

WILDLAND FIRE MANAGEMENT PLAN
For
Wildland Fire Suppression and Prescribed Burning

Willapa National Wildlife Refuge



FEBRUARY 2002

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Cover photo of a wildfire in the Bitterroot NF, Montana, taken by John McColgan on August 6, 2000.

EXECUTIVE SUMMARY

When approved, this document will become Willapa National Wildlife Refuge's Fire Management Plan. Major components of this plan include:

- B Updated policy for wildfire suppression and prescribed fires at Willapa National Wildlife Refuge (NWR). This plan updates the 1991 Willapa NWR Fire Management Plan.
- B Updated fire management activities based on the Refuge Management Plan (1986) and Willapa Refuge Goals (updated in 1997).
- B Format changes as directed in the *Fire Management Handbook* (August 2002).
- B Establishes a Prescribed Fire Program to manage habitat and reduce hazardous fuels

This plan is written to provide guidelines for appropriate suppression and prescribed fire programs at the Willapa National Wildlife Refuge. Prescribed fires may be used to reduce hazardous fuels, restore the natural processes and vitality of ecosystems, improve or maintain wildlife habitat, remove or reduce non-native species, and/or conduct research.

INTRODUCTION

This Plan meets the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended, the Endangered Species Act (ESA) of 1973, as amended, and the National Historic Preservation Act (NHPA) of 1966, as amended. The described actions and environmental effects of actions resulting from this Fire Management Plan for the Willapa National Wildlife Refuge are found to individually and cumulatively have no significant effect on the human environment, and therefore meet NEPA compliance through Categorical Exclusions under 516 DM 6, Appendix 1, 1.4 (4 and 5). Documentation is provided in Appendix C. Consultation and an intra-service Section 7 Biological Evaluation of the potential effects of proposed actions on threatened, endangered and candidate species were completed (Appendix D).

This plan is written as an operational guide for managing the refuge's wildland and prescribed fire programs and to comply with a service-wide requirement for refuges with burnable vegetation to develop a fire management plan (620 DM 1). It provides fire management guidance needed to ensure human safety, protect facilities and natural resources, restore habitats and restore fire's natural role in ecosystem processes.

The plan provides guidance for wildland fire suppression and using prescribed fire to restore and maintain wildlife habitats on the refuge. The plan also sets objectives and describes methodology for using wildland and prescribed fire to meet the mission and goals of the refuge.

The Refuge has no full-time fire staff. Fire management oversight will be provided by the Prescribed Fire Specialist at Willamette Valley National Wildlife Refuge Complex, Corvallis, OR, who will also act as the refuge's Fire Management Officer. The Project Leader will coordinate with the Prescribed Fire Specialist and is responsible for ensuring all fire management policies are followed. Suppression actions will be initiated by qualified refuge staff and the Washington Department of Natural Resources in accordance with the interagency Master Cooperative Fire Protection Agreement.

COMPLIANCE WITH US FISH AND WILDLIFE SERVICE POLICY

Willapa National Wildlife Refuge (Refuge) was established as the Willapa Harbor Migratory Bird Refuge by Executive Order No. 7541 signed by President Franklin D. Roosevelt on January 11, 1937. Under Executive Order No. 7721, signed October 8, 1937, the refuge area was enlarged and its name changed to Willapa National Wildlife Refuge. The purpose of the Refuge, under the National Wildlife Refuge System Improvement Act of 1997, is to develop, advance, manage, conserve, and protect fish, wildlife, plants and their habitats, to conserve the wetlands of the Nation in order to maintain the public benefits they provide, and help fulfill international obligations contained in various migratory bird treaties and conventions. The goals of the Refuge, revised in 1997, are to 1) protect and restore tideland habitat and associated migratory bird species representative of the native biological diversity of Willapa Bay, 2) preserve and protect unique ecosystems associated with Willapa Bay, 3) manage for the conservation and recovery of threatened and endangered species in their natural ecosystem, and 4) provide opportunities for wildlife and wildland-dependent recreation, education, and research.

Authority and guidance for implementing this plan are found in:

- < Protection Act of September 20, 1922 (42 Stat. 857; 16 U.S.C.594): authorizes the Secretary of the Interior to protect from fire, lands under the jurisdiction of the Department directly or in cooperation with other Federal agencies, states, or owners of timber.
- < Economy Act of June 30, 1932: authorizes contracts for services with other Federal agencies.
- < Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66, 67; 42 U.S.C. 1856, 1856a and b): 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 lands in suppressing fires when no agreement exists.
- < Disaster Relief Act of May 22, 1974 (88 Stat. 143; 42 U.S.C. 5121): authorizes Federal agencies to assist state and local governments during emergency or major disaster by direction of the President.
- < National Wildlife Refuge System Administrative Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997, 16 U.S.C. 668dd et seq.: defines the National Wildlife Refuge System as including wildlife refuges, areas for the protection and conservation of fish and wildlife which are threatened with extinction, wildlife ranges, game ranges, wildlife management areas and waterfowl production areas. It also establishes a conservation mission for the Refuge System, defines guiding principles and directs the Secretary of the Interior to ensure that biological integrity and environmental health of the system are maintained and that growth of the system supports the mission.
- < Federal Fire Prevention and Control Act of October 29, 1974 (88 Stat. 1535; 15 U.S.C.2201): provides for reimbursement to state or local fire services for costs of firefighting on federal property.
- < Wildfire 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, Chapter 1, Wildland Fire Management: General Policy and Procedures (April 10, 1998): defines Department of Interior fire management policies.
- < Service Manual, Part 621, Fire Management (February 7, 2000): defines U.S. Fish and Wildlife Service fire management policies.
- < National Environmental Policy Act of 1969 (40 CFR 1500.4(o) and 1506.4): regulations implementing NEPA encourage the combination of environmental comments with other agency documents to reduce duplication and paperwork
- < Clean Air Act (42 United State Code 7401 et seq.): requires states to attain and maintain the national ambient air quality standards adopted to protect health and welfare. This encourages

states to implement smoke management programs to mitigate the public health and welfare impacts of wildland and prescribed fires managed for resource benefit.

- < Endangered Species Act of 1973 regulates the protection and recovery of federal endangered species.
- < *U.S. Fish & Wildlife Service Fire Management Handbook* (Updated June 11, 2001): provides general operation guidance for fire management activities in the U.S. Fish and Wildlife Service (USFWS).

This fire management plan complies with requirements set forth in NEPA, NHPA, and the Endangered Species Act of 1973, as they are amended. A categorical exclusion addressing fire management activities was completed as part of this FMP (Appendix C). Compliance with NHPA was completed as part of the FMP documentation and project-level compliance will be completed for each prescribed burn. An intra-service Section 7 Biological Evaluation was prepared in association with this plan (Appendix D). Appropriate action will be taken to identify and protect any rare, threatened, or endangered species from adverse effects resulting from actions proposed in this plan.

The authority for funding normal 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 emergency prevention and suppression of wildland fire expenses.
- < PL 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*.

FIRE MANAGEMENT OBJECTIVES

The overall objectives for fire management on the refuge are to create a program that provides for firefighter and public safety, reduces the incidence of human-caused fires, ensures appropriate suppression response capability to meet expected wildland fire complexity, and increases the use of prescribed fire.

Specific fire management objectives addressed in this plan are to:

- < Promote firefighter and public safety while managing wildland and prescribed fires.
- < Protect life, property, and resources from wildland fires at costs commensurate with resource values at risk.
- < Control all wildland fires while meeting identified resource management objectives.
- < Use appropriate suppression tactics and strategies that minimize long-term impacts of suppression actions on natural resources.
- < Use prescribed fire to reduce hazard fuel accumulation on the refuge, particularly in the beachgrass and forested areas.
- < Use prescribed fire to restore the habitat of threatened and endangered species
- < Use prescribed fire to maintain refuge dikes and pastures where appropriate and dispose of unwanted vegetation and wood associated with refuge facilities.
- < Use prescribed fire to restore and maintain forest health and biodiversity.

REFUGE DESCRIPTION

REFUGE MANAGEMENT UNITS

Willapa National Wildlife Refuge (NWR) is located around and within Willapa Bay in southwestern Washington (Figure 1). The main portion of the refuge lies along the southern shore of Willapa Bay. The refuge headquarters, which is also the administrative office for the refuge complex, is located approximately 13 miles north of the town of Ilwaco, in Pacific County, along Washington State Route 101.

Willapa NWR is approximately 16,069 acres of fee title and easement lands that include sand dunes, sand beaches, intertidal mud flats, saltwater and freshwater marshes, grasslands, and forested lands. The refuge consists of 10,930 acres of land and 5139 acres of tidelands divided into ten management units. Tarlatt Slough, Riekkola, Lewis, Porter Point, Bear River, Long Island, and the Headquarters Units are located in south Willapa Bay (Figure 2). Leadbetter Point and Shoalwater Units are located near the mouth of Willapa Bay (Figure 3). The Wheaton Unit is located east of Raymond along the Willapa River (Figure 4). There are no private land holdings within the refuge, except for a 1.25 acre land parcel on Long Island (Figure 5).

The **Leadbetter Point Unit** is 1742 acres, located at the northern tip of the Long Beach Peninsula, near the mouth of Willapa Bay. The Unit is composed of Leadbetter Point itself and Grassy Island, which is an island east of the point that is slowly connecting to the tip of the peninsula. The coastal dune communities at Leadbetter Point consist of sand dunes in various stages of ecological succession, including bare unstable sand; beachgrass; a transition zone composed of shrubs, small shore pine (*Pinus contorta*), and grass; shore pine forest; and salt marsh.

Leadbetter Point's beachgrass communities consist primarily of the native American dunegrass (*Leymus mollis* or *Elymus mollis*) and two non-native *Ammophila* species – American beachgrass (*A. breviligulata*), which was introduced from the eastern United States, and European beachgrass (*A. arenaria*). American beachgrass is the most abundant of the three grass species on the Long Beach Peninsula dunes, although all three species can be found growing together and there are patches of these species growing separately at Leadbetter Point. A few areas of pure American dunegrass remain on the peninsula, especially on the oldest dunes. The beachgrasses form a continuous band of vegetation parallel to the high tide mark along the outer ocean beach. Beachgrass stretches from the refuge southward about 3 miles to the small community of Surfside and continues to the south end of the peninsula. This narrow band of almost continuous dense beachgrass could provide fuel for a wildfire to spread from the refuge southward into residential areas along the beach or vice-versa. Many beach-front residences on the peninsula are built in the beachgrass community and in the shore pine/Sitka spruce/western hemlock forest that grows adjacent to the beachgrass on the peninsula. These non-native beachgrasses have also rapidly taken over the open sand dunes that provide nesting habitat for the western snowy plover (*Charadrius alexandrinus nivosus*) and the streaked horned lark (*Eremophila alpestris strigata*).

Figure 1. Willapa National Wildlife Refuge Vicinity Map.

