA 99344
(509) 488-2951

8. Special Provisions

A. Changes: This agreement may be amended by either party as the need arises, Any change shall not be binding unless said change is mutually agreed upon, issued in writing and signed by the Contracting Officer of the Fish and Wildlife Service and an authorized official of the Adams County 5 Fire Protection District.

B Liability: Neither of the parties hereto shall bear responsibility of the other for any loss, damage, personal injury or death occurring in consequence of the performance of this Agreement. Maintenance of equipment needed to fulfill the terms of this Agreement shall be at the expense of the agency owning or leasing the equipment.

9. Termination

Either party may terminate this agreement upon thirty (30) days notice in writing to the other, computed from receipt of the notice.

10. Applicable OMB Circulars

OMB (Office of Management and Budget) Circulars applicable to State and Local Governments, A-102 (Admin), A-87 (Costs) and A-128 (Audits) are hereby incorporated by reference.

ADAMS COUNTY 5 FIRE PROTECTION DISTRICT

U.S. FISH AND WILDLIFE SERVICE

Exhibit A: Refuge Resources

The following equipment is available for emergency fire suppression at Columbia-Saddle Mountain Refuge Complex.

2 Type 6 Engines, 1 Type 3 Water Tender, 1 5000 gallon tank trailer, all stationed at Columbia-Saddle Mountain National Wildlife Refuge, Othello, WA.

Emergency Response Contacts

Columbia-Saddle Mtn NWR	(509)488-2668
Eric Hagen	(509)488-5360
Tom Padgett	(509)488-6983
Greg Hughes	(509)488-2794
Dave Goeke	(509)488-6517
Randy Hill	(509)488-9618

Exhibit B: FOREST MINIMUM STANDARDS FOR ENGINES

Resource	Components	(Type minimum standards)		
		1	2	3
Engines	Pump @ 150 psi	1000 GPM	500 GPM	120 GPM
Structural	Water Tank	400 GAL	400 GAL	300 GAL
	Hose 2 ½"	1200 FT	1000 FT	300 FT
	Hose 1 ½"	400 FT	400 FT	400 FT
	Hose 1"	200 FT	200 FT	400 FT
	Draft Capable	Yes	Yes	Yes
	Personnel	4	3	3

Hourly Rate		105.00	84.00	73.00
Maximum Daily Rate		1260.00	1008.00	876.00

		4	5	6	7
Engines	Pump @ 100 psi	70 GPM	50 GPM	50 GPM	30 GPM
Wildland	Water Tank	700 GAL	500 GAL	200 GAL	125 GAL
	Hose 1 ½"	300 FT	300 FT	300 FT	200 FT
	Hose 1"	300 FT	300 FT	300 FT	200 FT
	Personnel	3	3	3	3
Hourly Rate		67.00	63.00	59.00	54.00
Maximum Daily Rate		804.00	756.00	708.00	648.00

		1	2	3	4
Water Tender	Pump	300 GPM	200 GPM	200 GPM	200 GPM
	Tank	5000 GAL	2500 GAL	1000 GAL	400 GAL
	Personnel	2	2	2	1
Hourly Rate		86.00	80.00	73.00	57.00
Maximum Daily Rate		1032.00	960.00	876.00	684.00
Self-standing Portable Water Tanks			Capacity	1000-1500 GAL	25.00/day
				2000 GAL	30.00/day

EXHIBIT C: FOREST SERVICE EMERGENCY FIREFIGHTER RATES

Classification	Description	Hourly Wage
Emergency Firefighter – I	Involves persons working as a fire suppression crew member, using handtools such as shovels, pulaskis, and backpack pumps; or persons having general fire camp duties.	8.08/hr
Emergency Firefighter – II	Involves persons working alone or as a crew member skilled in the use of fire suppression tools such as chain saws, pumps, and driving an engine. Positions include firefighter, engine crew member, engine boss, or squad boss.	9.40/hr

Emergency Firefighter – III	Involves working as a supervisor of a group of people (6-20). Positions include crew boss and company officer. This classification requires successful completion of NEFPA II and Intermediate Wildfire training.	10.40/hr
Emergency Firefighter – IV	Involves performance of specialized work or as a supervisor of a large group of people (21+ and/or 5 or more engines). Work performed may include Strike Team or Task Force Leader, or other leadership positions defined by ICS and appointed by the Incident Commander. This classification requires successful completion of NFPA III and Advanced Wildfire training courses or their equivalent in experience.	11.80/hr

AGREEMENT NUMBER

1448-13510-97-J031

COOPERATIVE AGREEMENT
Between
U.S. Fish and Wildlife Service
Columbia-Saddle Mountain National Wildlife Refuge
and
Grant County 4 Fire Protection District

1. Purpose

This Cooperative Agreement is entered into between the U.S. Fish and Wildlife Service, Columbia-Saddle Mountain National Wildlife Refuge complex, hereinafter referred to as the Service, and the Grant County 4 Fire Protection District, hereinafter referred to as the District, for the purpose of providing adequate fire protection and wildfire suppression for Service lands located within the Grant County 4 Fire Protection District in Grant County of Washington.

2. Authority

A. Fire Protection Act of September 20, 1922 (Stat 857, 16 U.S.C. 594).

B. Reciprocal Fire Protection Act of May 27, 1955 (69 Stat 66,67, 42 U.S.C. 1856,1856a and b).

3. Scope of Work

A. The Grant County 4 Fire Protection District agrees to

1. Provide fire fighting equipment and labor as is available, for the suppression of fires on lands within the boundaries of the Refuge located in the Grant County 4 Fire Protection District, Grant County, Washington.

2. Notify the Refuge as soon as possible when a fire occurs and the District responds to a fire on Refuge lands. Notification of one person from the Refuge shall be made by State Radio or telephone. Exhibit 1 lists personnel and telephone numbers of Refuge personnel.

B. The Service Agrees to

1. Provide, at its own expense, first response and initial attack with such equipment and labor as is available on wildland fires occurring within the boundaries of the Refuge and on adjacent private lands.

2. Assist in wildland fire suppression on lands surrounding the Refuge, not covered by this agreement, when requested by the District and deemed practical by the Refuge Manager. This assistance will be provided to the District at the Service's expense.

4. Schedule of Reimbursable Costs

A. Upon receipt of an itemized billing, the Refuge shall reimburse actual suppression costs to the District, according to item 3 A., at the agreed upon service rates provided in Exhibit B.

B. The minimum compensation for any contract period is two hours of work time for each person on the fire and one hour for each equipment unit.

5. Period of Performance

A The terms of this agreement shall remain in effect from the date of execution through September 30, 2000.

B. This Agreement shall be reviewed annually by the service and the District to determine whether any revisions are necessary.

6. Financial Administration

A. Cost Accounting 13510-9261-XXXX

B. The District shall submit an itemized bill to the Refuge Manager with each line item showing the number and type of units, unit cost, number, classification and names of fire fighters, and total costs. Personnel must be current enrolled members of the Grant County 4 Fire Protection District. The Refuge may request written verification of District personnel.

C. The Refuge shall add funds to this agreement for each fire m order to reimburse the District and obligate funds as necessary.

7. Project Officers

U.S. Fish and Wildlife Service
Columbia-Saddle Mountain National Wildlife Refuge
David Goeke, Refuge Manager
Telephone (509)488-2668

Grant Co 4 FPD
220 S Broadway
P.O.Box 368
Warden, WA 98857

(509) 349-2471

8. Special Provisions

A. Changes: This agreement may be amended by either party as the need arises, Any change shall not be binding unless said change is mutually agreed upon, issued in writing and signed by the Contracting Officer of the Fish and Wildlife Service and an authorized official of the Grant County 4 Fire Protection District.

B Liability: Neither of the parties hereto shall bear responsibility of the other for any loss, damage, personal injury or death occurring in consequence of the performance of this Agreement. Maintenance of equipment needed to fulfill the terms of this Agreement shall be at the expense of the agency owning or leasing the equipment.

9. Termination

Either party may terminate this agreement upon thirty (30) days notice in writing to the other, computed from receipt of the notice.

10. Applicable OMB Circulars

OMB (Office of Management and Budget) Circulars applicable to State and Local Governments, A-102 (Admin), A-87 (Costs) and A-128 (Audits) are hereby incorporated by reference.

GRANT COUNTY 4 FIRE PROTECTION DISTRICT

U.S. FISH AND WILDLIFE SERVICE

Exhibit A: Refuge Resources

The following equipment is available for emergency fire suppression at Columbia-Saddle Mountain Refuge Complex.

2 Type 6 Engines, 1 Type 3 Water Tender, 1 5000 gallon tank trailer, all stationed at Columbia-Saddle Mountain National Wildlife Refuge, Othello, WA.

Emergency Response Contacts

Columbia-Saddle Mtn NWR	(509)488-2668
Eric Hagen	(509)488-5360
Tom Padgett	(509)488-6983
Greg Hughes	(509)488-2794
Dave Goeke	(509)488-6517
Randy Hill	(509)488-9618

Exhibit B: FOREST MINIMUM STANDARDS FOR ENGINES

Resource	Components	(Type minimum standards)		
		1	2	3
Engines	Pump @ 150 psi	1000 GPM	500 GPM	120 GPM
Structural	Water Tank	400 GAL	400 GAL	300 GAL
	Hose 2 ½"	1200 FT	1000 FT	300 FT
	Hose 1 ½"	400 FT	400 FT	400 FT
	Hose 1"	200 FT	200 FT	400 FT
	Draft Capable	Yes	Yes	Yes
	Personnel	4	3	3

Hourly Rate		105.00	84.00	73.00
Maximum Daily Rate		1260.00	1008.00	876.00

		4	5	6	7
Engines	Pump @ 100 psi	70 GPM	50 GPM	50 GPM	30 GPM
Wildland	Water Tank	700 GAL	500 GAL	200 GAL	125 GAL
	Hose 1 ½"	300 FT	300 FT	300 FT	200 FT
	Hose 1"	300 FT	300 FT	300 FT	200 FT
	Personnel	3	3	3	3
Hourly Rate		67.00	63.00	59.00	54.00
Maximum Daily Rate		804.00	756.00	708.00	648.00

		1	2	3	4
Water Tender	Pump	300 GPM	200 GPM	200 GPM	200 GPM
	Tank	5000 GAL	2500 GAL	1000 GAL	400 GAL
	Personnel	2	2	2	1
Hourly Rate		86.00	80.00	73.00	57.00
Maximum Daily Rate		1032.00	960.00	876.00	684.00
Self-standing Portable Water Tanks			Capacity	1000-1500 GAL	25.00/day
				2000 GAL	30.00/day

EXHIBIT C: FOREST SERVICE EMERGENCY FIREFIGHTER RATES

Classification	Description	Hourly Wage
Emergency Firefighter – I	Involves persons working as a fire suppression crew member, using handtools such as shovels, pulaskis, and backpack pumps; or persons having general fire camp duties.	8.08/hr
Emergency Firefighter – II	Involves persons working alone or as a crew member skilled in the use of fire suppression tools such as chain saws, pumps, and driving an engine. Positions include firefighter, engine crew member, engine boss, or squad boss.	9.40/hr

Emergency Firefighter – III	Involves working as a supervisor of a group of people (6-20). Positions include crew boss and company officer. This classification requires successful completion of NEFPA II and Intermediate Wildfire training.	10.40/hr
Emergency Firefighter – IV	Involves performance of specialized work or as a supervisor of a large group of people (21+ and/or 5 or more engines). Work performed may include Strike Team or Task Force Leader, or other leadership positions defined by ICS and appointed by the Incident Commander. This classification requires successful completion of NFPA III and Advanced Wildfire training courses or their equivalent in experience.	11.80/hr

AGREEMENT NUMBER

1448-13510-97-J035

COOPERATIVE AGREEMENT
Between
U.S. Fish and Wildlife Service
Columbia-Saddle Mountain National Wildlife Refuge
and
Grant County 10 Fire Protection District

1. Purpose

This Cooperative Agreement is entered into between the U.S. Fish and Wildlife Service, Columbia-Saddle Mountain National Wildlife Refuge complex, hereinafter referred to as the Service, and the Grant County 10 Fire Protection District, hereinafter referred to as the District, for the purpose of providing adequate fire protection and wildfire suppression for Service lands located within the Grant County 10 Fire Protection District in Grant County of Washington.