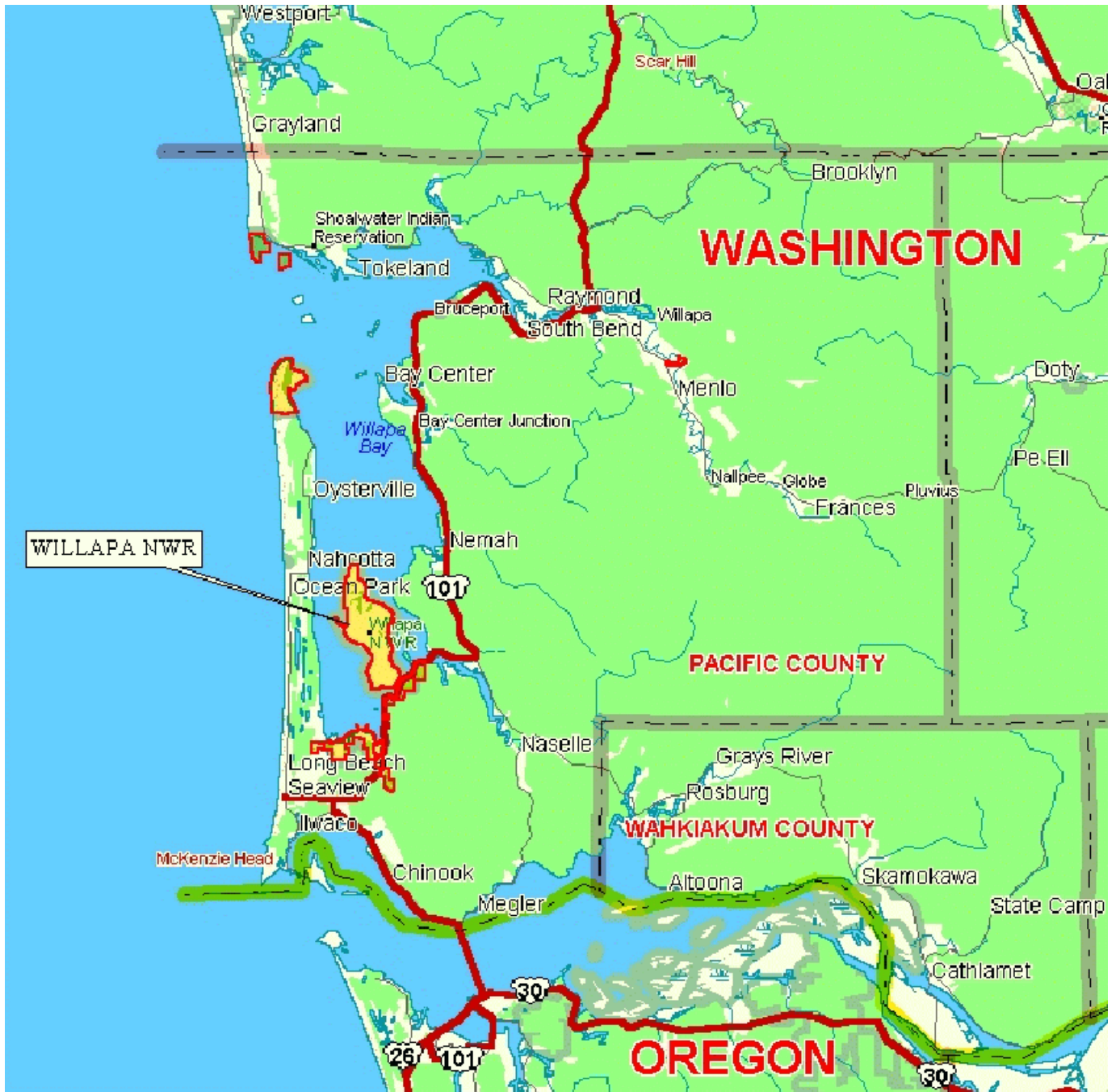


Figure 2. Willapa NWR Units in South Willapa Bay.

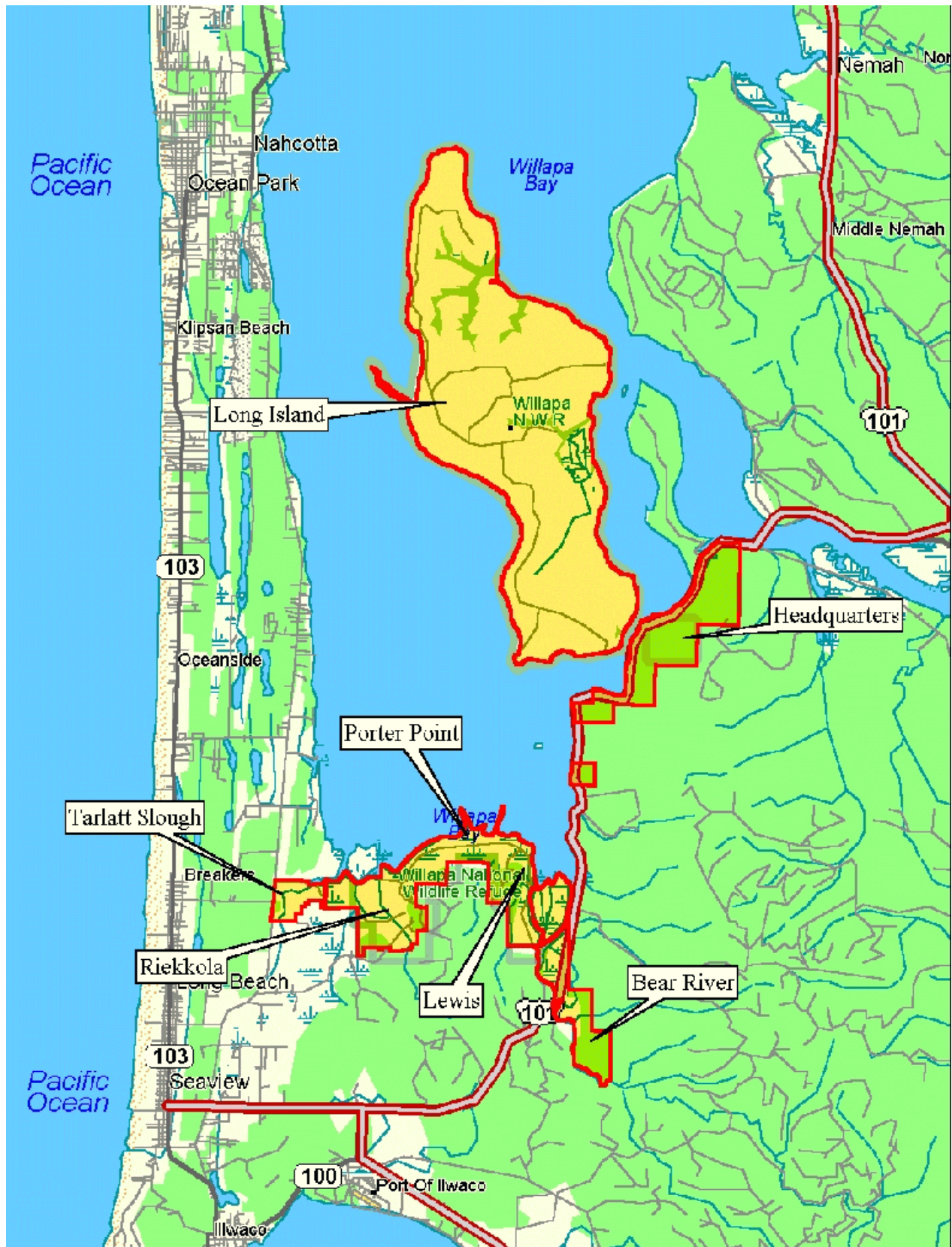


Figure 3. Shoalwater and Leadbetter Point Units.

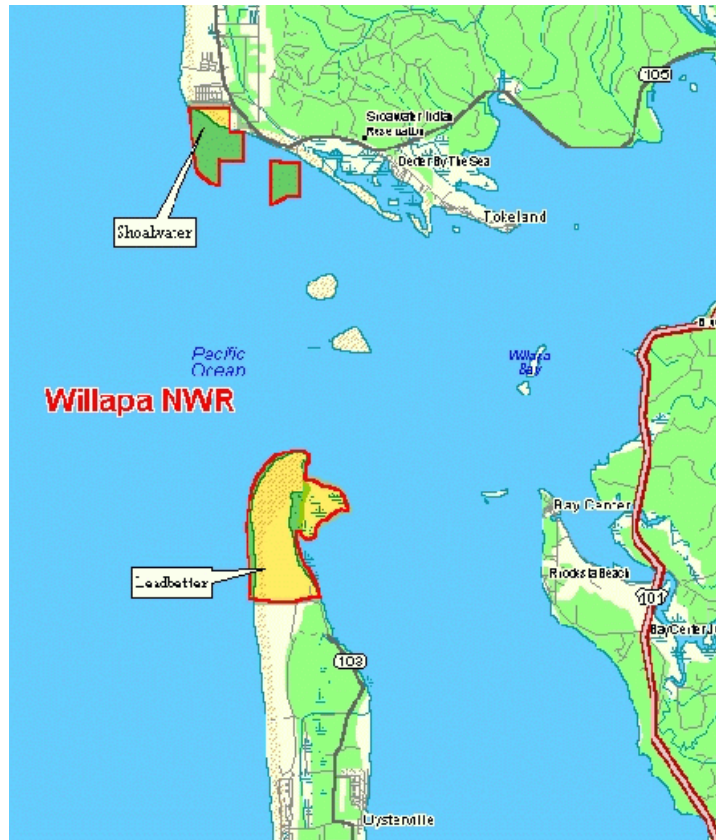


Figure 4. Wheaton

Unit.



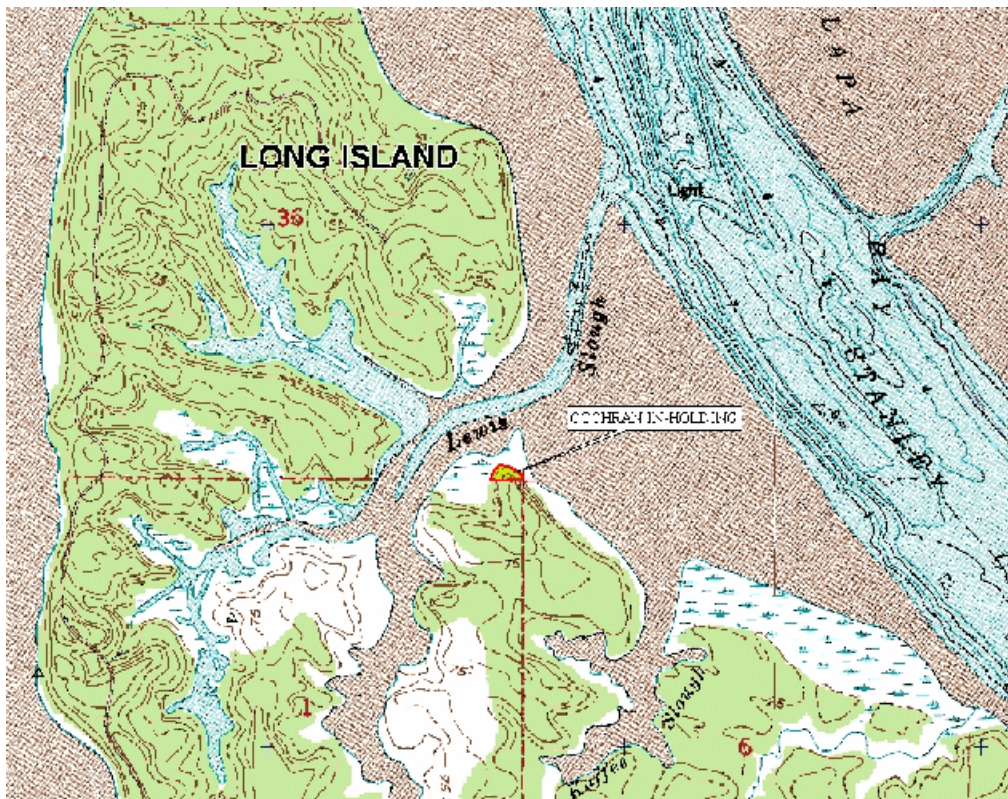
The **Tarlatt Slough Unit** is 158 acres of pasture and coniferous forest, acquired in 2000, located along Sandridge Road, and adjacent to the city of Long Beach. The stream called Tarlatt Slough collects the majority of water draining into Willapa Bay from the lower Long Beach Peninsula and is an important agricultural water source. The riparian area along Tarlatt Slough is partially forested within the refuge, runs through the unit, and has a shrub understory. Several acres of tree seedlings have been planted along Tarlatt Slough, in an effort to rehabilitate the forested riparian habitat within the refuge. Mature western hemlock/Sitka spruce forest is located on the eastern slopes of the Tarlatt Slough Unit, between this unit and the Riekkola Unit. Several springs occur at the toe of the forested eastern slope of this unit.