2. Authority

A. Fire Protection Act of September 20, 1922 (Stat 857, 16 U.S.C. 594).

B. Reciprocal Fire Protection Act of May 27, 1955 (69 Stat 66,67, 42 U.S.C. 1856,1856a and b)

3. Scope of Work

A. The Grant County 10 Fire Protection District agrees to

1. Provide fire fighting equipment and labor as is available, for the suppression of fires on lands within the boundaries of the Refuge located in the Grant County 10 Fire Protection District, Grant County, Washington.

2. Notify the Refuge as soon as possible when a fire occurs and the District responds to a fire on Refuge lands. Notification of one person from the Refuge shall be made by State Radio or telephone. Exhibit 1 lists personnel and telephone numbers of Refuge personnel.

B. The Service Agrees to

1. Provide, at its own expense, first response and initial attack with such equipment and labor as is available on wildland fires occurring within the boundaries of the Refuge and on adjacent private lands.

2. Assist in wildland fire suppression on lands surrounding the Refuge, not covered by this agreement, when requested by the District and deemed practical by the Refuge Manager. This assistance will be provided to the District at the Service's expense.

4. Schedule of Reimbursable Costs

A. Upon receipt of an itemized billing, the Refuge shall reimburse actual suppression costs to the District, according to item 3 A., at the agreed upon service rates provided in Exhibit B.

B. The minimum compensation for any contract period is two hours of work time for each person on the fire and one hour for each equipment unit.

5. Period of Performance

A The terms of this agreement shall remain in effect from the date of execution through September 30, 2000.

B. This Agreement shall be reviewed annually by the service and the District to determine whether any revisions are necessary.

6. Financial Administration

A. Cost Accounting 13510-9261-XXXX

B. The District shall submit an itemized bill to the Refuge Manager with each line item showing the number and type of units, unit cost, number, classification and names of fire fighters, and total costs. Personnel must be current enrolled members of the Grant County 10 Fire Protection District. The Refuge may request written verification of District personnel.

C. The Refuge shall add funds to this agreement for each fire m order to reimburse the District and obligate funds as necessary.

7. Project Officers

U.S. Fish and Wildlife Service	Grant Co. 10 FPD
Columbia-Saddle Mountain National Wildlife Refuge	588 Camilla St.

David Goeke, Refuge Manager
Telephone (509) 488-2668

P.O. Box 220
Royal City, WA 99357
(509) 346-2658

8. Special Provisions

A. Changes: This agreement may be amended by either party as the need arises, Any change shall not be binding unless said change is mutually agreed upon, issued in writing and signed by the Contracting Officer of the Fish and Wildlife Service and an authorized official of the Grant County 10 Fire Protection District.

B Liability: Neither of the parties hereto shall bear responsibility of the other for any loss, damage, personal injury or death occurring in consequence of the performance of this Agreement. Maintenance of equipment needed to fulfill the terms of this Agreement shall be at the expense of the agency owning or leasing the equipment.

9. Termination

Either party may terminate this agreement upon thirty (30) days notice in writing to the other, computed from receipt of the notice.

10. Applicable OMB Circulars

OMB (Office of Management and Budget) Circulars applicable to State and Local Governments, A-102 (Admin), A-87 (Costs) and A-128 (Audits) are hereby incorporated by reference.

GRANT COUNTY 10 FIRE PROTECTION DISTRICT

U.S. FISH AND WILDLIFE SERVICE

Exhibit A: Refuge Resources

The following equipment is available for emergency fire suppression at Columbia-Saddle Mountain Refuge Complex.

2 Type 6 Engines, 1 Type 3 Water Tender, 1 5000 gallon tank trailer, all stationed at Columbia-Saddle Mountain National Wildlife Refuge, Othello, WA.

Emergency Response Contacts

Columbia-Saddle Mtn NWR	(509)488-2668
Eric Hagen	(509)488-5360
Tom Padgett	(509)488-6983
Greg Hughes	(509)488-2794
Dave Goeke	(509)488-6517
Randy Hill	(509)488-9618

Exhibit B: FOREST MINIMUM STANDARDS FOR ENGINES

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Structural	Water Tank	400 GAL	400 GAL	300 GAL
	Hose 2 ½"	1200 FT	1000 FT	300 FT
	Hose 1 ½"	400 FT	400 FT	400 FT
	Hose 1"	200 FT	200 FT	400 FT
	Draft Capable	Yes	Yes	Yes
	Personnel	4	3	3

Hourly Rate		105.00	84.00	73.00
Maximum Daily Rate		1260.00	1008.00	876.00

		4	5	6	7
Engines	Pump @ 100 psi	70 GPM	50 GPM	50 GPM	30 GPM
Wildland	Water Tank	700 GAL	500 GAL	200 GAL	125 GAL
	Hose 1 ½"	300 FT	300 FT	300 FT	200 FT
	Hose 1"	300 FT	300 FT	300 FT	200 FT
	Personnel	3	3	3	3
Hourly Rate		67.00	63.00	59.00	54.00
Maximum Daily Rate		804.00	756.00	708.00	648.00

		1	2	3	4
Water Tender	Pump	300 GPM	200 GPM	200 GPM	200 GPM
	Tank	5000 GAL	2500 GAL	1000 GAL	400 GAL
	Personnel	2	2	2	1
Hourly Rate		86.00	80.00	73.00	57.00
Maximum Daily Rate		1032.00	960.00	876.00	684.00
Self-standing Portable Water Tanks			Capacity	1000-1500 GAL	25.00/day
				2000 GAL	30.00/day

EXHIBIT C: FOREST SERVICE EMERGENCY FIREFIGHTER RATES

Classification	Description	Hourly Wage
Emergency Firefighter – I	Involves persons working as a fire suppression crew member, using handtools such as shovels, pulaskis, and backpack pumps; or persons having general fire camp duties.	8.08/hr
Emergency Firefighter – II	Involves persons working alone or as a crew member skilled in the use of fire suppression tools such as chain saws, pumps, and driving an engine. Positions include firefighter, engine crew member, engine boss, or squad boss.	9.40/hr

Emergency Firefighter – III	Involves working as a supervisor of a group of people (6-20). Positions include crew boss and company officer. This classification requires successful completion of NEFPA II and Intermediate Wildfire training.	10.40/hr
Emergency Firefighter – IV	Involves performance of specialized work or as a supervisor of a large group of people (21+ and/or 5 or more engines). Work performed may include Strike Team or Task Force Leader, or other leadership positions defined by ICS and appointed by the Incident Commander. This classification requires successful completion of NFPA III and Advanced Wildfire training courses or their equivalent in experience.	11.80/hr

AGREEMENT NUMBER

1448-13510-97-J033

COOPERATIVE AGREEMENT
Between
U.S. Fish and Wildlife Service
Columbia-Saddle Mountain National Wildlife Refuge
and
Grant County 11 Fire Protection District

1. Purpose

This Cooperative Agreement is entered into between the U.S. Fish and Wildlife Service, Columbia-Saddle Mountain National Wildlife Refuge complex, hereinafter referred to as the Service, and the Grant County 11 Fire Protection District, hereinafter referred to as the District, for the purpose of providing adequate fire protection and wildfire suppression for Service lands located within the Grant County 11 Fire Protection District in Grant County of Washington.

2. Authority

A. Fire Protection Act of September 20, 1922 (Stat 857, 16 U.S.C. 594).

B. Reciprocal Fire Protection Act of May 27, 1955 (69 Stat 66,67, 42 U.S.C. 1856,1856a and b)

3. Scope of Work

A. The Grant County 11 Fire Protection District agrees to

1. Provide fire fighting equipment and labor as is available, for the suppression of fires on lands within the boundaries of the Refuge located in the Grant County 11 Fire Protection District, Grant County, Washington.

2. Notify the Refuge as soon as possible when a fire occurs and the District responds to a fire on Refuge lands. Notification of one person from the Refuge shall be made by State Radio or telephone. Exhibit 1 lists personnel and telephone numbers of Refuge personnel.

B. The Service Agrees to

1. Provide, at its own expense, first response and initial attack with such equipment and labor as is available on wildland fires occurring within the boundaries of the Refuge and on adjacent private lands.

2. Assist in wildland fire suppression on lands surrounding the Refuge, not covered by this agreement, when requested by the District and deemed practical by the Refuge Manager. This assistance will be provided to the District at the Service's expense.

4. Schedule of Reimbursable Costs

A. Upon receipt of an itemized billing, the Refuge shall reimburse actual suppression costs to the District, according to item 3 A., at the agreed upon service rates provided in Exhibit B.

B. The minimum compensation for any contract period is two hours of work time for each person on the fire and one hour for each equipment unit.

5. Period of Performance

A The terms of this agreement shall remain in effect from the date of execution through September 30, 2000.

B. This Agreement shall be reviewed annually by the service and the District to determine whether any revisions are necessary.

6. Financial Administration

A. Cost Accounting 13510-9261-XXXX

B. The District shall submit an itemized bill to the Refuge Manager with each line item showing the number and type of units, unit cost, number, classification and names of fire fighters, and total costs. Personnel must be current enrolled members of the Grant County 11 Fire Protection District. The Refuge may request written verification of District personnel.

C. The Refuge shall add funds to this agreement for each fire m order to reimburse the District and obligate funds as necessary.

7. Project Officers

U.S. Fish and Wildlife Service
Columbia-Saddle Mountain National Wildlife Refuge
David Goeke, Refuge Manager
Telephone (509) 488-2668

Grant Co. 11 FPD
Royal Camp, Station 1
Road 17 SW
Royal City, WA 99357

(509) 346-2244

8. Special Provisions

A. Changes: This agreement may be amended by either party as the need arises, Any change shall not be binding unless said change is mutually agreed upon, issued in writing and signed by the Contracting Officer of the Fish and Wildlife Service and an authorized official of the Grant County 11 Fire Protection District.

B Liability: Neither of the parties hereto shall bear responsibility of the other for any loss, damage, personal injury or death occurring in consequence of the performance of this Agreement. Maintenance of equipment needed to fulfill the terms of this Agreement shall be at the expense of the agency owning or leasing the equipment.

9. Termination

Either party may terminate this agreement upon thirty (30) days notice in writing to the other, computed from receipt of the notice.

10. Applicable OMB Circulars

OMB (Office of Management and Budget) Circulars applicable to State and Local Governments, A-102 (Admin), A-87 (Costs) and A-128 (Audits) are hereby incorporated by reference.

GRANT COUNTY 11 FIRE PROTECTION DISTRICT

U.S. FISH AND WILDLIFE SERVICE

Exhibit A: Refuge Resources

The following equipment is available for emergency fire suppression at Columbia-Saddle Mountain Refuge Complex.

2 Type 6 Engines, 1 Type 3 Water Tender, 1 5000 gallon tank trailer, all stationed at Columbia-Saddle Mountain National Wildlife Refuge, Othello, WA.