The **Riekkola, Lewis and Porter Point Units** make up 1296 acres of the refuge in south Willapa Bay. Freshwater wetlands, riparian forest, forested uplands, streams, pastures, tidal marsh and mud flats are found in these units. The pastures and three fresh water marshes make up the bulk of the unit that is actively managed for wintering waterfowl, wading birds and shorebirds.

The **Bear River Unit** is 360 acres and located at the mouth of the Bear River in the southern end of Willapa Bay. This unit's habitats include tidal marsh, forested riparian, coniferous forest, and streams. U.S. Highway 101 bisects the Bear River Unit, separating the marsh from Willapa Bay, and crosses over the Bear River.

The **Long Island Unit** is a 5461-acre island in south Willapa Bay. Except for islands in Puget Sound, Long Island is the largest island along the Washington and Oregon coast. The island is entirely owned by the USFWS, except for 1.25 acres located at the southern lip of the mouth of Lewis Slough, which is owned by Gregory J. Cochran (Figure 5). The island consists of coniferous forest in various age classes, salt marsh, streams, and a freshwater pond.

Figure 5. Cochran Private Land In-holding.



The **Headquarters Unit** is located south of the mouth of the Naselle River and north of Greenhead Slough, along U.S. Highway 101. This unit is 973 acres and includes the Omeara Point and Teal Slough areas. It is primarily covered by coniferous forest of various ages and contains some salt marsh and stream habitats.

The 808 acre **Shoalwater Unit** is located in the mouth of Willapa Bay, immediately south of State Highway 105, and west of the town of Tokeland. This unit was originally acquired as two parcels in 1937; since then the unit has been severely impacted by coastal erosion and no longer consists of dry land or vegetation. The entire unit has eroded away and is now sandy beach tideland; although the land has not yet been reclassified as tideland for property purposes. No fires would occur on this unit and it is not open to the public; therefore, this unit and tidelands within the bay will not be discussed further in this plan.

The **Wheaton Unit** is 132 acres of pasture and riparian habitat, located in the Willapa Valley, east of Raymond. The Willapa River and Mill Creek run through the unit. The unit has three fields that are either hayed or grazed by cattle. A concrete pad mobile home site is located at the corner of Lilly-Wheaton Road and Mill Creek Road. The mobile home site has a frost free hand water pump for potable water. Several acres have been planted with conifer and deciduous tree seedlings to reforest the riparian area along the east side of the Willapa River and the south side of Mill Creek.

CLIMATE

The refuge has a mild marine climate characterized by moderate temperatures, high humidity, copious rainfall, and breezy winds. Temperature, wind, and snow fall representative of most of the refuge are historically measured at the US Weather Station at North Head, Washington, about 14 miles southeast of the refuge. Other historic climatic parameters, such as humidity and hourly wind, are measured at the Astoria Airport in Oregon.

Area temperatures are mild. The average annual temperature in areas surrounding Willapa Bay is 51 degrees Fahrenheit (EF). The annual average maximum and minimum temperatures for the Long Beach area from 1967 to 2000 were 57.8EF and 47.8EF, respectively. Annual precipitation on the refuge ranges from 80 to 115 inches and occurs mostly as rain in the winter. Thunderstorms over the area's lower

elevations occur on four to eight days each year and over the mountains on seven to 15 days. Damaging hailstorms rarely occur.

Precipitation can be extreme at Willapa Bay. During the driest months of July and August, it is not unusual for two to four weeks to pass with only a few showers. In the wettest months of December and January, precipitation is frequently recorded on 20 to 25 days or more each month. The average annual total precipitation for the Long Beach area from 1967 to 2000 was 82.18 inches. June, July and August were the driest months in the 1967 to 2000 year period. The monthly average precipitation for the Long Beach area from 1967 to 2000 was 3.01 inches in June, 1.61 inches in July, and 1.78 inches in August. Periodic dry weather conditions in the fall typically prompt a temporary fire ban to be issued by the county each fall that lasts about four to eight weeks. During the winter, rainfall is usually of light to moderate intensity and continuous over a period of time rather than heavy downpours for brief periods. Thunderstorms are unusual but occur periodically each year in summer. Fog and drizzle occur year round and often from October through June, particularly on the Long Beach peninsula. Snowfall occurs almost yearly with an average of 1.6 inches annually. Unusual years can bring several inches of snow, as in 1949 when 5.9 inches of snow fell in the Long Beach area.

On-shore westerly winds from the Pacific Ocean are predominant year round at Willapa Bay. The average annual wind speed at the airport in Astoria, Oregon is 7.9 miles per hour (mph). Average monthly wind speeds in Astoria range from 6.8 mph in October to 9.1 mph in December. The prevailing wind direction in summer is northwest and in winter southwest and west. Drier east and southeasterly winds are uncommon, but occur periodically each year and are often strong. Strong winds usually accompany annual winter storms, which can result in winds of 40 to 90 mph, with gusts from 65 to over 100 mph. Winter storms often have sustained winds of 40 to 65 mph and gusts that exceed 65 mph. Hurricane force winds (>74 mph) are experienced almost annually and occasionally produce a recognized hurricane. A hurricane with 120-mph winds occurred on October 12, 1962 and a 100-mph wind storm on November 25 of the same year, resulted in approximately 1 million board feet of timber blown down on Long Island.

CULTURAL RESOURCES

A records search conducted in 1976 for known cultural resources sites in the Leadbetter Point Unit yielded no existing records.

The Riekkola, Lewis and Porter Point Units were surveyed for cultural resources in 1980. No sites were discovered at that time and no recorded sites existed.

Recently acquired land in the Tarlatt Slough, Bear River, and Headquarters Units have not been surveyed for cultural resources. However, it is known that the Tarlatt Slough Unit was once a golf course in the early 1900s. A records search conducted through the Washington Archaeological Research Center in 1976 revealed no previously recorded sites in these areas (letter dated January 7, 1976).

Long Island has been partially surveyed for cultural resources over many years. In 1947 and 1953, seven archaeological sites on Long Island were documented. The known sites on Long Island consist of Native American village remains and/or middens (shell mounds), as well as other significant archaeological resources. The Native American village sites are all within two hundred feet of the shoreline and most occur on the north and east side of the island. Other archaeological sites on the island include a 20 foot by 20 foot cemetery plot where a descendant of the Kaffee family, one of the original settlers on the island, is buried. The cemetery plot is located southeast of Kaffee Slough. Diamond City, the native oyster harvesting community of 75 people, occupied a site on the northwest shore of Diamond Point in the late eighteen hundreds. Some cedar posts from this site remain. In 1976, seven land parcels

(approximately 1300 acres) designated for timber harvest on Long Island were surveyed for cultural resources; no previously unknown sites were discovered at that time.

The Wheaton Unit has been surveyed for cultural resources and none were found. Artifacts from past Native American settlement are likely to be present along and adjacent to the Willapa River. Care should be taken when doing any ground disturbing activities along the Willapa River and Mill Creek.

The Headquarters Unit was surveyed for cultural resources in 2001. The road right-of-way and public parking area were surveyed and no resources were found in those areas. An isolated stone artifact was found on the northern hillside up the small drainage, but was not collected.

No historical structures are currently located on the Willapa NWR.

No further information related to cultural resources was found in the refuge files, although more information may exist at the Regional Archaeologist's office in Portland, Oregon. A cultural resource clearance from a Service archaeologist must be requested and approved prior to conducting any prescribed burns. A more thorough search of cultural resource data will be performed by a Service archaeologist as part of the prescribed fire planning process. The cultural resources clearance request form required for submission to the regional archaeologist is located in Appendix E.

FISH AND WILDLIFE

The variety of wildlife habitats on the refuge provides an abundance of wildlife. An estimated 233 species of birds, 51 species of mammals, and 17 species of amphibians and reptiles are known to occur in and around the refuge.

Mammals

Mammals that inhabit the forested and pasture areas of the refuge include elk (*Cervus elaphus*), black-tailed deer (*Odocoileus hemionus*), bobcat (*Lynx rufus*), black bear (*Ursus americanus*), mountain lion (*Felis concolor*), coyote (*Canis latrans*), Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), porcupine (*Erethizon dorsatum*), striped skunk (*Mephitis mephitis*), snowshoe hare (*Lepus americanus*), mink (*Mustela vison*), Pacific jumping mouse (*Zapus trinotatus*), snowshoe hares (*Lepus americanus*), weasels, bats, squirrels, chipmunks, wood rats, shrews, moles, mice and voles.

Eight bat species are known to occur on the refuge, including the little brown myotis (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), Yuma myotis (*M. yumanensis*), western long-eared myotis (*M. evotis*), long-legged myotis (*M. volans*), California myotis (*M. californicus*), silver-haired bat (*Lasionycteris noctivagans*), and the hoary bat (*Lasiurus cinereus*). Many of these bat species roost and forage in forested areas and several frequently use snags and downed logs as day roosts. Bat species found on Long Island include little brown myotis, silver-haired bat, and California myotis.

Mammals that inhabit the streams, rivers, and associated riparian habitats within the refuge include mountain beaver (*Aplodontia rufa*), beaver (*Castor canadensis*), nutria (*Myocastor coypus*), muskrat (*Ondatra zibethicus*), harbor seal (*Phoca vitulina*), and river otter (*Lutra canadensis*). River otters fish in the coastal streams and harbor seals use Willapa Bay, occasionally hauling out on the tidelands.

Amphibians and Reptiles

The cool, wet climate and lush vegetation of the freshwater riparian and forested habitats of the refuge may support up to 13 of the 24 amphibians native to Washington. The area's species richness is quite unique, even within the Pacific Northwest (Cassidy *et al.* 1997).

Northwestern garter snakes (*Thamnophis ordinoides*) are found in meadows, along forest edges, and disturbed areas. Common garter snakes (*T. sirtalis*) are common in pastures, forests, freshwater marshes and near riparian areas.

Long Island and wet areas amid similar forested areas on the refuge's mainland are rich in amphibian species. Eight species have been found on Long Island, including Pacific giant (*Dicamptodon tenebrosus*), northwestern (*Ambystoma gracile*), Columbia torrent (*Rhyacotriton kezeri*), western red-backed (*Plethodon vehiculum*), Van Dyke's (*P. vandykei*), and Dunn's (*P. dunni*) salamanders, rough-skinned newt (*Taricha granulosa*), and ensatina (*Ensatina eschscholtzii*). Cope's giant salamander (*Dicamptodon copei*) may occur on the island as well. Many of the species found on Long Island also occur on the mainland within the refuge and surrounding lands. Some of these amphibian species spend a large part of their life near streams and wet environments within the forest uplands. The refuge has red-legged frog (*Rana aurora*), Pacific tree frog (*Pseudacris regilla*), and the introduced bullfrog (*Rana catesbeiana*) in wet habitats, such as marshes, streams, ponds, and seeps.

Amphibian and fish species are particularly susceptible to the toxic effects of chemicals in minute quantities and at particular stages of their life cycle; therefore fire chemicals should be used with great caution in and around wet and forested areas.

Fish

Rivers and streams within the refuge provide habitat for several anadromous salmon species, including coho (*Oncorhynchus kisutch*), chinook (*O. tshawytscha*), and chum salmon (*O. keta*), and cutthroat trout (*O. clarki clarki*). The Bear River estuary provides rearing habitat for juvenile fish, clams, and Dungeness crab (*Cancer magister*), as well as a staging area for adult anadromous fish preparing to move into and out of Bear River. Chum, chinook, and coho salmon are all found in the Bear River. The small unnamed stream near the headquarters, often referred to as the Headquarter's Stream, has a recently established fall run of chum salmon, coho, cutthroat, and sculpin. The unnamed streams in the Lewis and Porter Point Units support sculpin and coastal cutthroat trout (*Oncorhynchus clarki clarki*). A fish ladder at the Lewis tide gate has recently opened this stream to anadromous fish passage, resulting in its use by coho salmon.

Birds

Willapa Bay is relatively shallow and contains vast areas of intertidal mud flats, also referred to as tidelands, which provide foraging habitat for many migrating shorebirds. Willapa Bay is one of three sites in Washington that is used by more than 100,000 shorebirds at one time and is recognized by the Western Hemisphere Shorebird Reserve Network as an internationally important shorebird area. The most abundant species of shorebirds found at Willapa Bay are dunlin (*Calidris alpina*), western sandpiper (*C. mauri*), and sanderling (*C. alba*).

Shorebirds feed on the tidelands of Willapa Bay when the mud flats are exposed at low tides. As the tides start to rise, the shorebirds become concentrated along the margins of the Bay. The intertidal marsh in the Bear River area and the tidelands along the margins of the Bay provide important foraging habitat for shorebirds during rising tides. Surveys conducted from 1991 to 1995 show that during the fall migration period, as many as 210 black-bellied plovers (*Pluvialis squatarola*) and 27,260 dunlin (*Calidris alpina*) were found using the intertidal marsh in the Bear River area (Buchanan and Everson 1997). During the spring migration period, as many as 300 black-bellied plovers, 12,300 dunlin, 36,900 western sandpipers, and 5,000 short-billed dowitchers (*Limnodromus giseus*) were found using the area. These surveys also indicate that the Bear River area and adjacent Refuge lands are of particular importance to the long-billed dowitcher (*Limnodromus scolopaceus*) and common snipe (*Gallinago gallinago*). This area, during fall migration, has the highest concentration of these shorebirds in all of Willapa Bay.

Willapa Bay provides important habitat for waterfowl during the spring and fall migration periods. Overwintering use by waterfowl is also found. The most common duck species found at Willapa Bay include mallards (*Anas platyrhynchos*), American wigeon (*A. americana*), and northern pintail (*A. acuta*).

Waterfowl use the intertidal marsh and freshwater riparian areas in the Leadbetter Point, Lewis, Porter Point, Riekkola, Headquarters, Bear River, and Tarlatt Slough Units. Large numbers of American wigeon (*Anas americana*) and canvasback (*Aythya valisineria*) are occasionally found in the mouth of the Bear River. Small numbers of bufflehead (*Bucephala albeola*) are commonly found in waters within the Bear River, Lewis and Headquarters Units during the winter.

The seven subspecies of Canada geese (*Branta canadensis*) found at Willapa Bay include the lesser (*B. c. parvipes*), Taverner (*B. c. taverneri*), cackling (*B. c. minima*), dusky (*B. c. occidentalis*), western (*B. c. moffitti*), Vancouver (*B. c. fulva*), and Aleutian (*B. c. leucopareia*). Canada geese primarily use the Bear River, Riekkola, and Tarlatt Slough areas, and the tidelands along the Bay. The tidelands in the Bear River are annually used by approximately 200 western Canada geese that are not mature enough to breed. These geese congregate in the Bear River estuary throughout the spring and summer. The pastures in the Tarlatt Slough Unit are used by as many as 1,100 geese during the fall and winter for foraging and loafing. Geese in the Tarlatt Slough Unit include approximately 100 dusky Canada geese, whose populations have significantly declined in the past several decades, and small flocks of Aleutian Canada geese. The Riekkola Unit receives the most use by Canada geese in winter, with up to 3,000 present at times.

Wading birds, such as the great blue heron (*Ardea herodias*), use the intertidal marsh areas and the tidelands for foraging and loafing. Great blue heron colonial nesting areas exist on Long Island.

Threatened, Endangered and Candidate Species

There are sixteen species found on the refuge that are state and/or federally protected as threatened, endangered, or candidate species (Appendix G). Protected species include birds, salamanders, fish, plants and one insect. The Oregon silverspot butterfly formerly occurred on the Long Beach Peninsula, including Leadbetter Point; but has not been reported there for several years. The Oregon Silverspot Butterfly Recovery Plan calls for reintroducing the butterfly to the Leadbetter Point area, once suitable habitat is reestablished. The refuge recently established an experimental silverspot butterfly habitat plot within the shore pine forest at Leadbetter Point that contains nectar producing plants for the butterflies to reproduce and feed on. Since reintroduction will likely occur in the near future, the Oregon silverspot butterfly is included in this section.

Federally and state protected birds include the brown pelican, American white pelican, Aleutian Canada goose, peregrine falcon, bald eagle, marbled murrelet, northern spotted owl, streaked horned lark, and western snowy plover. Brown pelicans use the beach at Leadbetter Point for resting. There are no brown pelican night roosts or nesting areas on the refuge. American white pelicans use the waters of Willapa Bay to feed and likely use areas off-shore of Leadbetter for feeding; although this species is rarely seen in the area. Aleutian Canada geese occasionally feed in refuge fields at Riekkola and Tarlatt during fall, winter, and early spring. Peregrine falcons use all refuge units but are most common at Leadbetter Point during fall, winter, and early spring. There are no known peregrine falcon nesting sites on the refuge. Marbled murrelets nest in forested habitats on Long Island and the Headquarters Units (including the Teal Slough area). Bald eagles forage on all refuge units year-round. There is an active bald eagle nest in the northern half of Long Island that has not successfully produced fledglings since 1992. Bald eagles have also been known to nest in the southern half of the island without success. Northern spotted owls nested on Long Island and the Headquarters Units until their nesting habitat was taken over by barred owls (*Strix varia*) in 1990. Their habitat is intact and spotted owls may return to their former nesting areas; but these areas have continued to be occupied by barred owls. The streaked horned lark and western snowy plover

nests in the open and sparsely vegetated sand dunes at Leadbetter Point Unit. The streaked horned lark is listed as a candidate for the Washington State Endangered Species List (WAC 232-12-297, Washington Department of Fish and Wildlife, October 28, 1998). Streaked horned larks prefer to nest in grassland and open habitats that have less than fifty percent vegetation cover and where the vegetation is less than 30 cm high. The encroachment of invasive and native species of beachgrass and other tall vegetation (trees and shrubs) in the Leadbetter Unit's dune areas is detrimental to the nesting habitat of both the plovers and larks. Prescribed burning and mechanical treatment of non-native beachgrass would benefit streaked horned lark nesting habitat, as well as that of western snowy plovers. Vegetation treatments would need to occur outside the plover and lark's nesting season, between September 15 and March 15, when possible. Any vegetation treatments occurring within the nesting period would be done only if they are short term disturbances lasting only several hours and only when the larks and plovers are not observed in the immediate vicinity and would not be harmed.

The refuge has three species of salamanders that are on the Washington state list of candidate species for consideration as threatened. The Dunn's and Van Dyke's salamanders are known to occur on Long Island. Dunn's salamanders also occur in the small stream at Teal Slough. The Columbia torrent salamander occurs along the stream near the headquarters and Teal Slough and may occur along other refuge's rivers and streams.

Coho salmon are found in Willapa Bay and in some of the rivers and streams on the refuge, including streams on the Bear River, Headquarters, Lewis and Porter Point Units. Coho salmon have been identified as a candidate for federal listing as a threatened species in southwestern Washington.

Two plants listed as threatened in Washington state may occur on the refuge, based on their habitat description and known locations within the county. The perennial herb, queen of the forest, grows in north-facing banks of streams and rivers, usually in rock crevices and seeps. Queen of the forest grows in the narrow zone just above the high water line or where water seeps over the rock surface. This plant occurs in geologically and successional stable western hemlock forest and has been found in Pacific County. Forest management activities that produce increased solar radiation due to canopy removal, soil disturbance, and herbicide use pose the greatest threat to this species. The perennial bunchgrass, San Francisco bluegrass, occurs in Washington on rock crevices and small ledges on steep, coastal headlands. It is known to grow on open sand dunes in Oregon and may occupy similar sand dune sites in Washington; therefore, it is included as a protected species. Competition with other plant species and trampling by recreationists are the most serious threats to this grass.

LAND COVER AND VEGETATION TYPES

Land cover types within the refuge include late-successional western hemlock/Sitka spruce/western red cedar forest, young to mature western hemlock/Sitka spruce/western red cedar forest, lodgepole pine (shore pine), shrub, beachgrass, pasture, salt marsh, freshwater marsh, and other non-burnable types such as water, sand, and developed areas. Appendix F lists the common and scientific names of plant species referred to in this document. Table 1 lists the estimated acres of different land cover types on the refuge's units having burnable vegetation.

Table 1. Land Cover Composition of Burnable Units Within Willapa NWR.