Emergency Response Contacts

Columbia-Saddle Mtn NWR	(509)488-2668
Eric Hagen	(509)488-5360
Tom Padgett	(509)488-6983
Greg Hughes	(509)488-2794
Dave Goeke	(509)488-6517
Randy Hill	(509)488-9618

Exhibit B: FOREST MINIMUM STANDARDS FOR ENGINES

Resource	Components	(Type minimum standards)		
		1	2	3
Engines	Pump @ 150 psi	1000 GPM	500 GPM	120 GPM
Structural	Water Tank	400 GAL	400 GAL	300 GAL
	Hose 2 ½"	1200 FT	1000 FT	300 FT
	Hose 1 ½"	400 FT	400 FT	400 FT
	Hose 1"	200 FT	200 FT	400 FT
	Draft Capable	Yes	Yes	Yes
	Personnel	4	3	3

Hourly Rate		105.00	84.00	73.00
Maximum Daily Rate		1260.00	1008.00	876.00

		4	5	6	7
Engines	Pump @ 100 psi	70 GPM	50 GPM	50 GPM	30 GPM
Wildland	Water Tank	700 GAL	500 GAL	200 GAL	125 GAL
	Hose 1 ½"	300 FT	300 FT	300 FT	200 FT
	Hose 1"	300 FT	300 FT	300 FT	200 FT
	Personnel	3	3	3	3
Hourly Rate		67.00	63.00	59.00	54.00
Maximum Daily Rate		804.00	756.00	708.00	648.00

		1	2	3	4
Water Tender	Pump	300 GPM	200 GPM	200 GPM	200 GPM
	Tank	5000 GAL	2500 GAL	1000 GAL	400 GAL
	Personnel	2	2	2	1
Hourly Rate		86.00	80.00	73.00	57.00
Maximum Daily Rate		1032.00	960.00	876.00	684.00
Self-standing Portable Water Tanks			Capacity	1000-1500 GAL	25.00/day
				2000 GAL	30.00/day

EXHIBIT C: FOREST SERVICE EMERGENCY FIREFIGHTER RATES

Classification	Description	Hourly Wage
Emergency Firefighter – I	Involves persons working as a fire suppression crew member, using handtools such as shovels, pulaskis, and backpack pumps; or persons having general fire camp duties.	8.08/hr
Emergency Firefighter – II	Involves persons working alone or as a crew member skilled in the use of fire suppression tools such as chain saws, pumps, and driving an engine. Positions include firefighter, engine crew member, engine boss, or squad boss.	9.40/hr

Emergency Firefighter – III	Involves working as a supervisor of a group of people (6-20). Positions include crew boss and company officer. This classification requires successful completion of NEFPA II and Intermediate Wildfire training.	10.40/hr
Emergency Firefighter – IV	Involves performance of specialized work or as a supervisor of a large group of people (21+ and/or 5 or more engines). Work performed may include Strike Team or Task Force Leader, or other leadership positions defined by ICS and appointed by the Incident Commander. This classification requires successful completion of NFPA III and Advanced Wildfire training courses or their equivalent in experience.	11.80/hr

COOPERATIVE AGREEMENT
Between
U. S. Fish and Wildlife Service
Hanford National Wildlife Refuge Complex
and
The Hanford Fire Department, Operated by DynCorp Tri-Cities Services, Inc.

1. Purpose

This Cooperative Agreement is entered into between the U. S. Fish and Wildlife Service, Hanford National Wildlife Refuge Complex (HNWRC), hereinafter referred to as the Service, and the Hanford Fire Department, hereinafter referred to as HFD, to providing fire protection and wildfire suppression for the Service managed lands located within the Hanford Site boundaries in Benton County, Washington .

2. Authority

A. Fire Protection Act of September 20, 1922 (16 U.S.C. 594), as amended.

B. Reciprocal Fire Protection Act of May 27, 1955 (42 U.S.C. 1856, 1856a and b), as amended.

C. Contract No. R006-96PR 13426.000, dated June 20, 1997, between the U. S. Department of Energy (DOE) and the U. S. Fish and Wildlife Service.

3. Scope

A. The HFD agrees to:

1. Provide first response fire fighting and equipment (units) as available for fires within the boundaries of the Fitzner/Eberhardt Arid Lands Ecology Reserve (ALE);

2. Provide ongoing fire fighting, medical, and overhead team services as available, and at the request of the Service;

3. When necessary, request and use the services of HFD's Mutual Aid partners willing and able to respond to a request for assistance;

4. Notify the Service as immediately when a fire occurs and HFD responds to a fire on ALE. Notification will be made to one Service representative by either State Radio or telephone, whichever means provides first contact. Personnel and telephone numbers of Refuge personnel are available in the dispatch plan.

5. Avoid the use of tractors, graders and all other ground surface breaking/modifying equipment without prior approval of the Service, except when the use of such equipment is essential to protect life, private property, or prevent the spread of fire to the Hanford 5ite east of Highway 24. The final decision on the use of such equipment rests with the Incident Commander.

6. Review, process and forward to the Service for payment, all claims from supporting fire agencies (listed in Appendix A), contractors, and other service providers.

7. Given the fact that a major fire occurred on ALE while this agreement was in the process of being revised, bill the Service the full cost of all support from non-Service agencies participating in the Elk Meadows fire and any subsequent fires which might occur during the negotiations leading to this agreement. Subsequent to receipt of payment from the Service make payment to the other participating agencies.

B. The Service agrees to:

1. Provide, at its own expense, first response and initial attack with its own equipment and personnel as may be available from its Columbia National Wildlife Facility in Othello, WA, on wildland fires occurring within the boundaries of ALE and on adjacent private lands;

2. Arrange, at its own expense; air support and any additional resources available from federal agencies;

3. Assist in wildland fire suppression on lands surrounding, but not adjacent to the HNWR when requested by the HFD and determined to be practical by the Service's Fire Management Officer (FMO) or Project Leader if no FMO is available. The assistance will be provided at the Service's expense; and,

4. Make payment to RFD for the full costs of all non-Service agencies . participating in fires occurring during the period of contract negotiations.

5. Reimburse the participating TriCounty agencies (listed in Appendix A) for costs incurred during support to fire fighting efforts on ALE, per the claims submitted through HFD. HFD is relieved from responsibility for the resolution of any claim.

C. Command and Control:

1. HFD will perform as the Incident Command agency in coordination with the Service until a qualified Service FMO is on scene. At that point, the FMO and the HFD Incident Commander will establish Unified Command.

2. Units dispatched in response to a request under this agreement will operate under the immediate supervision and control of the officer or person m charge of the unit. That officer or person will direct his units activities in accordance with

instructions/assignments made by the Incident Commander or the joint Incident Command Team.

3. HFD will coordinate the call out of additional overhead personnel from participating TriCounty agencies, if such personnel are deemed by the Incident Commander to be required.

4. Schedule of Reimbursable Costs

A. Upon receipt of an itemized invoice, the Service agrees to reimburse actual and reasonable costs incurred by HFD, including the costs of other Hanford Site Contractor organizations, costs of contracted off-site services such as catering, portable toilets, and crew housing; and all such costs of other supporting agencies. Personnel reimbursement will be at the invoicing agency's total cost of compensation for both paid and volunteer personnel-according to Washington State Fire Services Resource Mobilization Plan direction. Equipment reimbursement will be at Washington State Association of Fire Chiefs' rates for appropriate equipment not listed on Service rate tables; and at rates established by the agency owning the equipment for all other appropriate equipment items.

B. The minimum compensation for any call out period is two hours of work time for each person on the fire and one hour for each equipment unit.

C. The Service will reimburse participating agencies for the cost of repair or replacement for any equipment lost or damaged resulting from traveling to the event scene, fighting a fire or transit home following demobilization from a fire. Any agency requesting reimbursement will submit an itemized invoice and any appropriate accident, loss, or damage reports.

D. The Service will reimburse HFD for post fire costs of incident related reports and the preparation of financial documentation packages.

5. Term of Agreement

A. This agreement will remain in effect from the date of its execution through September 30, 2000; unless sooner terminated by action of the Service's agreement with DOE or as stated below.

B. This Agreement will be reviewed annually by the Service and HFD to determine whether any revisions are necessary.

C. Furthermore, either party may terminate this agreement upon thirty (30) days written notice to the other. Any invoices in process from a fire occurring prior to the termination date will be paid even if submitted following termination.

6. Financial Administration

A. Cost Accounting code (provided by the Service), will be in the following format and included on all correspondence and invoices: 135119261-XXXX. The Service's checks will be made payable to: DynCorp Tri-Cities Services, Inc.

B. The RFD will submit an itemized invoice to the Service's Project Leader showing the number and type of units, unit cost, number, and names of fire fighters and total costs Personnel must be current enrolled members of the HFD, members of other supporting Hanford site organizations or members of other local fire departments responding at the request of HFD or the Service.

C. HFD personnel will provide Overhead Team services on an as required basis to include time keeping for equipment and personnel. Documentation of personnel and equipment time will be performed utilizing Washington State Department of Emergency Management forms wherever possible, and the forms of other participating agencies such as DNR, when requested by those agencies. Bills participating support services provided by caterers and other contractors will be forwarded for payment m the form received.

D. HNWRC shall add funds to this agreement for each fire in order to reimburse HFD and obligate funds as necessary.

7. Project Offices

David Goeke, Project Leader
U.S. Fish and Wildlife Service
Columbia NWR and
Hanford National Wildlife Refuge Complex
PO Drawer F / 735 E. Main St.
Othello, WA 99344

Telephone: (509) 488-2658

Donald Good, Chief
Hartford Fire Department
DynCorp Tri-Cities Services, Inc
1430 Steven Center Place
PO Box 1400 MS S3-97
Richland, WA 99352

Telephone: (509) 373-1311

8. Special Provisions

A. Changes: This agreement may be amended by either party , as the need arises. No change will be binding unless mutually agreed in writing and signed by the responsible parties.

B. Maintenance of equipment needed to fulfill the support contemplated by this Agreement shalI be at the expense of the agency owning or leasing the equipment.

This agreement consists of seven pages including exhibit A and is effective once executed and dated by the principal panics first designated below.

HANFORD FIRE DEPARTMENT

U.S. FISH AND WILDLIFE SERVICE

Appendix A to
USF&WS - HFD/DTCSI Cooperative Agreement

List of Potentially Participating TriCounty Agencies

Benton County Fire District # 1
Benton County Fire District # 2
Benton County Fire District # 3
Benton County Fire District # 4
Benton County Fire District # 5
Benton County Fire District # 6
Franklin County District # 3
Walla Walla County Fire District # 4
Walla Walla County Fire District # 5
Benton County Emergency Services
Franklin County Emergency Services
City of Richland
City of Kennewick
City of Pasco
City of Prosser
City of College Place
Hanford Site Emergency Preparedness
Miscellaneous Hanford Site organizations which provide support services such as Hanford Patrol, traffic control, heavy equipment operation, vehicle maintenance, vehicle fueling, facilities Management, material delivery, etc..

DEPARTMENT OF THE INTERIOR
RECEIVED
FEB - 9 1996
Columbia National Wildlife Refuge
FISH & WILDLIFE SERVICE

Ref. Mgr.
X Asst. Mgr. CMA
Biologist
X FCO
Admin. Asst.
X Clerk
Shop
Review ____ File ____
Action Copy FYI File

ADAM'S COUNTY FIRE DIST 5
220 S. Broadway 488-2951
Othello, Wa. 99344

February 8, 1996

Mr. Greg Hughes
Columbia National Wildlife Refuge
PO Drawer F
Othello, WA 99344

Dear Greg:

In regards to your letter dated February 6, 1996 and our telephone conservation concerning your request to renew your authorization to use our radio frequency of 154.190 during times of an emergency.

We again authorize you to use our frequency of 154.190 as well as our Primary Frequency of 154.010. We understand that at this time non of your radios have 154.010 in them. If in the future you upgrade your present radios and/or purchase new ones, you may want to think of adding this frequency in them as well.

Please find enclosed, a copy of our Radio License which is to be renewed in 1998 along with a Frequency Use Authorization Form for both of our frequencies.

If you have any other questions, feel free to contact me at the office Monday thru Friday from 8:00 A.M. to 5:00 P.M. or call me at (509)488-2951.

Sincerely,

Clyde Fought

Clyde Fought
Fire Chief

CF:gb
Enclosures

FREQUENCY USE AUTHORIZATION

Name of Authorizing Department. ADAMS COUNTY FIRE PROTECTION DISTRICT 5

Authorizing Agent. CLYDE FOUGHT

Title. DISTRICT CHIEF

Terms and Conditions.

Use of the frequency 154.190 & 154.010 shall be authorized for

COLUMBIA NATIONAL WILDLIFE REFUGE COMPLEX

for an indefinate period. Use of this frequency is authorized for use when operating in conjunction with the granting department in tactical mutual aid fireground operations. Use of this frequency for other purposes is prohibited without prior approval of the Fire Chief, his designated alternate or the Fire Commisioners. The frequency may be used in mobile and portable equipment only unless otherwise specified by the granting department.

Termination of this agreement may be initiated by either party with written notice to the other.

Valid FCC License call letters: KNHN 685
Expiration Date: OCTOBER 6, 1998

Title and Signature of Granting Agency;

ADAMS COUNTY FIRE DISTRICT 5 by CHIEF CLYDE FOUGHT Clyde Fought

Title and Signature of User Agency;

COLUMBIA NATIONAL WILDLIFE REFUGE by ASSIST. REFUGE MANAGER GREG HUGHES

Date: This 8th day of February, 1996

Federal Communications Commission
Gettysburg, PA 17325-7245

RADIO STATION LICENSE

Licensee Name: ADAMS COUNTY FIRE PROTECTION DIST 5

Radio Service: PF FIRE
Call Sign: KNHN685 File Number: 235250
Frequency Advisory No: WAF2083
License Issue Date: 930803
License Expiration Date: 961006
Number of Mobiles by Category: Vehicular - **25** Portable - ***5**Aircraft - ******Marine - ******Pagers********

930803R 161 1 1R

ADAMS COUNTY FIRE PROTECTION DIST 5
220 S BROADWAY
OTHELLO WA 99344

Station Technical Specifications

FCC I.D.	Frequencies (MHz)	Station Class	No. of Units	Emission Designator	Output Power (Watts)	E.R.P. (Watts)	Ground Eleva	Ant. Hgt. To Tip	Antenna Latitude	Antenna Longitude
1:	154.19000	FB	1	20K0F3E	60.000	120.000	1122	45	46-49-30	119-09-50
2:	154.01000	MO	30	20K0F3E	45.000	45.000				
	154.19000	MO	30	20K0F3E	45.000	45.000				

	TRANSMITTER STREET ADDRESS	CITY	COUNTY	STATE
1:	220 S BROADWAY	OTHELLO	ADAMS	WA

AREA OF OPERATION
SITE 2: WA COUNTYWIDE: ADAMS

CONTROL POINTS:220 S BROADWAY OTHELLO WA
CONTROL POINT PHONE: 509-488-2951

EMISSION DESIGNATOR(S) CONVERTED TO CONFORM TO DESIGNATOR(S) SET OUT IN PART 2 OF THE COMMISSION'S RULES.

PAGE 1 OF 1

FEDERAL COMMUNICATIONS COMMISSION

This authorization becomes invalid and must be returned to the Commission if the stations are not placed in operation within eight months, unless an extension of time has been granted. EXCEPTION: 900 MHz trunked and certain 900 MHz station licenses cancel automatically if not constructed within one year.

FCC 5
September

United States Department of the Interior
U.S. Fish & Wildlife Service
Hanford Reach National Monument
Saddle Mountain National Wildlife Refuge
3250 Port of Benton Boulevard
Richland, Washington 99352
Phone: (509) 371-1801 Fax: (509) 375-0196

FWS-01-053

April 12, 2001

Mr. James Spracklen, Director
Office of Security and Emergency Services
U. S. Department of Energy
P.O. Box 550, MS A6-35
Richland, WA 99352

RE: FIRE DEPARTMENT COORDINATION

Dear Mr. Spracklen:

Recent discussions have taken place between Hanford Fire Department Chief Donald Good and U.S. Fish and Wildlife Service (FWS) Fire Management Officer Thomas Skinner regarding opportunities to enhance coordination and communication between the respective fire programs. Strategies resulting from these discussions include new arrangements to park FWS engines at a Hanford Fire Station, and to track daily engine work assignments through your dispatch office.

Please consider this a formal request for permission to park one type 5, and one type 6 engine at one of your fire stations during the summer of 2001. This arrangement would benefit communications between our fire program staffs by bringing personnel together on a daily basis. It would also benefit our program directly, as we currently are without a secured yard to house our engines.

We are also requesting that your dispatch center track our engine crew work locations on a daily basis. Keeping your dispatch office informed of our engine locations will allow for efficient and timely dispatch operations.

RECEIVED
Hanford Fire Department
MAY 04 2001
Action: Meeting 5/16 - 12:30 pm
Copies:
Route:
File: Toss:

Once the above arrangements are agreed to, we will notify the Central Washington Interagency Communications Center that Hanford Fire Department will serve as our Initial Attach Dispatch Center, and that the Hanford Dispatch Center is authorized to make resource requests on our behalf. As discussed, we will provide your dispatch office with additional information on making resource requests.

Sincerely,

Paula Call for

Gregory M. Hughes
Project Leader

cc:
C. Bohan, FWS
P. Ensley, FWS
D. E. Good, FDH
D. Voros, FWS
File 621.2

APPENDIX I: EQUIPMENT INVENTORY

COLUMBIA NATIONAL WILDLIFE REFUGE
CACHE INVENTORY

PERSONAL GEAR

DESCRIPTION	ORDER #	QUANTITY	DATE	DATE
Nomex Pants				
8x30		2		
10x30		4		
12x30		2		
28x30		4		
30x30		7		
32x30		9		
34x30		4		
38x30		5		
40x30		1		
30x32		2		
32x32		4		
34x32		10		
36x32		4		
28x34		3		
30x34		2		
32x34		14		
34x34		9		
36x34		8		
38x34		4		
40x34		1		
42x34		1		
Nomex Shirts				
X-Small	NFES 0522	1		

Small	NFES 0577	9		
Medium	NFES 0578	12		
Large	NFES 0579	13		
Large/Long	NFES 2078	2		
X-Large	NFES 0580	5		
XX-Large	NFES 0570	1		
X-Large/Long	NFES 2079	1		
Brush Jackets				
Small		0		
Medium		0		
Large	NFES	4		
X-Large		1		
XX-Large		2		
Brush Jacket Liners				
Small		0		
Medium		0		
Large		2		
X-Large		3		
Crew T-Shirts				
Medium		0		
Large		0		
X-Large		9		
Crew Sweatshirts				
Medium		5		
Large		2		
X-Large				
Hard Hats				
Cap Style (Red)		4		
Full Brim (Black)		2		

Fill Brim (Red)		2		
Head Lamps				
Red Head Lamp	NFES 0713	12		
Red Head Lamp w/ belt attac	NFES 0110	6		
Yellow Head Lamp		3		
Shroud		7		
Goggles				
Big Goggles (Clear)		3		
Replacement Lenses (Dark)		4		
Small Goggles (Dark)		6		
Replacement Lenses (Dark)		4		
Saw Goggles		2		
Gloves				
X-Small	NFES 1293	10		
Small	NFES 1294	8		
Medium	NFES 1295	22		
Large	NFES 1296	19		
X-Large	NFES 1297	11		
IA Bags				
Eagle Packs (detachable)	New Old	8 2		
Yellow IA Packs	NFES 1372	2		
Personal Gear Bag	NFES 1855	5		
Fire Shelters				
Fire Shelter w/case & plastic	NFES 0169	7		
Fire Shelter		6		
Yellow case for fire shelter		8		
Practice Shelter	NFES 2407	3		
Sleeping Bags				

Yellow/Green	NFES 1022	6		
White	NFES 0062	6		
Red		1		
Sleeping Pads	NFES 1566	15		
Tents				
Tex-Sport		6		
Tex-Sport w/out poles		1		
Ear Plugs				
Aearo Ear Plugs	NFES 1027	1 Box		
Ear Plug w/ Cord		7		
Fireline Handbook				
Handbooks	NFES 0065	15		
Appendix B	NFES 2165	16		
Flagging				
Blue	NFES 0455	16		
Lime	NFES 2392	27		
Pink	NFES	18		
Pink/Black	NFES	20		
Red/White	NFES 2402	14		
Yellow/Black	NFES	24		
White/Green	NFES	14		
Killer Tree	NFES 6066	25		
Spot Fire	NFES 6067	24		
Flagging Holders	NFES	2		
MRE's		14		

TOOLS

DESCRIPTION	ORDER #	QUANTITY	DATE	DATE

Combi's	NFES 1180	15		
Flappers	NFES 1868	4		
McLoeds	NFES0296	10		
Pulaski	NFES 0146	32		
Shovels	NFES 0171	18		
Falling Axe	NFES 0352	3		
Double Bit Axe	NFES 0015	5		
Sandvik	NFES 0013	2		
Sandvik Blades	NFES 0034	4		
Combi's Handles	NFES 1168	6		

WATER HANDLING

DESCRIPTION	ORDER #	QUANTITY	DATE	DATE
Adapter				
1" NPSH-F to 1" NH-M	NFES 0003	1		
11/2" NPSH-F to 11/2" NH-M (Brass)	NFES	2		
11/2" NH-F to 11/2" NPSH-M	NFES 0006	4		
11/2" NPSH-M to 11/2" NH-F	NFES 0007	13		
Quarter Turn by Male Thread 11/2"		4		
Quarter Turn by Female Thread 11/2"		4		
¾" Adapter Handles		4		
Ball Valves				
¾" NH	NFES 0738	20		
1" NPSH	NFES 1201	5		
11/2" NH	NFES 1207	3		
Caps				
1" NPSH-F	NFES 0732	10		
11/2" NH-F	NFES 2210	1		
2" NH-F	NFES	2		
Collapsible Bucket	NFES 0141	6		

Coupling				
1” NPSH double Male	NFES 0916	6		
1” NPSH double Female	NFES 0710	8		
11/2” NH double Male	NFES 0856	10		
11/2” NH double Female	NFES 0857	11		
Ejector (High Performance)		1		
Foot Valves				
11/2” NH-F	NFES 0212	2		
2” NPSH	NFES 0906	1		
21/2”		1		
Foam				
Class A	NFES 1145	4		
Wetting Agent		3 – 1qt.		
Tex-Penetro		8 – 1gallon		
Gaskets (for nozzles)				
¾”	NFES 0721			
1”	NFES 0743			
11/2”	NFES 0254			
2”	NFES 0742			
¾”	NFES 1016	1700 ft.		
1”	NFES 1238	4000 ft.		
11/2”	NFES 1239	2900 ft.		
Hoses (cont.)				
1” x 8ft. Draft Hose	NFES	2		
11/2” x 6ft. Draft Hose		1		
11/2” x 8ft. Draft Hose	NFES 1808	1		
11/2” x 10ft. Draft Hose	NFES 0115	1		
2” x 8ft. Draft Hose	NFES 0914	2		
Hose Clamps	NFES 0046	5		

Hose Rollers				
Small	NFES 1016	1		
Large		1		
Hose Washer		1		
Increasers				
¾” NH to 1” NPSH	NFES 2235	11		
1” NPSH-F to 11/2” NH-M	NFES 0416	7		
Nozzles				
¾” NH	NFES 0136	1		
¾” NH Foam	NFES 0627	5		
1” Forester	NFES 0024	4		
¾” Forester Tip	NFES			
¾” Forester Fog	NFES 0636	17		
¾” Forester Stream	NFES 0737	10		
1” Barrel	NFES 1081	3		
1” Defender Foam		2		
1” 10-24GPM Bubble Cup		2		
11/2” Blizzard Wizard Foam 30 GPM	NFES 0629	9		
11/2” NH Barrel	NFES 1082	4		
11/2” 95 GPM Bubble Cup		1		
Pressure Relief Valve				
11/2” NH-F x 1/1/2” NPSH-M x 1 NPSH-M		3		
Pumps				
Floto Pump		1		
Mark III		3		
Mark III Kits		4		
Backpack Pumps	NFES 1149	22		
Maruyama Pump		2		
Reducers				

1” NPSH-F to ¾” NH-M	NFES 0733	23		
11/2” NH-F to 1” NPSH-M	NFES 0010	11		
2” NPSH-F to 11/2” NH-M	NFES 0417	4		
21/2” NPSH-F to 11/2” NH-M	NFES 2229	4		
Spanner Wrenches				
1” to 11/2”	NFES 0234	3		
11/2” to 4”		1		
Strainer				
11/2” AL 150 PSI		2		
21/2” Basket Type		1		
Tanks				
1800 gal. Pumpkin (orange)		1		
2100 gal. Fod-da-Tank		2		
Tees				
11/2”NH-F x 11/2” NH-M x 1” NPSH-M	NFES 0230	11		
11/2”NH-F x 11/2” NH-M x 1” NPSH-M w/ cap	NFES 0731	5		
Wyes				
¾” NH-F x ¾” NH-M x ¾” NH-M	NFES 0272	13		
1” NPSH-F x 1” NPSH-M x 1” NPSH-M	NFES 0259	9		
11/2” NH-F x 11/2” NH-M x 11/2” NH-M	NFES 0231	3		