Unit	Total Unit Acres	Other Land Cover Acres	Young to Mature Forest Acres	Late-Successional Forest Acres	Shrub Acres	Salt-water Marsh Acres	Fresh-water Marsh Acres	Grass Acres
Leadbetter Pt.	1742	480–sand	690–shore pine	—	80	240	—	252
Tarlatt Slough	158	11–water	25–hemlock/spruce/redcedar	13–hemlock/spruce/redcedar	4	—	—	105
Riekkola, Lewis, Porter Point	1296 (land only)	4–developed 8–water	400–hemlock/spruce/redcedar	—	—	332	237	315
Bear River	360	2–developed	141–hemlock/spruce/redcedar	19–hemlock/spruce/redcedar	—	198	—	—
Long Island	5461	11–water	4376–hemlock/spruce/redcedar	264–hemlock/spruce/redcedar	—	810	—	—
Headquarters	973	3–developed	878–hemlock/spruce/redcedar	69–hemlock/spruce/redcedar	4	19	—	—
Wheaton	132	1–developed 3–water	9–spruce/redcedar/alder	—	—	—	10	109
Totals Acres	10,122	523	6519	365	88	1599	247	781
Total Acres Vegetation	9,599							

Forest Resources

Leadbetter Unit has several hundred acres of young to mature lodgepole pine (shore pine) on the peninsula tip that continues to spread north and westward and a small area of lodgepole pine on Grassy Island. The oldest lodgepole pine trees are approximately 80 years old, although most of the lodgepole pine on the refuge is much younger than 80 years.

Natural-caused fires are infrequent in the maritime climate of lodgepole pine. The fire interval of lodgepole pine is 150 to 350 years but may not be cyclic (Parminter 1991). Human-caused fires can be much more frequent in lodgepole pine due to public use occurring in and near this forest type.

Forests on the refuge are within the Sitka spruce and western hemlock forest zones found along the coastal range physiographic province of Oregon and Washington (Franklin and Dyrness 1973). The most abundant conifers on the refuge and within these forest zones are western hemlock, western redcedar and Sitka spruce. Other common tree species on the refuge are red alder, bigleaf maple, Pursh's buckthorn (cascara), and Douglas-fir. Shrubs, such as salal, red huckleberry, California huckleberry, trailing blackberry and red elderberry are common in areas that have been logged or burned. This brush community can dominate a site for many years, inhibiting seedling trees from becoming established. (Franklin and Dyrness 1973). This condition is evident; Long Island's clear-cuts were dominated by salal, red huckleberry and California huckleberry in 1976 and these shrubs still dominate many old clear-cuts on the island today.

Species composition and structure vary in all the refuge's forested areas because of past harvest activities but, in general western hemlock and Douglas-fir are the primary tree species found in the upland forests. Sitka spruce, western red cedar, and red alder are also found scattered throughout most of the stands and stands dominated by those species also exist. Areas that have been heavily disturbed contain a significant component of red alder. Common understory species in western hemlock/Sitka spruce/ western redcedar forest include salal, deer fern, red huckleberry, and rusty menziesia. Salal and deer fern are the most common understory species.

Natural fire intervals in western hemlock forest of the Pacific Northwest generally range from 150 to 400 or more years (Parminter 1983). The frequency of wildfires in western hemlock stands on the refuge is greatly influenced by the stand's location and public use.

Most of the forest on Long Island has been logged by several private timber companies at least once in the past 100 years. Tree harvest began in the late 1800s, when people began living on the island and commercially harvesting trees there. The USFWS acquired portions of the island over the years since 1940 and now owns all but 1.25 acres. Commercial logging under the administration of the USFWS continued on the island from 1984 to 1993. Tree harvest and post-harvest activities that were administered by the USFWS on Long Island from 1984 to 1993 are shown in Appendix I. Approximately 856 total acres were logged in about ten years.

A total of 126 acres on portions of Units T, R, and S were not harvested as planned in order to provide a live tree buffer between the old growth western redcedar grove and the harvest units. The live trees were left to protect the grove from potential wind throw and reduce the threat of fire spreading from the prescribed fire treatment in Unit R into the old growth area.

Tree regrowth following logging on Long Island consists primarily of naturally regenerated western hemlock, with some Douglas-fir, Sitka spruce and western redcedar. A recent inventory of post-harvest stand conditions does not exist. Many stands that were clear-cut in the last sixty years have a high tree density (number of trees per acre), because natural thinning in the stands has not yet taken place and the stands are relatively undisturbed. The dense forest conditions have stunted radial tree growth to some degree and put the stands at risk for serious damage by wildfire, insects, and disease. From 1981 to 1983, an outbreak of hemlock sawfly (*Neodiprion tsugae*), a tree defoliator, emerged and was studied on the island. The sawfly population eventually collapsed without causing much tree mortality, but tree radial growth was depressed on a significant portion of the island.

The Tarlatt Slough and the Headquarters Units have approximately 896 acres of western hemlock forest. Past tree harvest in these units has created a mix of forest stands ranging from approximately 130 years to recent plantations that are about fifteen years old.

Late-successional forest is one of the most limited and ecologically important forest habitat types found on the refuge in the Long Island, Bear River and Headquarters Units. A 264-acre stand of old growth western redcedar/western hemlock/California huckleberry forest exists in the southern portion of Long Island. Dr. Jan Henderson, Area Ecologist for Olympic and Mount Baker-Snoqualmie National Forests, said that the lack of evidence of catastrophic fire and wind storm events in the old growth redcedar stand at Long Island suggests that the stand may have existed in its present climax condition for the past 4,000 years, resulting in its stable composition and structure (1985 U.S. Fish and Wildlife Service). Although evidence of past fires do exist in the island's old growth area, the fires appear to have been small and the redcedar has survived them. A 63-acre stand of late-successional forest is located in the Teal Slough area within the Headquarters Unit. The stand is predominantly 127-year old western hemlock and Sitka spruce and contains lesser amounts of 82-year old western hemlock, Sitka spruce, and western redcedar. Scattered throughout the stand are large western redcedar and Sitka spruce that are estimated to be 250 years or older (Healy 1999). The six acre stand of late-successional forest located in the headwaters of the small Headquarters watershed is predominantly mature western hemlock with large, older Sitka spruce and western redcedar scattered throughout. This stand exhibits some old growth characteristics and provides nesting habitat for marbled murrelets. The Tarlatt Slough Unit contains about thirteen acres of late-successional forest in its eastern portion that was harvested in the early 1900s and is now second growth Sitka spruce and western hemlock. The area also contains a significant component of mature red alder. These trees are part of a forested ridge that runs south between the bay and Sandridge Road. There is also about 19 acres of late-successional Sitka spruce in the southern portion of the Bear River Unit along the Bear River. Trees in these open spruce stands are remnants of larger, denser stands of Sitka spruce that once flanked the Bear River. These remnant trees provide an important habitat component along the river that is often lacking due to past logging practices, and also the few nurse logs available for spruce seedling establishment in the riparian area. Because the spruce grows in moist soil within the floodplain of the river, the trees are not generally subject to wildfire.

Formally Designated Natural Areas

The refuge has three State-registered natural areas that are in the research natural area (RNA) category (Figure 6). These RNAs are administered by the Service to (1) preserve examples of all significant natural ecosystems for comparison with those influenced by humans, (2) provide educational and research areas for ecological and environmental studies, and (3) preserve the genetic and behavioral diversity of native and endangered plants and animals. As directed in 8 RM 10.8, RNAs must be reasonably protected from any influence that could alter or disrupt the characteristic phenomena for which the area was established. Management practices, such as prescribed burning and chemical control of plants, may be conducted only where necessary to preserve vegetation and as directed in a plan approved by the Regional Director.

Diamond Point RNA is an 88-acre forested area at the northern tip of Long Island that was designated a research natural area in 1976. Diamond Point RNA is managed to preserve an example of second growth Sitka spruce/western hemlock forest growing on an island in a coastal estuary for education and scientific purposes. The natural area includes 48 acres of mature red alder and 40 acres of mature Sitka spruce/sword fern forest and Sitka spruce/salal forest.

Cedar Grove RNA is 264 acres of old growth western redcedar/western hemlock/California huckleberry forest located in the southern portion of Long Island. The three-quarter mile Trail of Ancient Cedars loops through the northern edge of the Cedar Grove RNA.

Leadbetter Point RNA, located at the northern tip of the Long Beach Peninsula, was put on the Washington Register of Natural Areas in 1989. The original designation included 1,705 acres of the peninsula tip, Grassy Island, and the marsh between the island and peninsula tip; however, the Leadbetter Point Unit is now approximately 1742 acres due to sand accretion at the peninsula tip. The unique natural

elements protected at Leadbetter Point include salt marsh, native dunegrass, lodgepole pine forest, shrub/lodgepole pine, and open beach habitats. A complete list of plant species found at Leadbetter Point is included in Appendix H. Leadbetter Point contains high quality examples of high salinity Virginia glasswort/inland saltgrass marsh, low salinity marsh, and transition zone wetlands. Flora associated with the marshes are of primary significance, as are the dune grassland and deflation plain communities. Pockets of native plants within the secondary dune, deflation plains, and dune troughs are also significant ecological features and are of high quality compared to these remaining plant communities in Washington. The open beach and dune grassland communities of Leadbetter have been significantly impacted by the invasion and naturalization of two non-native dunegrasses. The salt marsh has been invaded by smooth cordgrass, an eastern salt marsh species. Efforts to control cordgrass in recent years have slowed its spread at Leadbetter Point. Selective removal or control of plant species not native to Leadbetter Point, including spartina, Scotch broom, and common gorse, was an approved management activity at the time the RNA was established. Removal and control of the non-native beachgrasses has been recently approved and work has been done as part of the management of habitat for the endangered western snowy plover.

Figure 6. Research Natural Areas at Willapa NWR.
PHYSICAL RESOURCES



Air Quality

Areas that have experienced persistent air quality problems have been designated by the U.S. Environmental Protection Agency (EPA) as non-attainment areas. The federal Clean Air Act requires additional air pollution controls in these areas. Each non-attainment area is declared so for a specific pollutant and additional air pollution controls are required by the federal Clean Air Act to control emissions of problem pollutants. Non-attainment Areas that have a 10-year plan for meeting and maintaining air quality standards and other requirements of the Clean Air Act and that are shown by air quality monitoring to meet health-based air quality standards are redesignated as maintenance areas. No areas within Pacific County are currently within a non-attainment or maintenance area.

Soils and Topography

Refuge lands surround the shores of Willapa Bay. The shallow, bar-built estuary is mostly covered in mud flats instead of salt marsh. The bay has extensive, gradually-sloping intertidal flats with small, shallow channels connecting to larger, deeper channels by which the tide flows in and out of the bay. The mud flats in the southern end of the bay have a fine silty substrate accumulated from sediments flowing into the bay from rivers and streams.

The following soil information was taken from a soil survey of Grays Harbor, Pacific, and Wahkiakum Counties, published by the Soil Conservation Service (Pringle 1986).

The headquarters area within the Headquarters Unit is comprised of Palix silt loam soils on slopes ranging from 8 to 90 percent. The Palix silt loam soils are deep, well drained soils. Weathered bedrock is found at depths from 40 to 60 inches or more. These soils support productive western hemlock and Douglas-fir forest, as well as red alder, Sitka spruce and western red cedar. The Palix silt loam soils are also unstable, hard to pack and subject to erosion when wet and devoid of vegetation.