POTABLE WATER

DESCRIPTION	ORDER #	QUANTIT	DATE	DATE
Canteens				
	NFES 0037	63		
	NFES 1063	13		

1 qt. I		14		
Cooler holders		2		

SAFETY

DESCRIPTION	ORDER #	QUANTITY	DATE	DATE
Belt Weather Kits	NFES 1050	4		
Sling Psychrometer	NFES 1156	5		
Drip Torches	NFES 0241	9		
Flare Gun		2		
25mm Red Flares		128		
Fusses		3 cases		
Lightsticks				
Green	NFES 3009	18		
Orange	NFES	20		
Yellow	NFES 3008	18		

CHAIN SAW PARTS

DESCRIPTION	**ORDER #**	**QUANTITY**	**DATE**	**DATE**
Chaps				
32”	NFES 0045	4		
36”	NFES 0078	2		
Wedges				
Tiny Metal		12		
Small Plastic	NFES 0515	2		
Large Plastic	NFES 0516	1		
Files				
7/32” Round	NFES 0345	39		
3/16” Round	NFES 2105	27		
5/32” Round	NFES 1248	4		

Sharpening Guides	NFES 0343	5		
Scrench		3		
E-Clip		4		
Oil Caps		2		
Bearing 036		2		
Air Filter Insert		6		
Star Scrench		1		
Philips Scrench		1		
Flat Scrench		1		
Clean & Adjust		4		
Bar Nuts		5		
Air Filter Cover Knob		1		
Fuel Faucet		1		
Chain Links		1 bag		
Saw Parts (cont.)				
Grease		5oz.		
Pull Chord		1		
Spark Plugs		9		
Oregon Chain Boxes		15		
Oregon File Holder		1		
Owner's Manual		2 (044) 1 (036)		
Chain Breaker		1		
Rivet Spinner		1		
Chain		¼" Roll		
036 Saws		4		

MEDICAL

DESCRIPTION	ORDER #	QUANTITY	DATE	DATE
Particle Masks	NFES 0131	68		
Clear Eye Shades		36		

Eye Dressing Unit		3		
Mini First Aide Kit	NFES 0067	18		
Wire Splint		1		
CPR Mouth Barrier		4		
40” Bandage		1		
4”x4” Bandage Compress		2		
2”x2” Bandage Compress		4		
First aide Safety Glasses		1		
3”x4” Moleskin	NFES 1134	6		
AIDS Report		3		
Body Fluids Barrier Kit	NFES 0640	9		
Bio-Hazard/Infectious Disease Ki		1		
Curad Bandage Strips		31		
1” Wrap		2 rolls		
2” Wrap		1 roll		
Field Dressing		1		
Insect Repellent		6 cans		

Miscellaneous

DESCRIPTION	**ORDER #**	**QUANTITY**	**DATE**	**DATE**
Packs				
Yellow Belt Packs	NFES 0590	5		
Green Corbura Pack		1		
Large Green Leather Bag		2		
Small Green Leather Bag		2		
Blue Tent Fly 9x10	NFES 1521	2		
Red Survey Vest				
Large		2		
Medium		1		

Files				
8”	NFES 0351	1		
10”	NFES 0060	16		
12”	NFES 1059	6		
Handles	NFES 0063	20		
Tape (Packaging)	NFES 0222	15 rolls		
Tape Dispenser		1		
50’ Nylon Rope		1		
200’ Black Plastic		1		
Waders				
Size 9		1		
Size 10		1		
Size 12		1		
Hip waders Size 7		1		

APPENDIX J: DISPATCH PLAN

Columbia National Wildlife Refuge
Fire Dispatch Plan
2001

1.) **Detection**

a) When a fire is discovered on or near Refuge land, document the following information:
   i) Name and telephone number of the reporting party
   ii) Location of fire or smoke
   iii) An indication of the best access into the fire
   iv) Color of smoke
   v) Approximate size of fire
   vi) Type of fuel burning and type of fuel that may burn
   vii) Values at risk and resources threatened
   viii) Current fire behavior (running, creeping, smoldering, torching, etc.)
   ix) Accounting of personnel in the vicinity (e.g., vehicles leaving the scene)
   x) Weather at the scene

2.) **Notification**

a) Call all numbers until reaching an individual (do not stop notification after leaving a message on an answering machine) or reaching the bottom of the list.

NAME	TITLE	TELEPHONE	RADIO
Betsy Schenk	Assistant Fire Management Officer	**(C)** (509) 989-0353 **(H)** (509) 488-5333 **(O)** (509) 488-6965 **(P)** (509) 766-5099	Schenk
Julie Martin	Engine Foreman	**(C)** (509) 989-0353 **(H)** (509) 488-5333 **(O)** (509) 488-6965 **(P)** (509) 766-5098	Martin
Eric Hagen	Fire Management Officer	**(C)** (509)521-7381 **(H)** (509)586-8155 **(O)** (509)371-1801	Hagen

Rob Larrañaga	Deputy Project Leader	**(C)** (509)989-1084 **(H)** (509)488-9965 **(O)** (509)488-2668	Columbia 2
Randy Hill	Refuge Biologist	**(C)** (509)989-2802 **(H)** (509)488-9418 **(O)** (509)488-2668	Columbia 3
Bob Flores	Project Leader	**(C)** (509) 989-2543 **(H)** (509) 331-0388 **(O)** (509)488-2668	Columbia 1
Fire Crew Quarters		(509)488-6928	
Work Center		(509)488-2126	

b) If no-one on the above list can be reached, use the attached map to determine which Fire Protection District should be called, and call the appropriate personnel from the following table:

Fire Protection District	**Contact**	**Telephone**	**Cellular Telephone**
Adams County #5	Clyde Fought (Chief)	(509) 488-2951	(509) 989-2591
Grant County #4	Marty Whitney (Chief) Larry Rosenberg Jeff Whitaker Fire Station	(509) 349-0247 (509) 349-2416 (509) 349-2396 (509) 349-2471	 (509) 750-1104 (509) 750-1117
Grant County #10	Bill Greenway (Chief) Bob Woodward Howard Burdine (Capt.)	(509) 346-2658 (509) 346-1111 (509) 346-9420	(509)989-2436 (509) 360-3912 (509) 989-1617
Grant County #11	Garth Gunter (Chief) Tim Freeman (Asst. Chief St.#1) Pat Schrom Royal City (Station #1) Mar Don (Station # 3) Jim Sahli (Asst. Chief St.#3)	(509) 346-9234 (509) 346-9727 (509) 346-2244 (509) 346-2211 (509) 346-2809 (509) 346-2074	(509) 989-0236 (509) 989-0222

c) In addition to contacting a Fire Protection District, contact a Fish and Wildlife Service fire person using the following table:

NAME	**TITLE**	**TELEPHONE**	**RADIO**

Thomas Skinner	Mid-Columbia NWRC Fire Management Officer	**(C)** (509) 521-3555 **(H)** (509) 585-7984 **(O)** (509) 545-8588 **(P)** (509) 530-9628	701

Tom Padgett	Engine Foreman Hanford/Saddle Mtn.	**(C)** (509) 521-6975 **(H)** (509) 371-1245 **(O)** (509) 371-1801x235 **(P)** (509) 530-1324	Padgett
Cliff Berger	Mid-Columbia NWRC Prescribed Fire Specialist	**(C)** (541)561-6119 **(H)** (541)922-4503 **(O)** (541)922-5909	702

3.) **On-Refuge Fire**

If a fire is on the refuge, or is threatening to spread onto the refuge (usually within one mile of the refuge boundary with a path of available fuel to spread onto the refuge), dispatch the refuge engine crew(s). A minimum of two carded fire fighting personnel will be dispatched to the fire, and one person must be Single Resource Boss (Engine Boss or Crew Boss) qualified.

4.) **Arrival On Scene** Upon arrival at the scene, the most qualified person will become the Initial Attack Incident

Commander.

a) The Initial Attack Incident Commander should use the information in Chapter 1 of the

Fireline Handbook to:

i) Assess the fire while enroute
ii) Complete a size-up of the fire
iii) Formulate an initial plan
   (1) Use light hand on the land tactics when possible
   (2) Use fireline handbook chapter one as a guideline to select tactics
iv) Direct personnel to begin initial attack.

b) The Initial Attack Incident Commander should soon assess the fire

i) Consider requesting and assigning an ICT4 for fires on Refuge land
ii) Report progress on the fire to both Deputy Project Leader and FMO.

5.) **Evaluate Initial Attack Plan**

a) Will firefighting resources on the scene control fire within the first burning period?
b) If additional firefighting resources will be required or if fire will burn into a second burning period, transition the fire to an extended attack incident (see chapter 2 of the fireline handbook).

i) Use closest forces concept when ordering additional resources
ii) Consider FWS personnel first, then cooperating resources.

CNWR AVAILABLE RESOURCES

NAME	TITLE	ICS QULIFICATIONS
Eric Hagen	FMO	
Betsy Schenk	AFMO	ICT4, TFLD, ENGB, CRWB, PLDO
Julie Martin	Engine Foreman	ICT5, ENGB, CRWB, FALB
Dan Varney	Firefighter	FFT2
Jerod Kidd	Firefighter	FFT2
Rob Larranaga	Deputy Project Leader	ENGB
Randy Hill	Biologist	FFT2
Dana Barg	Equipment Operator	FFT2

APPENDIX K: COMMUNICATIONS

EF Johnson / Racal **Zone 1 CNWR**

Channel	Rx Freq.	PL	Tx Freq.	PL
1 Wahitas D	164.775		166.275	
2 Wahitas A	164.775	110.9	166.275	110.9
3 C/C D				
4 C/C A	164.775		164.775	
5 Red Net	153.830		153.830	
6 Adams 5	154.010		154.010	
7 Grant 4	153.905		153.905	
8 Grant 8	154.325		153.740	100
9 Grant 10/11	154.325	91.5	153.740	91.5
10 Tac 1	159.525		159.525	
11 MACC	154.190	156.7	156.195	156.7
12 Turnbull RP	164.775		164.275	156.7
13 Turnbull C/C				
14 BLM Wahi	163.050	114.8	164.725	114.8
15 USFS A/G	166.675		166.675	

King

Channel	Rx Freq.	PL	Tx Freq.	PL
1 Wahitas A	164.775	110.9	166.275	110.9
2 FWS Local	164.775		164.775	
3 Red Net	153.830		153.830	
4 Adams 5	154.010		154.010	
5 Grant 4	153.905		153.905	
6 Grant 8	154.325		153.740	100
7 Grant 10/11	154.325	91.5	153.740	91.5
8 Tac 1	159.525		159.525	
9 MACC	154.190	156.7	156.195	156.7

10 Turnbull RP	164.775		164.275	156.7
11 Turnbull C/C	166.775		164.775	
12 BLM Wahi	163.050	114.8	164.725	114.8
13 USFS A/G	166.675		166.675	
14 NOAA Weather	162.450		162.450	

EF Johnson / Racal **Zone 2 S/Mtn.**

Channel	Rx Freq.	PL	Tx Freq.	PL
1 Rtlsnk D	172.275		1680150	
2 Rtlsnk A	172.275	103.5	168.150	103.5
3 Wahitas D	164.775		166.275	
4 Wahitas A	164.775	110.9	166.275	110.9
5 JJoe D	164.775		164.250	
6 JJoe A	164.775	127.3	164.250	127.3
7 Red Net	153.830		153.830	
8 Hnfrd FD	164.400	192.8	173.100	192.8
9 Hnfrd Tac	167.825		167.825	
10 Adams 5	154.010		154.010	
11 Bntn Co	155.000		155.000	
12 Grant 8	154.325		153.740	100.0
13 Frnkln 4	154.190		154.190	
14 USFS A/G	166.675		166.675	

EF Johnson / Racal **Zone 3 MCR OR**

Channel	Rx Freq.	PL	Tx Freq.	PL
1 JJoe D	164.775		164.250	
2 JJoe A	164.775	127.3	164.250	127.3
3 USFS	164.125		164.125	131.8
4 Hermistn	154.400		154.400	
5 UMT Shrf	154.725		155.655	173.8
6 Bntn 6	154.445		154.445	162.2
7 OR St Pl	154.905	151.4	155.460	114.8
8 Mrrw Co	154.725		155.655	162.2
9 UMT RFD	154.310		154.310	
10 Brdmn Rp	150.805	156.7	154.235	100.0
11 Brdnm C/C	154.235	100.0	154.235	100.0
12 Turnbull RP	164.775		164.275	156.7
13 Turnbull C/C	166.775		164.775	
14 Red Net	153.830		153.830	
15 USFS A/G	166.675		166.675	

APPENDIX L: BURN PLAN FORMAT

Refuge or Station
Unit

Prepared By: _____ Date:

Reviewed By: _____ Date:
Refuge Manager
Reviewed By: _____ Date:
Prescribed Fire Burn Boss
Reviewed By: _____ Date:
(Others)

The approved Prescribed Fire Plan constitutes the authority to burn, pending approval of Section 7 Consultations, Environmental Assessments or other required documents. No one has the authority to burn without an approved plan or in a manner not in compliance with the approved plan. Prescribed burning conditions established in the plan are firm limits. Actions taken in compliance with the approved Prescribed Fire Plan will be fully supported, but personnel will be held accountable for actions taken which are not in compliance with the approved plan.

Approved By: _____ Date:

PRESCRIBED FIRE PLAN

Refuge: _____ Refuge Burn Number:

Sub Station: _____ Fire Number:

Name of Area: _____ Unit No.

Acres To Be Burned/Maximum Manageable Area (MMA): ____ Perimeter Of Burn:

Legal Description: Lat. ___ Long. ___ T __ R __ S

County:

Is a Section 7 Consultation being forwarded to Fish and Wildlife Enhancement for review ?
Yes No (circle).

(Page 2 of this PFP should be a refuge base map showing the location of the burn on Fish and Wildlife Service land)

The Prescribed Fire Burn Boss/Specialist must participate in the development of this plan.

I. GENERAL DESCRIPTION OF BURN UNIT

Physical Features and Vegetation Cover Types (Species, height, density, etc.):

Primary Resource Objectives of Unit (Be specific. These are management goals):

1)
2)
3)
4)

Objectives of Fire (Be specific. These are different than management goals):

1)
2)
3)
4)

Acceptable Range of Results (Area burned vs. unburned, scorch height, percent kill of a species, range of litter removed, etc.):

1)
2)
3)
4)

II. PRE-BURN MONITORING

Vegetation Type Acres % FBPS Fuel Model

_____ __ __ _____

Total

Habitat Conditions (Identify with transect numbers if more than one in burn unit.):

Type of Transects:

Photo Documentation (Add enough spaces here to put a pre-burn photo showing the habitat condition or problem you are using fire to change/correct. A photo along your transect may reflect your transect data.):

Other:

III. PLANNING AND ACTIONS

Complexity Analysis Results:

Site preparation (What, when, who & how. Should be done with Burn Boss):

Weather information required (who, what, when, where, how, and how much):

Safety considerations and protection of sensitive features (Adjacent lands, visitors, facilities, terrain, etc., and needed actions. Include buffer and safety zones. Be specific, indicate on a burn unit map. Map should be a USGS quadrangle if possible, so ridges, washes, water, trails, etc. can be identified.)

Special Safety Precautions Needing Attention (Aerial ignition, aircraft, ignition from boat, etc.):

Media Contacts (Radio stations, newspaper, etc., list with telephone numbers):

Special Constraints and Considerations (Should be discussed with Burn Boss):

Communication and Coordination on the Burn (Who will have radios, frequencies to be used, who will coordinate various activities.):

IV. IGNITION, BURNING AND CONTROL

Planned or Proposed Actual

Scheduling: Approx. Date(s) _____
Time of Day _____

	Acceptable Range		
FBPS Fuel Model	Low	High	Actual
Temperature			
Relative Humidity			
Wind Speed (20' forecast)			
Wind Speed (mid-flame)			
Wind Direction			
Cloud Cover (%)			
ENVIRONMENTAL CONDITIONS			
Soil Moisture/KBDI			
1 hr. Fuel Moisture			
10 hr. FM			
100 hr. FM			
Woody Live Fuel Moisture			
Herb. Live Fuel Moisture			
Litter/Duff Moisture			
FIRE BEHAVIOR			
Type of Fire (H,B,F)			
Rate of Spread			
Fireline Intensity			
Flame Length			
Energy Release Component NFDRS Fuel Model _____			

Cumulative effects of weather and drought on fire behavior:

Ignition Technique (Explain and include on map of burn unit. Use of aerial ignition must be identified in this plan. Last minute changes to use aircraft will not be allowed and will be considered a major change to the plan. This will require a resubmission):

Prescribed Fire Organization (See Section VII, Crew and Equipment Assignments. All personnel and their assignments must be listed. All personnel must be qualified for the positions they will fill.)

Other (If portions of the burn unit must be burnt under conditions slightly different than stated above, i.e., a different wind direction to keep smoke off of a highway or off of the neighbors wash, detail here.)

Prescription monitoring (Discuss monitoring procedure and frequency to determine if conditions for the burn are within prescription):

V. SMOKE MANAGEMENT

Make any Smoke Management Plan an attachment.

Permits required (who, when):

Distance and Direction from Smoke Sensitive Area(s):

Necessary Transport Wind Direction, Speed and Mixing Height (Explain how this information will be obtained and used):

Visibility Hazard(s) (Roads, airports, etc.):

Actions to Reduce Visibility Hazard(s):

Residual Smoke Problems (Measures to reduce problem, i.e., rapid and complete mop-up, mop-up of certain fuels, specific fuel moistures, time of day, etc.):

Particulate emissions in Tons/Acre and how calculated (This should be filled in after the burn so more precise acreage figures can be used):

VI. FUNDING AND PERSONNEL (INCIDENT ACTION PLAN)

Activity Code:

	Equipment & Supplies	Labor	Overtime	Staff Days	Total Cost
Administration (planning, permits, etc.)					
Site Preparation					
Ignition & Control					

Travel/Per Diem					
Total					

Costs

VII. BURN-DAY ACTIVITIES

Public/Media Contacts on Burn Day (List with telephone numbers):

Crew & Equipment Assignments (List all personnel, equipment needed, and assignments. The following is not an all inclusive list for what you may need.)

Burn Boss/Manager -
Ignition Specialist -
Ignition Crew -
Holding Specialist -
Holding Crew -
Aircraft Manager -
FWBS -
Dispatcher-
Other -

Crew Briefing Points (Communications, hazards, equipment, water sources, escape fire actions, etc. To be done by Burn Boss. Refer to Safety Considerations in Planning Actions and points listed below):

Ignition Technique (Methods, how, where, who, and sequence. Go over what was submitted in Section IV and any changes needed for the present conditions.) Attach ignition sequencing map if necessary:

Personnel Escape Plan:

Special Safety Requirements:

Go-No-Go Checklist:

Holding and Control:

Critical Control Problems:

Water Refill Points:

Other:

Contingency Plan for Escaped Fire (Are there crews standing by to initial attack or will people doing other jobs be called upon to do initial attack, who must be called in case of an escape, what radio frequencies will be used, etc.)

Mop Up and Patrol:

Rehabilitation Needs:

DI 1202 Submission Date:

Special Problems:

VIII. CRITIQUE OF BURN

Were burn objectives within acceptable range of results? (Refer to Section I):

What would be done differently to obtain results or get better results?

Was there any deviation from plan? If so, why?

Problems and general comments:

IX. POST-BURN MONITORING

Date:_____ Refuge Burn Number:

Length of Time after Burn:

Vegetative Transects:

Comments on Habitat Conditions, etc.:

Photo Documentation:

Other:

X. FOLLOW-UP EVALUATION

Date: _____ Refuge Burn Number:

Length of Time after Burn:

Vegetative Transects:

Comments on Habitat Conditions, etc.:

Photo Documentation:

Other:

BURN PLAN GO/NO GO CHECKLIST

	YES	NO
Do you have an **APPROVED** prescribed fire plan?		
Are **ALL** fire prescription parameters and specifications met?		
Are **ALL** smoke management prescription and specifications met?		
Have **ALL** permits and clearances been obtained?		
Has an area **spot weather forecast** been obtained?		
Are **ALL** personnel required and specified in the burn plan on-site?		
Has the **contingency planning** process adequately considered fuels adjacent to and within a reasonable distance from the burn unit?		
Are on-site resources and contingency resources adequate to contain an escape in the event of a **worst-case scenario**? Are **ALL** contingency resources available?		
Have **ALL** of the required notifications been made?		
Have **ALL** personnel received an on-site briefing of the burn plan and do they have a clear understanding of its contents?		
Have **ALL** personnel been briefed on and do they understand the hazards, escape routes and safety zones?		
Are **ALL** personnel equipped and in position with appropriate safety equipment? Is **ALL** of the required equipment in place and in operating order?		
Are the answers to **ALL** of the above questions "Yes"?		
In **YOUR OPINION**, can the project be carried out according to plan and will the project meet the planned objectives?		

If all of the fourteen questions above have been answered "Yes", you may proceed with initiation (ignition) of the project.

If any of the fourteen questions have been answered "No", you will not initiate any action until the appropriate corrective actions have been taken or until conditions are more favorable.

I certify that I have reviewed the burn objectives and that I am in agreement that the Prescribed Fire Complexity Analysis is correct, and that all of the above questions were answered "Yes".

_____ _____
Prescribed Fire Burn Boss Date

_____ _____
Refuge Manager Date

APPENDIX M: WFSA

WILDLAND FIRE SITUATION ANALYSIS

g. Jurisdiction: **US Fish and Wildlife Service**	h. Geographic Area: **Northwest Coordination Center**
i. Unit: National Wildlife Refuge	j. WFSA Number of .
k. Fire Name:	l. Incident Number:
m. Accounting Code:	
n. Date/Time prepared / / @ : .	
o. Attachments	
-Complexity Analysis X -Risk Assessment/Analysis X Probability of success Consequences of Failure -Maps -Decision Tree -Fire Behavior Projections X -Calculations of Resource Requirements -Other	

OBJECTIVES AND CONSTRAINTS

2.Objectives (Must be specific and measurable) These objectives must be considered in the development of alternatives in III, below. Suppression objectives must relate to the Unit resource management objectives.

1 Safety (These must receive the highest priority)
-Public
-Firefighter

2 Economic (May include closure, which could impact the public through transportation, communication and resource values)

3 Environmental (e.g. management objectives for wildlife habitat, water quality, etc.)

4 Social (May include local attitudes twoards fire that might affect decisions on the fire)

5 Other (e.g. legal or administrative constraints needing consideration such as fire encroaching onto other jurisdictions)

3. Constraints (e.g. environmentally and culturally sensitive areas, irreprarable damage to resources, and economic constrants)

ALTERNATIVES

	A.	B.	C.
Wildland Fire Strategy	e.g. Allow fire to play a natural role	e.g. Aggressive attack	
Narrative			
Resources Needed Hand Crews Engines Dozers Air Tankers Helicopters			
Final Size			
Est. Contain/ Control Date			
Costs			
Risk Assessment -Probability of success -Consequence of failure			
Complexity			
Attach maps for each alternative			

EVALUATION OF ALTERNATIVES

	A.	B.	C.
Evaluation Process			
Safety Firefighter Aviation Public			
Sum of safety values			
Economic Forage Improvements Recreation Water Wildlife Other			
Sum of economic values			
Environmental Air Visual Fuels T&E Species Other			
Sum of environmental values			
Social Employment Public Concern Cultural Other			
Sum of social values			

Other			
Sum of other values			
TOTAL			

ANALYSIS SUMMARY

	A.	B.	C.
Compliance with Objectives Safety Economic Environmental Social Other			
Pertinent Data Final fire size Complexity Suppression cost Resource values Probability of success			
External/Internal Influences			

VI. DECISION

The Selected Alternative is: .