The Omeara's Point area within the Headquarters Unit is made up of several soil types – Palix, Ilwaco, Vesta, Knappton and Montesa silt loams. Palix silt loam occurs on 30 to 90 percent slopes. Large areas of Ilwaco silt loam occur on 1 to 30 percent slopes in the northern panhandle and two relatively large areas in the mid part of section 32. Ilwaco silt loam is a very deep, well drained soil occurring on broad ridgetops, small plateaus, shoulders, and the back slopes of uplands. Western hemlock forest is the principle tree species found on Ilwaco silt loams, where it grows well. Vesta silt loam occurs on 1 to 8 percent slopes over much of the Omeara's Point area. Vesta silt loam is a very deep, well drained soil formed from basalt parent material on ridgetops. Vesta silt loams are slightly more productive for growing western hemlock than Palix and Ilwaco silt loams. Knappton silt loam is found on steep slopes surrounding the small drainage formed by and unnamed stream at the bottom of Section 32, Township 10 North, Range 10 West. Knappton silt loam is a deep, well drained soil. In Knappton silt loam, weathered fractured basalt occurs at a depth of about 40 inches and bedrock occurs from 40 to 60 inches in depth. Knappton silt loams generally support the growth of western hemlock and Douglas-fir forest. Knappton silt loam is moderately permeable with a rapid runoff rate; therefore, the hazard of water erosion on this soil is severe. The Montesa silt loam occurs on alluvial fans, the broad fan-like deposits of soil at the mouth of small streams. These very deep, somewhat poorly drained deposits were formed from sedimentary and igneous sediments at low elevations (25 to 300 feet elevation). The seasonal water table occurs at 18 to 30 inches from fall to spring. Montesa silt loam typically produces red alder.

The Bear River area contains a diverse group of soils, including Knappton, Palix, Lebam and Nuby silt loams, and Ocosta silty clay loam, as well as smaller areas of Traham very gravelly loam and Orcas peat. Lebam silt loam is very deep, well drained soil occurring on 1 to 30 percent slopes. It has slow runoff and does not easily erode from water, but does get muddy when wet. Nuby silt loam is a very deep, poorly drained soil occurring on flood plains, where it was deposited by the Bear River. The seasonal water table in this soil is at a depth of 24 to 36 inches. This soil's moisture content is usually altered by

ditching and tiling to drain the soil for use as pasture. Nuby soil is moderately permeable and occurs on flat (0 to 3 percent slope) areas that are subject to brief periods of winter flooding. Although the natural progression of vegetation growth on Nuby soils results in sparse conifers and hardwood forest, the Nuby soil areas at Bear River were used for growing hay and as pasture. Grazing is usually restricted to drier months of the year to preserve this soil's condition. Red alder is the principle forest species on Nuby soils. Traham very gravelly loam occurs on a narrow ridge top in Township 10 North, Range 10 West, Section 5. Traham soil occurs on 5 to 30 percent slopes and is a moderately deep, well drained soil. Traham soil is generally used for forest production. Western hemlock is the principle tree species found on Traham soil. Tree root depth is limited to 24 to 36 inches, the depth at which fractured basalt is found. This soil contains a readily available rock source for road construction. Harbor Rock Pit is located in the southeastern quarter of Township 10 North, Range 10 West, Section 5. Steep cuts and fills erode easily in Traham soil without protective plant cover. Two small areas of Orcas peat soil are present in the lower portion of the Bear River Area. Orcas peat is very deep, very poorly drained soil occurring in depressions. The native vegetation of Orcas peat is living sphagnum moss, bog Labrador tea, rushes and sedges.

Long Island is made up primarily of Willapa silt loam and Ilwaco silt loam, with lesser amounts of Newskah loam, Palix silt loam, and Ocosta silty clay loam. Willapa silt loam is very deep, moderately well drained soil that supports the growth of western hemlock, Sitka spruce, western redcedar, and red alder in a major part of the island's northern interior, north of Sawlog Slough. The soil surface is typically covered with about one inch of duff. Willapa silt loam has a seasonally high water table that is at a depth of 30 to 42 inches in winter. Runoff is slow and water erosion hazard is slight for this soil; although it is muddy when wet and can be damaged without its protective duff layer. Ilwaco silt loam is a very deep, well drained soil on broad ridgetops, small plateaus, and shoulders. It has a two inch layer of duff on the surface, slow runoff, and slight hazard for erosion, except when steeply cut. Ilwaco silt loam primarily supports western hemlock and Sitka spruce and is the soil type in the old growth redcedar grove and other parts of the island south of Sawlog Slough. Newskah loam is a very deep, well drained soil on terraces and back slopes of terraces, occurring south of Sawlog Slough. It supports primarily western hemlock and has a protective surface covering of three inch thick moss, needles and twigs. Newskah loam erodes readily if steeply cut, wet or devoid of vegetation or its duff layer. Palix silt loam is a deep, well drained soil that occurs along the island's steep shorelines. Ocosta silty clay loam occurs near sloughs and marshes.

The Tarlatt Slough area contains four soil types. Ilwaco silt loam occurs in the forested uplands. Ocosta silty clay loam occurs in narrow corridors along the riparian areas. Yaquina loamy fine sand occurs in most of the flat pasture areas, which are depressional areas between stabilized sand dunes composed of Netarts fine sand. Yaquina loamy fine sand is a very deep, somewhat poorly drained soil. The water table is seasonally high in this soil from November to April and ranges from a depth of 24 inches to the soil's surface. Yaquina loamy fine sand will support coniferous and deciduous forest, primarily red alder and a limited amount of Sitka spruce, western hemlock, western redcedar, and lodgepole pine. The Netarts fine sand areas occur in small patches along Tarlatt Slough. The Netarts soil areas are very deep and well drained. Netarts soil has a moderately rapid permeability and a low water capacity.

The Riekkola, Lewis and Porter Point Units consist primarily of Ocosta silty clay loam in the diked pastures and marsh areas. Forested areas in the higher elevations surrounding the units, including Lewis Hill, consist of Palix silt loam and some Ilwaco silt loam.

The Wheaton Unit has three soil types, Arta silt loam, Grehelam silt loam and Rennie silty clay loam. Arta silt loam is a very deep, moderately well drained soil present in the eastern hay field and higher areas of the homestead site and field. Runoff is slow and the hazard of water erosion is slight in Arta soil. Arta soil supports hemlock and red alder forest, but is presently maintained as pasture at the Wheaton Unit. Grehelam silt loam is also a very deep, well drained soil found on the natural levees of the flood plain,

which makes up the majority of the Wheaton Unit and includes the west field that is across the Willapa River and the field that is between Mill Creek and the Willapa River. Grehelam soil is subject to brief periods of flooding in winter. Grehelam soil typically supports Douglas-fir and red alder forest, but is maintained as pasture at Wheaton. A small area of Rennie silty clay loam exists in the oxbow wetland on the north side of the Willapa River, near the bend in the boundary fence. Rennie soil is very deep, poorly drained soil occurring on the flood plain. Permeability is slow, the water table is high seasonally and runoff is very slow in this soil, resulting in the formation of small seasonal wetlands.

The Leadbetter Unit has five soil types. The outer beach above mean high tide is classified as beach, has no vegetation and is subject to continual wave action during high tide. Dune land makes up the majority of outer peninsula westward and north. The dune land is very deep fine sand, drains excessively, and is constantly shifted by strong coastal winds. The dune land topography consists of a primary foredune, an interdune area of dunes and hollows and foredune ridges that run parallel with prevailing winds from the shoreline (also called the foredune complex), and a relatively flat deflation plain still further inland. The water table is at the surface of the interdune area during winter. The beachgrass and lodgepole pine areas of the peninsula tip and interior of Grassy Island is Westport fine sand, which forms on slightly weathered stabilized sand dunes. Westport fine sand is covered in a thin mat of organic material and is also very deep and excessively drained. The protective organic layer of Westport fine sand is fragile and all-terrain vehicles (ATVs) and other vehicles can cause long-lived damage to the soil surface and plants in the area. The dune land and Westport fine sand are highly susceptible to wind erosion when exposed. The salt marsh and most of the southern portion of Grassy Island is Ocosta silty clay loam. The forested area near the parking area is Yaquina loamy fine sand, a very deep, somewhat poorly drained soil. The water table in winter is from 24 inches deep to the surface of this soil. The duff layer is half an inch thick. Using wheeled or tracked vehicles on this soil when it is wet causes ruts, soil compaction and damage to the soil and tree roots.

STRUCTURES, FACILITIES, AND ACCESSIBILITY

Keys for access to refuge owned buildings and locks are stored at the refuge office and copies are issued to refuge employees as warranted. All locked road and field gates, gas storage tanks, dock and out buildings (e.g., heating oil shed) on the refuge can be opened with a "No. 4" lock key. Shop, office, and hazardous materials storage building locks can be opened with the same door key. The Bear River residence (Quarters 88) has a separate door key. The Wheaton garage door also has a different door key. Locks on the utility hook-up boxes and some gates at the Wheaton Unit open with a "No. 4" lock key; locks on other gates in the interior fields open with a "No. 2" key.

Locked road gates exist on all units of the refuge except Leadbetter Point and Long Island and are usually a minimum of 16 feet wide. The gate accessing the headquarters buildings and equipment yard allows access for equipment that is a maximum of 15 feet wide, due to the skewed position of the gate.

Structures on private lands adjacent to the refuge are shown in the private land owner contact list in Appendix N.

Leadbetter Point Unit Facilities and Accessibility

The Leadbetter Point Unit is accessed via Stackpole Road, which terminates at a public parking area located on Leadbetter Point State Park. The parking area has a restroom and kiosk and is generally always open, although there is a gate where Stackpole Road enters the park. There are no roads on this unit, but there are two foot trails that go to the bay and loop back to the parking area (Bay Loop Trail) and out to the ocean beach from the parking lot (Bearberry Trail). The foot trails are not suitable for ATV travel their entire length. ATV and larger four-wheel drive vehicle access within the unit is obtained through the beach on the bay-side of the peninsula to the marsh between the peninsula and Grassy Island, and through the outer ocean beach to the northern tip of the peninsula. The interior of the unit is largely

unaccessible, except by foot and in some areas by ATV. Wheeled and tracked vehicles should be used with caution to avoid soil and plant damage in the Leadbetter Point Unit. Grassy Island is only accessible by boat from the bay; although it can be reached by foot from the peninsula by wading a shallow channel at low tide. No residences are closer than a mile from Leadbetter Point's southern boundary. The closest residences are on Stackpole Road and on the ocean beach, immediately south of the state park boundary.

Tarlatt Slough Unit Facilities and Accessibility

The Tarlatt Slough Unit is surrounded by residences and businesses and two-lane paved roads on three sides. Eleven residences are immediately adjacent to the refuge along Sandridge Road. The Public Utilities District No. 2 office and substation is located adjacent to the Tarlatt Slough Unit on the north side of Olsen Road (95th Place). The Lone Fir Cemetery Road (85th Place) is narrow, parallels a ditch and does not have a wide shoulder or turnouts except at the east end of the road. Electric transmission lines run along the fence line adjacent to Sandridge Road, north and south in the forested area between sections 10 and 11, and along the road accessing the Tarlatt Slough tide gate in the northeast corner of the unit. Barbed wire fence with an interior electric fence hot wire and several metal gates surrounds the north and part of the western boundary of the unit. The electric fence is solar powered and usually operational from April 15th through October 15th. Fresh water is available from Tarlatt Slough and several on-site impoundments.