Rationale:

Agency Administrator's Signature Date/Time

VII. DAILY REVIEW

Date	Time	By	PREPAREDNESS LEVEL	INCIDENT PRIORITY	RESOURCE AVAILABILITY	WEATHER FORECAST	FIRE BEHAVIOR PREDICTIONS	WFSA VALID

VIII. FINAL REVIEW

The elements of the selective alternative were met on:

Date Time:

By:

Agency Administrator

APPENDIX N: FIRE RESEARCH

Project Title: Management of fuel loading in the shrub-steppe

Principal Investigators: Dr. Steven Link, Randal Hill

Abstract

We propose to investigate the effect of herbicides, their concentrations, and seeding on fuels loads and rehabilitation. In addition we will determine the relationship between community types (fuels loading) and the probability of a carrying fire. This effort addresses tasks 2 and 3.

The objective of the proposed work is to address the following four questions.

(1) What is the minimum concentration of herbicides that will shift the competitive balance to native species (vascular plants and soil cryptogams) and away from *B. tectorum* that will result in less continuous fuel loading?

(2) What is the effect of a prescribed burn on the competitive balance between native species and *B. tectorum*?

(3) What is the effect of seeding *P. secunda* into treatment areas on the competitive balance between native species and *B. tectorum*?

(4) What is the ability of varying plant communities to carry fire?

This will be a set of replicated field experiments where we measure the response to treatments of species richness, percent cover, fuel continuity. The results will be to determine a cost effective and least damaging protocol for reducing fuels in the shrub-steppe. The results will applicable to all land managers in the intermountain west.

Introduction

Project Justification

Our proposal is written in response to Tasks 2 and 3 of the Request for Proposals, 2001-3 Joint Fire Science Program. The justification for the proposed administration study is that it has been difficult for management at the Columbia National Wildlife Refuge to implement administrative studies on fuels treatments and post-fire stabilization/rehabilitation actions for the reasons discussed in the request for proposals.

We propose to develop a fuel management protocol that, when implemented, will reduce the risk of wildfire on the Columbia National Wildlife Refuge at minimal cost. We will investigate the ability of various treatments to reduce fuel loading. After three years we will have a preliminary fuel management protocol that will allow implementation of a fuel management strategy at minimal cost. We recognize that plant community and fuel dynamics after treatments will continue after three years. We will propose a continuation of monitoring after three years if results after three years are encouraging. We specifically are proposing to find a way to sustainably minimize the presence of *Bromus tectorum* in the Columbia NWR. This will be done by restoring ecosystems back to a near-natural condition. A shrub-steppe ecosystem dominated by native plant species should result in a return to near-historical fire frequencies (Whisenant 1990).

Our management goal is to return lands to a highly diverse assemblage of native species that will reduce fire risk (Pellent 2000) to natural levels. We will search for the method of least impact on native species and least cost that will satisfy our goal. The benefit of the proposed work goes beyond the confines of the Columbia NWR in that our results and our management protocol

should be applicable in similar lands throughout the intermountain west.

Project Objectives

The objective of the proposed work is to address the following four questions.

(1) What is the minimum concentration of herbicides that will shift the competitive balance to native species (vascular plants and soil cryptogams) and away from *B. tectorum* that will result in less continuous fuel loading?
(2) What is the effect of a prescribed burn on the competitive balance between native species and *B. tectorum*?
(3) What is the effect of seeding *P. secunda* into treatment areas on the competitive balance between native species and *B. tectorum*?
(4) What is the ability of varying plant communities to carry fire?

The results of this work will provide information on minimal concentrations of herbicides that will shift the competitive balance away from *B. tectorum* and back to native species. We will determine which herbicide of the three to be tested will have the least impact on native species and be the least costly to implement. We will determine the effect of a prescribed burn on the competitive balance between native species and *B. tectorum.* We will determine the effect of seeding *P. secunda* into treatment areas on the competitive balance between native species and *B. tectorum.* Lastly, we will determine the ability of plant communities at the Columbia NWR to carry fire. This test will be done to determine the risk associated with differing degrees of *B. tectorum* and associated litter cover with fire propagation.
The product that will be provided at the end of the effort will be peer-reviewed publications and an administrative fire risk reduction protocol.
The information generated from this project will further define the relationship between land management protocols and fire risk. In addition, results will add to the scientific database on restoration and fire. This is especially important for the Columbia Basin where research of this nature has not been conducted to the degree that it has in the Snake River plain in Idaho and elsewhere in the Great Basin.

Background

Whisenant (1990) reviewed the effect of *Bromus tectorum* on fire frequency in the shrub-steppe. *Bromus tectorum* tends to become dominant on disturbed soils and because it forms a continuous fuel its presence leads to increased fire frequency. This leads to a reduction in the diversity and cover of native species making it easier for *B. tectorum* to increase its presence in relatively undisturbed soils. This forms an unfortunate ecological feedback loop. Since 1990 this feedback loop has only become stronger in the intermountain west with many unpleasant consequences for society.
Whisenant (1990) also notes that even though there are species that can compete with *B. tectorum* and that effective revegetation techniques are available little progress has been made in this battle. This is attributed to fiscal restraints on land management agencies. We propose to find the least cost method of beating *B. tectorum* and developing management protocols that will interrupt the cheatgrass-fire feedback loop.
During recent restoration and weed control projects at the Columbia NWR there has been an opportunity to look at the response of cheatgrass to fire and various herbicides, especially concentrations of Roundup® at different growth stages, and the success of naturally producing and seeded native grasses under different temporal and temperature/moisture conditions. Both

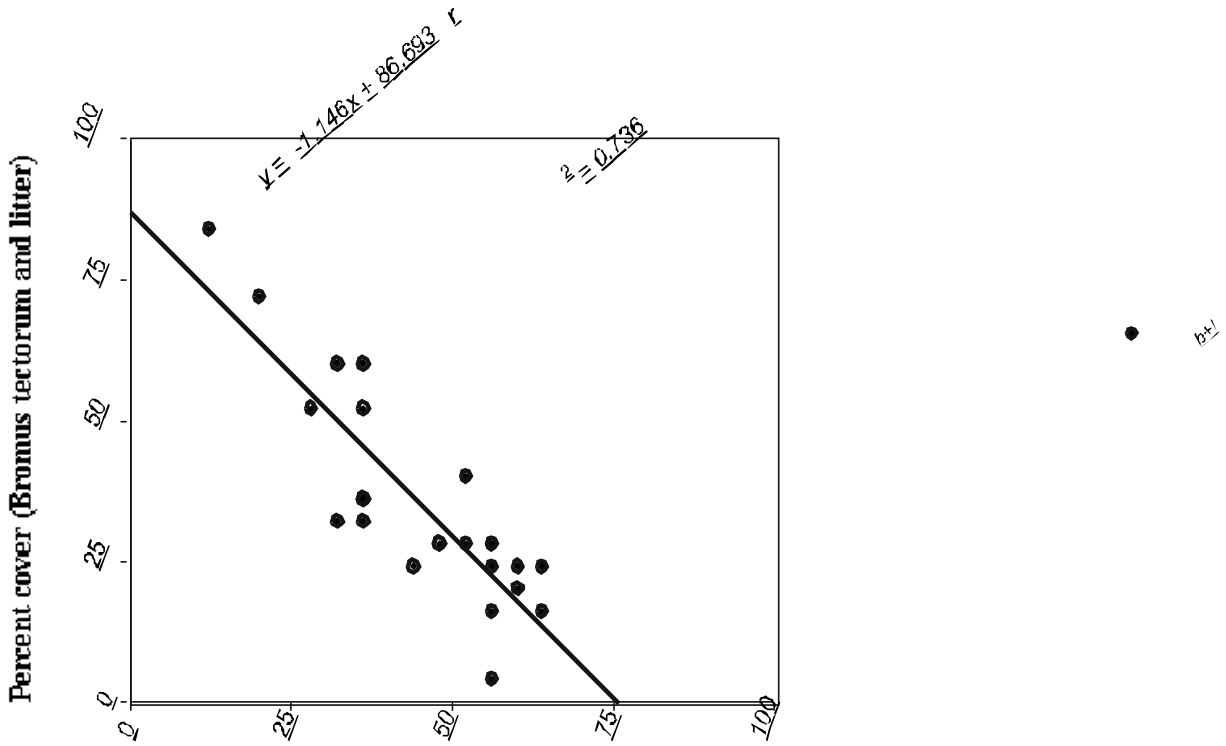
successes and failures in restoration appeared to be closely related to competition for moisture at critical periods. Working with a chemical supplier vegetation management specialist, and research associates with BASF, Monsanto, and DuPont, trial plots on refuge lands using Plateau and other products have produced some interesting results that need to be extended to cheatgrass control. Work with Roundup applied at 5, 6, 8, 9 and 12 oz./acre has indicated various degrees of effect to *P. secunda*, but effects to components of the cryptogamic crust are unknown.

We propose the investigate combinations of fire, herbicide application, and seeding with *Poa secunda* (*P. secunda* in the Columbia Basin is synonymous with *Poa sandbergii*) to break the cheatgrass fire feedback loop.

Fire is part of our strategy because it can reduce the amount of herbicide needed to control *B. tectorum* by eliminating old cover that can interfere with contact between the herbicide and the plant. In addition because fire is common, a strategy that includes fire whether prescribed or not will find use.

Herbicides are an important component of control strategies for *B. tectorum*. We will investigate glyphosate (Roundup®), sulfometuron methyl (OUST®), and imazameth (Plateau®). Glyphosate is applied to foliage and is quickly deactivated in the soil (Carpenter and Murray 2000). Application rates up to 12 oz acre^{-1} have been effective (Carpenter and Murray 2000, Beck et al. 1995, Monsanto 2000). Sulfometuron methyl is granular and is applied mixed in water that is required to move the herbicide into the root zone (Shaw and Monsen 2000). It works as a pre and post emergent herbicide with a half-life of up to 100 days. When OUST® was applied in the fall at 1/2-oz acre^{-1} or greater cheatgrass was controlled during the subsequent growing season (Shaw and Monsen 2000). Shaw and Monsen (2000) suggest that lower application rates may be effective after prescribed fire. Imazameth is applied to foliage and remains active in the soil for a period where it can control germinating plants. Plateau® can control weeds without damaging other species (Vollmer and Vollmer 2000), but the application rate for such control is sensitive to species and environmental conditions.

Many native plant species can be seeded into restoration areas with success (Davis and Harper 1990). In the Columbia Basin, *Poa secunda* is a dominant grass in interspaces between larger bunchgrasses and shrubs (Daubenmire 1970). *Poa secunda* Presl. is synonymous with *Poa sandbergii* (Vasey) or Sandberg's bluegrass as described in Hitchcock & Cronquist (1976). It is a non-rhizomatous bunchgrass mostly less than 30 cm tall. It ranges from the Yukon and British Columbia, mostly east of the Cascades, to California and east to Saskatchewan, the Dakotas, Nebraska, Colorado and New Mexico. The perennial is active after fall rains begin in south central Washington and is dormant in the summer (Daubenmire 1970). This species is active when *B. tectorum* is active and appears to be a very successful competitor able to keep *B. tectorum* cover low when its cover and that of associated soil cryptogams is high (Fig. 1). Unpublished data for figure 1 were gathered at the nearby Saddle Mountain National Wildlife Refuge in 2000. We will plant *P. secunda* as a treatment in the proposed study.



The ultimate purpose of investigations is to reduce the risk of fire. There is a positive correlation between fine fuel load and the risk of fire (Bond and van Wilgen 1996). The risk of fire can be determined by igniting areas of differing plant community structure to determine if fire will be carried.

Materials and Methods

Study Area

Columbia National Wildlife Refuge is located in the Columbia Basin of eastern Washington. It includes more than 23,000 acres north and west of Othello in Grant and Adams counties, and lies in the rain shadow of the Cascade Mountains. Precipitation averages 8" per year, with most rain falling between October and April. Snowfall is quite variable, and winter high temperatures are usually in the 20s and 30s. Lightning during the summer months often has little moisture and is a frequent cause of wildfire.