Riekkola, Lewis, and Porter Point Units Facilities and Accessibility

The Riekkola shop is accessed from Sandridge Road via Honeyman Road (67th Place). A gate at the end of Honeyman Road provides security for the shop and is usually locked, except during refuge goose hunting days in winter. The shop/garage has an office that is generally occupied during waterfowl season as a hunter check station. The shop area does not have a water system. Streams and impoundments are located very near the shop in the pastures. Flammable and chemical substances are stored in flammable storage cabinets inside the garage. Heavy equipment is stored inside and outside the shop. A 500 gallon diesel storage tank is located on the north side of the shop.

The Lewis Unit has no Service-owned buildings of concern at this time; however, the parking area will be renovated in the near future and will likely contain an improved public restroom. Several residences are located along the Jeldness Road that leads to the Lewis parking lot. Jeldness Road is windy, narrow, has blind spots, and inadequate turn outs, especially for large vehicles. An active power line is located just north of the public parking area, behind the locked gate at the parking area. There is a locked gate at the beginning of the dike road that provides access to the Lewis I, Lewis II and Porter Point marshes. The dike road is capable of handling large equipment and also provides access to the Riekkola Unit. Currently, access from the main dike road to the forested areas west of the marshes is not possible on the cross dikes.

Porter Point has two major tide gates and a fish ladder on the main dike, but there are no facilities in danger of burning on Lewis or Porter Point Units, except a wooden split-rail fence at the Lewis parking lot.

Bear River Unit Facilities and Accessibility

The Bear River Unit has one Service-owned residence with attached garage, a wooden barn, and a water pump house on the property. The wooden barn often contains heavy equipment and fire wood. Bonneville Power's high-voltage electric transmission line runs parallel to State Highway 101 on poles located in the marsh east of the highway. An above-ground electric transformer is located near the residence. A dike along the Bear River provides access to the residence and barn. The dike road is secured by a locked gate at the road's entrance, near the State Highway 101 bridge over the Bear River.

Long Island Unit Facilities and Accessibility

The Long Island Unit is accessible only by boat. The unit has a system of gravel and dirt logging roads that provides access to almost all parts of the island and to five camp grounds, from the main boat launch on the south end of the island. Equipment, personnel and materials can be boated to the island using the station's motor boats, airboats, and non-motorized barge. The barge is 14 ft x 8 ft and is capable of transporting in excess of 50,000 pounds and the center bulkheads can hold water for transport. The unit has a metal shop building and a wooden/metal pole shelter that normally houses a 240-/120-volt single phase diesel-powered electric generator; a 4 x 4 three-quarter ton pick-up truck; a 4-wheeled ATV and a small supply of gasoline, diesel fuel and non-potable water. No other electricity or drinking water is available on the island. Fresh water for fire suppression is generally available from two small perennial streams on the island.

Headquarters Unit Facilities and Accessibility

The Headquarters office area is fenced and contains several dangerous fuel sources, including a 300 gallon heating fuel (diesel) tank stored in an outdoor shed, a 500 gallon above-ground unleaded gasoline fuel tank, a small hazardous materials (flammable and chemical substance) storage building, and smaller amounts of flammable and chemical substances stored in flammable storage cabinets inside the three-bay garage. A buried electric cable and two above-ground transformers are located along the toe of the north slope that provides electricity to the buildings. Fresh water from the neighboring creek is available from outdoor faucets (filtered and chlorinated), concrete water storage tanks (about 200-300 gallon capacity, filtered, non-chlorinated) that are part of the drinking water system and an overhead water delivery system (about 200-300 gallon capacity, untreated) in the yard used to fill large water tanks. A public restroom and paved parking area is located just outside the entrance gate to the refuge office and yard. A Service owned dock and public boat launch is located across State Highway 101 and public parking area. This boat launch provides the closes boat access to Long Island and South Willapa Bay. No residences or privately owned structures are located within or adjacent to the Headquarters Unit. A dirt/gravel road located behind the HazMat building provides access up the drainage to privately owned timber lands east of the unit.

Teal Slough area in the Headquarters Unit is accessible by a gravel road system that begins at a locked gate off of State Highway 101 near Teal Slough. One section of the lower arterial road that branches off the main road system has failed and is not passable by large vehicles. No power lines or structures exist on the property. Only one residence and oyster business is located close to the refuge boundary on the southern end of Stanley Peninsula, near Teal Slough.

Wheaton Unit Facilities and Accessibility

The Wheaton Unit's West Field, which is refuge land located north of the Willapa River, does not have an easement to provide year round access through neighboring private lands. The refuge typically obtains verbal permission to enter the West Field from either the Newman property by crossing the Willapa River at low water in summer, or the Burkhalter property by crossing Burkhalter's pastures. Both access options can only be utilized in the summer because the river is either too deep to safely cross or the pastures are too muddy to drive on without damaging the soil and grass. The river crossing does allow crossing of large trucks and machinery, since the river bed is a firm gravel surface at the crossing.

PUBLIC USE

A large part of the refuge is open to the public for a variety of uses, including some that affect the incidence of human-caused fire on the refuge. Public use in the Headquarters Unit includes day use of the public parking lot, restroom, and office reception area. An interpretive trail is also planned for construction in 2002 along the stream in the Headquarters Unit. Public use at Leadbetter Point includes hiking, wildlife observation, seasonal razor clamming, waterfowl hunting, surf fishing and other beach activities. Most recreation activities occur during the day, except razor clamming, which is regulated by the state and often occurs between noon and midnight. At Leadbetter Point, a 372-acre snowy plover

nesting area is closed to all public entry from March through September; though the season can vary from year to year due to variation in the plover's use of the area. Regulated goose hunting occurs on the Tarlatt Slough and Riekkola Units, during seasons set by the state. Free-roam waterfowl hunting is allowed in the bay side of Leadbetter Unit, the fresh water marsh (Lewis I) in west Lewis Unit, and the Bear River salt marsh east and north of Lewis I. The southern portion of the Bear River and the Teal Slough Unit is open to rifle deer, elk and bear hunting, in accordance with State regulations. Archery hunting for deer, elk, bear and grouse is allowed on Long Island. Camping is allowed year round in 21 designated campsites within 5 campgrounds on Long Island. Camp sites are often entirely filled the opening day of elk archery season. In an effort to control camp site use during peak periods of visitation and reduce subsequent resource damage, a permit system has been developed for camping on the island during the early elk season.

WILDLAND FIRE MANAGEMENT SITUATION

HISTORIC ROLE OF FIRE

Pre-settlement Fires

Natural caused wildfires and significant fire events may have historically occurred in periods following several years of drought, when fuel conditions were exceptionally dry. High humidity and precipitation and the low occurrence of lightning lead to few natural ignitions in the area. The natural fire return interval for forests types that occur in the area ranges from 80 to 350 years.

Post-settlement Fire History

The refuge's annual narrative reports provide a good history of wildland fires that have occurred on the refuge and nearby lands from 1940 to 1995 (Table 2). Four fires have occurred on the refuge since 1945; at least three were human-caused. All four fires were contained at less than one acre. Prior to refuge establishment, one major wildland fire occurred following a logging event around 1930, but no further details on this fire are known. The Washington DNR has established fire season from April 15 through October 15.

Table 2. Summary of Wildland Fires on the Willapa NWR from 1940 to 1995.

Year	Fire Name	Location	Acres	Other Information
Jul 24, 1945		Long Island, west side	0.8	Burned grass on beach; extinguished naturally by high humidity at night. Reported to refuge by the state fire warden.
Jan 27, 1961		Long Island, west side T10N,R11W,S12, NENW	5	Fire caused by Crown Zellerbach Corp. logging crew burning slash piles on landings, after three days of no rain and higher than normal temperatures; fire spread to refuge during 40 mph south winds; burned 50,000 board feet of timber on the refuge.
Oct 5, 1990	Tower Road	Long Island; T11N, R11W, S12, NWNE	0.1	30-ft diameter fire in duff of dense 25 year old hemlock stand; caused by abandoned warming fire; DNR dispatched crew on Oct 7; line dug around fire and left to burn out; fire was out on Oct 8.
Oct 7, 1992	Diamond Pt	Long Island, NE corner; T12N, R11W, S25	0.1	1500-ft ² fire in forest caused by camper's warming fire; suppressed by refuge personnel.

In the 1940s, several fires occurred in the area and fuel conditions were very dry; however, no wildland fires occurred on the refuge. In June of 1940, 0.35 inches of rainfall that month and temperatures ranging from 48 to 81EF produced many fires on private lands within the county. In June and July of 1948, a total rainfall for those two months of only 1.73 inches produced no fires on or near the refuge. Several small fires off refuge lands were reported to have occurred during a four-month dry period (May–August) in 1949 and 1951, when 4.91 and 2.7 inches, respectively, of total rainfall was measured.

In October 1966, a fire set to burn logging slash in Section 19 on Long Island got out of control and burned 25 acres of standing timber on private land. Section 19 was primarily old growth forest, similar to what remains today in the old growth redcedar grove.

In July of 1985, during a period of high fire danger, two wildland fires were started in the beachgrass on the Long Beach Peninsula. The 1st of July fire burned 140 acres of beachgrass and forest and the 4th of July fire burned 60 acres. DNR fire crews performed fire suppression for these fires. During this same period, fires were prohibited on Long Island for one week and the island was nearly closed to public entry, but sufficient rain was received to reduce the fire hazard severity just prior to the closure.

Several fires occurred on the Long Beach Peninsula and forests surrounding the refuge in 1987. In May of 1987, very low annual rainfall produced severe fire hazard conditions and prompted the refuge to close Long Island and all upland forest areas to public use from October 23rd to the 29th. Annual rainfall was 54.86 inches on the refuge that year, which was 30% below the ten year average. On Memorial Day weekend of that same year, an 8-acre fire was started by an ATV in the beachgrass one quarter mile north of Joe Johns Road on the shore of Willapa Bay. Fire conditions that year were said to have been as severe as they are known to get in this area.

Fuel conditions have changed from pre-settlement times to the present, but fire incidence probably has not in most vegetation types, except in beachgrass areas. Depending on the fuel type, typical wildland fires on the refuge are generally infrequent, small, slow moving and spotty, as they probably were in the past. Even during dry periods, periodic rain and cool conditions keep wildland fires from becoming very large. The gentle terrain of the refuge also makes for slow moving fires. Although fast spreading wildland fires can and have occurred in the beachgrass, local fire protection agencies tend to respond quickly to these fires and quickly suppress them before they become very large or reach forested and residential areas. Since extensive non-native beachgrass areas did not occur prior to the 1930s, fire incidence in the native dunegrass areas was probably rare. Past local fire prevention efforts, which included education of the public, prohibiting logging operations during periods of high fire hazard, limiting and/or banning campfires, closing private timber lands to public entry, and closing band-tailed pigeon season, were enough to keep the incidence of wildland fires low during periods of high fire danger. These same prevention efforts, along with relatively low public use in most refuge areas, continue to keep wildland fires from occurring. Although most wildland fires are small, the potential exists for a large burn, as evidenced by the Tillamook Burn (1933) in northwestern Oregon.

Prescribed Fire History

Prescribed burning on the refuge has been limited to slash pile burning on Long Island from 1985 to 1995 that occurred one to two years after tree harvest, and occasional pile burning of vegetation debris that is removed from dikes, roadways, around fences and other structures, and at building sites. The location and dates of the slash pile burning on the island are well documented from 1985 to 1990, when a U.S. Fish and Wildlife Service forestry technician was monitoring harvest and post-harvest activities. Slash pile burning is also documented in the Annual Narrative Reports and has been occurring since 1940, when vegetation was cleared for construction of the Service buildings and what is now the Headquarters building.