The area was formed by massive lava flows that were carved by Ice Age floods 12-15,000 years ago, leaving behind channeled scablands with rich soils. Cover was dominated by big sage, Sandberg's bluegrass, and bluebunch wheatgrass when cattle and sheep were introduced in the 1800s. The arid area was severely overgrazed and soon dominated by cheatgrass. The Columbia Basin Irrigation Project brought water to the area in the 1950s, and the refuge area was set aside due to rockiness, shallow soils, and depression areas that filled with water from a rising water table and seepage from reservoirs and canals. Grazing was halted more than 20 years ago, and fire is the most prominent disturbance to upland areas.

There are several locations for study plots where shrub cover has been removed. All have burned in the last 25 years, the most recent an area of about 400 acres (where our proposed study will, in large part, be conducted) that burned in 1993 and was over-seeded with bluebunch wheatgrass in spring 1994. Cheatgrass remains the dominant cover, with variable amounts of annual and perennial forbs. All areas have Sandberg's bluegrass and some degree of cryptogamic crust. Refuge lands also include several fields in various stages of restoration that will be useful for specific experimental plots.

Experimental Design and Treatment Application

We will address the management of fuel loads in the shrub-steppe by conducting a series of field experiments.

(1) What is the minimum concentration of herbicides that will shift the competitive balance to native species and away from *B. tectorum* after a fire that will result in less continuous fuel loading?

This question will be addressed by applying each of three herbicides (Roundup®, Oust®, Plateau®) at five concentrations: Plateau (0, 1, 2, 4, and 6 or 8 oz acre^{-1}), Oust (0, 0.1, 0.2, 0.4, 0.8 oz acre^{-1}), Roundup (0, 1, 2, 4, 8, oz acre^{-1}) to experimental plots. This experiment will be conducted in a burned area with herbicide application in the fall after *B. tectorum* has germinated. The burn will occur in the summer when most fires occur. We will use three replicates for each level of applied herbicide for a total of 36 experimental plots. We will use nine plots without herbicide as the 0-herbicide level treatment. One large homogeneous area will be burned in which experimental plots will be randomly located. Each experimental plot will be large enough to encompass spatial variation in native plants and *B. tectorum*.

(2) What is the effect of a prescribed burn on the competitive balance between native species and *B. tectorum* without herbicide?

This question will be addressed by comparing the competitive balance between native species and *B. tectorum* in burned and unburned areas. The nine burned plots without herbicide described in (1) above will be compared with nine plots randomly chosen from an adjacent unburned area.

(3) What is the effect of seeding *P. secunda* into treatment areas on the competitive balance between native species and *B. tectorum*?

Seed will be drilled in half of each treatment plot described above. Seed will be applied after the burn and before the next growing season.

(4) What is the ability of varying plant communities to carry fire?

This experiment will be carried out in a variety of plant community types that vary by the amount of *B. tectorum* and associated litter. These experimental fires will be carried in small areas with precautions taken to prevent spread beyond one meter from the point of ignition.

Sampling

The area of each experimental plot will be one acre. This size will serve to provide sampling areas that are not likely to be subjected to edge effects and will be representative of

normal variation in plant populations. Within each acre plot the center 1/2-acre will be used for sampling. Half of each sample plot will be seeded and the other half will not be seeded. The corners of the resulting 1/4-acre sample plots will be marked permanently with steel fence posts.

Response variables to be measured include species richness, cover, and fuel continuity. Species richness will be determined in each 1/4-acre sample plot by identifying all vascular plants species present. This will be done by walking the sample plot and listing all species present. This will be done prior to burning as soon as project is funded and in March and May in each year of the study after burning. Sampling in March is to recognize early flowering species that will be difficult to recognize in May. In May, later blooming species will be recognized.

Percent cover of each vascular plant species, bare soil, soil cryptogams, and litter will be determined prior to burning as soon as project is funded and in May in each year of the study after burning. The condition of soil cryptogams will be assessed by noting if it is bleached and dying or appears to be in good condition. This will be done using a tape placed on the ground and determining the identity of each cover type at each 0.5 m hash mark on the tape as discussed in Bonham (1989). Three tape transects, randomly located, will be observed in each sample plot for a total of at least 270 observations. The location of each transect will be permanently marked, for repeated measures, by driving steel rebar into the ground at each end of each transect. The location of each cover type along the tape will be recorded to quantify changes in cover patches.

The ability of plant community types to carry fire will be determined by observing if the fire carries to a point 10-m away from the point of ignition. This will be repeated 10 times in each community type to compute a coarse probability of its ability to carry fire. Community types will be chosen to range from pure *B. tectorum* and associated litter to communities dominated by bunchgrasses and soil cryptogams. Cover will be measured before ignition by using tapes as described above, but with a finer scale to obtain at least 100 points in a small area.

Fuel continuity (*B. tectorum* and associated litter) will be determined as the length of patches where *B. tectorum* and associated litter are found within perhaps 1-decimeter lengths on the line transects used to measure cover. The appropriate length measure will be determined from the combustion experiment described above. The average length of patches will be computed for each plot as an indication of the effect of treatments on fuel loading.

Statistical analysis

Response to treatments will be analysed by regression (2 seed levels, 5 herbicide levels, 3 reps) to define response (species richness, cover, fuel continuity) curves to herbicide levels. A minimal herbicide application producing an appropriate fuel reduction should be recognizable. Fire risk will be related to cover type by regression. The effect of burning on responses will be tested using Student's t-test.

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Project Duration

We propose a project duration of three years and will ask for extensions if appropriate.

Budget

Salary	year 1	year 2	year 3	total
Steven Link	21137 @ 608 h	19738 @ 546 h	20528 @ 545 h	61403
students (2)	13260 @ 1105 h	12892 @ 1033 h	13404 @ 1033 h	39556
Benefit				
S. Link	5707	5329	5543	16579
students (2)	2122	2063	2145	6332

Materials/misc 324 fence posts, walking wheel, 648 rebar 2 - 100 m tapes herbicide seed postage photocopy phone	4068	200	200	4468
Travel				
4 trips	317	327	1436	6000
to field	50 x 160mi x.345=2760	50x160x.345= 2760	50x160x.345= 2760	3422
field meals	50t x 3 p x $10 =1500	1500	1500	4500
total	50871	44809	47516	
wsu x .26	7601	6721	7127	
total	58472	51530	54643	$164,645
USFWS				
Travel + rtl car	392	405	1200	$1,997
USFWS overhead (14%)	8186	7214	7650	$23,050
Grand total	67050	59149	63493	**$189,692**

Deliverables

Annual reports will be delivered at the end of each project year. The PI will write an abstract and make a presentation at each PI workshop. A fire risk reduction administrative protocol will be delivered at the end of the last project year.

Technology Transfer

Technology transfer will occur by placing results on a USFWS web page, presentation at conferences, publication as Department of Interior documents, publication in the peer reviewed scientific literature (Restoration Ecology), publication in regional trade journals, in local newspapers (Steven Link writes a regular column on Natural History for the Tri-City Herald out of Kennewick, WA), and potentially in the radio and television media.

Qualifications of Investigators

Steven O. Link, Ph. D.
Biology Program, 2710 University Dr., Washington State University at Tri-Cities, Richland, WA 99352; 509-372-1526 (W), 509-967-2985 (H), 509-947-1735 (C), e-mail: slink@tricity.wsu.edu

Education

B.S.	Biology, University of Minnesota	1977
B.M.	Mathematics, University of Minnesota	1977
Ph. D.	Botany, Arizona State University (Statistics - Minor)	1983

Relevant experience: Since joining Washington State University in 1996, Dr. Link has specialized in the areas of restoration ecology, agricultural research, plant sensor development, arid-land plant ecophysiology, weed control research, landfill cover design, botanical surveys, biological assessments for the rare and endangered species act, ecosystem carbon budgets, remote sensing, and regulatory review.

Prior professional experience: Previous experience includes over 10 years with the Pacific Northwest National Laboratory, a 2 1/2 year post-doctoral fellowship position with Dr. Martyn M. Caldwell at Utah State University (Range Science Dept.) and Ph. D. research with Dr. Thomas H. Nash III at Arizona State University (Botany Dept.).

Current Societies
Ecological Society of America
American Association for the Advancement of Science
Society for Ecological Restoration
Washington Native Plant Society (started the Columbia Basin Chapter)

Funding: Collaborated on about $19,700,000 from 1985 to 1995 and PI on $547,326 (38 different grant and contracts) since 1996.

Publications: I have published 37 journal articles (plus 2 in revision and 2 submitted), book chapters and symposium proceedings, 97 technical and letter reports, 70 abstracts, 32 newspaper articles, and 45 newsletters. I have given 47 invited speeches since 1991.

Miscellaneous: I have my own business, worked with several companies and governmental agencies privately and through Washington State University (I am on 100% soft money in WSU), have been an associate editor, supervised several graduate students, organized symposia, reviewed grants, currently serve on four boards (President of the Benton County Noxious Weed Control Board, President of the Columbia Basin Chapter of the Washington Native Plant Society, Research Chair of the Washington Native Plant Society, Columbia River Chair of the Northwest Chapter of the Society for Ecological Restoration), member of the Rotary Club, taught four separate courses at Washington State University, initiated legislation in the Washington State Legislature, and I am a regular columnist for Tri-City Herald.

Recent Relevant Publications:

Link, S. O., J. L. Smith, J. J. Halvorson, and H. Bolton, Jr. 2001. Effect of climate change on a perennial bunchgrass and soil carbon and nitrogen pools in a semi-arid shrub-steppe ecosystem. (Submitted to Global Change Biology, Feb 24)

Link, S. O., J. Yu, S. F. Beall and A. L. Dittmer. 2001. Energy content of weeds from the semi-arid region of North America. Biomass and Bioenergy (Acceptable after revision)

Boudell, J., S. O. Link, and J. Johanssen. 2001. Effect of soil microtopography on seed bank distribution in the shrub-steppe. Western North American Naturalist (In press)

Link, S. O., B. D. Ryan, J. L. Downs, L. L. Cadwell, J. Soll, M. A. Hawke, and J. Ponzetti. 2000. Lichens and mosses on shrub-steppe soils in southeastern Washington. Northwest Science 74:50-56.

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Link, S. O., G. W. Gee, and J. L. Downs. 1990. The effect of water stress on phenological and ecophysiological characteristics of cheatgrass and Sandbergs's bluegrass. Journal of Range Management 43:506-513.

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Education

B.S.	Wildlife Management, Humboldt State University	1977

Relevant experience: Mr. Hill has worked as the Wildlife Biologist at Columbia NWR since 1990, and is responsible for wildlife and habitat monitoring and research. During the first five years he was the station Fire Management Officer responsible for coordinating wildfire suppression and rehabilitation, writing prescribed fire plans, completing prescribed burning, and monitoring burn results on refuge lands. Since 1995 he has written an integrated pest management plan for the refuge, coordinated upland habitat restoration in wildfire and other disturbed areas, and administered the noxious weed control program. Hill is an active member of the multi-agency task force that has addressed purple loosestrife and saltcedar control in the Columbia Basin of Washington, and is now addressing upland noxious weed concerns across jurisdictional boundaries. He was responsible for putting together the partnership among county weed boards and districts, irrigation districts, and state and federal agencies that successfully competed for restoration funds in both wetland and upland habitats in southern central Washington.

Prior professional experience: Previous experience includes work as a Wildlife Biologist for four Federal agencies in five states since 1976. Positions with BLM in Arizona and New Mexico involved wildlife and habitat relationships in extremely arid environments. USDA Forest Service positions in California included wildfire and slash burning effects and succession in a forested environment, including ponderosa pine grassland habitats. USFWS work in Minnesota was directed toward grassland restoration in purchased farmland (converting cornfields back to native prairie) and noxious weed control on managed areas. The USBR position in North Dakota was research oriented specific
to wetlands and aquatic plants.