Table 3. Summary of Prescribed Fires on the Willapa NWR from 1940 to 1995.

Year	Fire Type	Location	Acres	Other Information
1940	slash piles	hillsides of Headquarters drainage	5	Slash piles from logging to clear site for office, shop and residence construction were burned by the refuge staff and others
Sept. 23-30, 1966	slash piles	timber harvest units on Long Island in T11N, R11W, S12 & S1; T11N, R10W, S29		Slash piles on landings burned by refuge and Olympic Hardwood personnel. Logging by Olympic Hardwood on refuge land.
Aug 9, 1967	broadcast burn	Unit 2 at Lewis I	60	Burned after spraying in June to remove dead common rush
July 1967	broadcast burn	Unit 3 at Lewis II	40	Burned after mowing in May and spraying in July to remove dead common rush
Aug 23-30, 1968	broadcast burn	Unit 3 at Lewis II & Porter Point Unit near Lewis II	60+	Thick patches of rush were burned to remove dead plants and weaken live plants, after rush was sprayed in May and June
Oct 30, 1968	broadcast burn	Unit 3 at Lewis II	30	Burned to remove dead rush, after rush was sprayed in May and June and after several days of east wind prior to burning
Sept 1969	broadcast burn	Unit 1 at Lewis I	60	Burned to remove dead rush, after rush was sprayed in June
1974	pile burning	Leadbetter		Common gorse was dozer piled and burned for invasive plant control
Oct 29, 1986	slash pile burning	Long Island Units L, C		Weyerhaeuser Co. ignited slash piles, refuge staff monitored and mopped-up
Dec 12, 1986	broadcast burn	Lewis Unit	<0.1	Test burning of rush, only dead grass and sedge burned; fire did not carry well (weather conditions documented in annual narrative), insufficient wind attributed to lack of spread and low intensity of burn; no significant openings created
Jan 21, 1988	slash pile burning	Long Island Units C		Weyerhaeuser Co. ignited piles
Dec 19, 1988	slash pile burning	Long Island Units M, N, P, Q		
Oct 1990	slash pile burning	Long Island Units B, O		Not all piles were ignited
Oct 1991	slash pile burning	Long Island Units A, D		Piles in Unit A were not consolidated enough to burn well

The 1991 Fire Management Plan states that the short dry season and high humidity make for few suitable days for prescribed burning on the coast, and conditions for air stagnation frequently occur during the period when prescribed burning may be possible. Strong easterly winds can also occur in the fall, when conditions are best for burning, making conditions hazardous for prescribed burning. Fuel levels were heavy in logged areas on Long Island and the danger of having a wildfire in them remained high for three to seven years, until green vegetation was sufficiently reestablished. Although broadcast burning was commonly used on surrounding commercial forest lands to remove logging slash and facilitate replanting

of tree seedlings, broadcast burning was considered but never attempted on Long Island. Broadcast burning was not used on Long Island because it was incompatible with natural regeneration, nutrient recycling, and snag protection. Natural forest regeneration was preferred by the refuge so that wildlife would benefit from a prolonged brush seral stage and greater habitat diversity would result. In 1988, the refuge did consider broadcast burning an acceptable practice in harvest areas that did not occur adjacent to the old growth redcedar grove. Broadcast burning next to the redcedar grove was considered too risky, even under ideal conditions, because of the potential for spot fires starting in dead redcedar tops that are abundant in the old growth stand.

In an effort to protect the remnant redcedar grove on Long Island from potential wind throw and damage that could result from wildfire or spot fires from burning the adjacent logged units, mature forest on 126 acres along the borders of the redcedar grove was purchased in 1992. This tree buffer consisted of three planned harvest units (Units R, S and T) along the eastern and southern edges of the redcedar grove. With this purchase of forest, over 600 acres of continuous mature and over-mature forest was preserved on the southern portion of Long Island.

RESPONSIBILITIES

Willapa NWR does not have a dedicated fire management position or organization. The Project Leader is responsible for planning and implementing the fire management program on the refuge. The Zone Prescribed Fire Specialist (PFS), located at Willamette Valley NWR, is responsible for the refuge's fire management program oversight. The Project Leader will assign collateral-duty fire management responsibilities to staff who possess appropriate training, experience, and incident qualifications. Pre-suppression planning and work will be accomplished by refuge staff in accordance with national and regional fire management direction, under guidance from the Zone PFS. Emergency fire management actions will be handled by refuge staff, according to their training and incident qualifications, and interagency fire suppression cooperators, according to cooperative agreements. The Zone PFS will be immediately notified of all emergency actions. Additional information and direction are included in the Fire Dispatch Plan (Appendix L) and the Annual Operating Plan associated with cooperative agreements.

Resource Advisor (RA)

The RA is a technical specialist appointed by the Agency Administrator and reports to the Incident Commander or designee to provide guidance for the protection of natural and cultural resource from suppression operations. The RA provides input to the Incident Commander in the development of fire suppression strategies and tactics to minimize or mitigate the expected impacts of fire and fire suppression actions upon natural and cultural resources. The RA also provides input required for the development of rehabilitation plans. Resource Advisor responsibilities include (NWCG 1996):

- < Provides analysis, information, and advice to fire managers for areas of concern, including:
 - \$ Critical watersheds, riparian areas, fisheries, and water sources
 - \$ Threatened or endangered species
 - \$ Prehistoric and historic archaeological sites and cultural landscapes
 - \$ Fuel break locations and specifications
 - \$ Structures and improvements in urban interface impact areas
 - \$ Hazardous materials
- < Assists in developing fire maps and identification of areas of concern for fire management plans
- < Determines environmental restrictions commensurate with fire management plan resource protection in the fire area
- < Provides recommendations for fire suppression rehabilitation needs
- < Documents potential and actual suppression and fire related resource impacts and the rationale for the protection of priority areas

- < Provides resource information to local initial attack Incident Commander, dispatchers, or other fire personnel, during preseason training and planning meetings.

The refuge fire management responsibilities have been identified as follows:

Project Leader

- < Is responsible for implementation of all refuge fire management activities within the Complex and will ensure compliance with Department, Service and refuge policies.
- < Selects the appropriate management responses to address wildland fires on the Complex.
- < Coordinates the Complex's 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 adequate resources and access to the refuges when needed.
- < Ensures that employees consider the fire management program during Refuge related planning and implementation.
- < Approves prescribed burn plans for the refuge.

Deputy Project Leader

- < Integrates biological objectives into fire management planning and implementation.
- < Conducts and coordinates fire management and environmental planning for fire related projects.

Refuge Manager

- < For presuppression projects: identifies potential projects, informs the prescribed fire specialist of the projects and its constraints, and ensures that refuge resources are available to accomplish the projects.
- < Ensures specified fire effects monitoring is implemented.
- < Acts as the primary refuge Resource Advisor or Resource Management Specialist during fire management planning and operations, to provide archeological and cultural resource protection input to the fire program, in absence of Regional archeological staff.
- < Develops and assists the PFS in completing Wildland Urban Interface and hazardous fuels treatment projects
- < Drafts wildland fire Burned Area Emergency Stabilization and Rehabilitation Plans
- < Is responsible for posting and enforcing fire restriction regulations.

Biologist

- < Provides biological input for the fire program to the Fire Management Officer and PFS and determines the biological objectives of pre-suppression projects.
- < Acts as the primary refuge Resource Advisor or Resource Management Specialist during fire management planning and operations, to provide biological and natural resource input to the fire program.
- < Assists the PFS in design and implementation of fire effects monitoring
- < Participates, when qualified and as requested, in prescribed burning and wildland fire suppression.

Zone Prescribed Fire Specialist

- < Responsible for all fire related planning and implementation of the fire management plan for the refuge, including coordination and supervision of all prevention, pre-suppression, detection, wildland fire, prescribed fire, suppression, monitoring, and post-fire activities involving refuge lands.
- < Solicits fire program input from the Project Leader, Deputy Project Leader, Refuge Manager, and Biologist.
- < Supervises prescribed fire planning.
- < Plans, coordinates, and directs preparedness activities for the refuge, including fire training and nomination of personnel to receive fire training; physical fitness testing and Interagency Fire Qualification System data entry; fire cache and equipment inventory accountability, maintenance, and operation; and cooperative fire protection agency coordination.
- < Ensures fire management policies are observed.
- < Develops and coordinates rural fire assistance agreements (memorandums of understanding) and grants to effectively and efficiently provide fire protection services outside the Service's capabilities.
- < Coordinates with cooperative fire protection organizations to ensure adequate resources are available for fire operations when needed.
- < Develops and oversees Wildland Urban Interface and hazardous fuels treatment projects
- < Responsible for preparation of fire reports following the suppression of wildland fires and for prescribed burning projects requiring fire reports
- < Prepares an annual report detailing fire occurrences and presuppression activities undertaken in each calendar year. This report will serve as a post-year's fire management activities review, as well as to provide documentation for development of a comprehensive fire history record for the refuge.
- < Submits budget requests for fire funding and monitors FIREBASE funds.
- < Maintains records for all refuge personnel involved in suppression and presuppression activities, detailing the individual's qualifications and certifications for such activities.
- < When available, may serve as prescribed fire burn boss, propose prescribed fire projects.
- < Assists in preparation of a refuge fire prevention plan and coordinates fire prevention with other employees
- < Assists in updating the refuge fire management plan, maintains fire records, reviews fire reports (form DI-1202) for accuracy, and enters fire report data into Fire Management Information System

Incident Commander

The Incident Commander, at any level, uses strategies and tactics as directed by the Project Leader and the Wildland Fire Situation Analysis (WFSA) where applicable to implement selected objectives on a particular incident. A specific Limited Delegation of Authority (Appendix R) will be provided to each Incident Commander prior to assuming responsibility for an incident. Major duties of the Incident Commander are given in the National Wildfire Coordinating Group Fire Line Handbook, including:

- < Briefs, directs, and provides work tools for subordinates.
- < Ensures safety standards identified in the Fire Orders, the Watch Out Situations, and agency policies are followed at all times.
- < Personally scouts and communicates with others to be knowledgeable of fire conditions, fire weather, tactical progress, safety concerns and hazards, condition of personnel, and the need for additional resources.
- < Orders resources to implement the management objectives for the fire.
- < Informs appropriate dispatch of current situation and expected needs.
- < Coordinates mobilization and demobilization with dispatch.
- < Performs administrative duties, including approving work hours, completing fire reports for the command period, maintaining property accountability, providing or obtaining medical treatment, and evaluating performance of subordinates.
- < Assures aviation safety is maintained to the highest standards.

INITIAL ATTACK TEAMS

Initial attack teams consist of experienced, qualified, red-carded firefighters, including those on their first fire. A Type 5 or Single Resource Boss is the basic requirement of leadership for an initial attack team. 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 activity on Service or cooperator managed 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

An interagency agreement between the refuge and the Washington Department of Natural Resources (DNR) was first entered into in 1974 to provide fire protection on forested lands for an annual payment. In October 1998, the Master Cooperative Fire Protection Agreement was executed to improve fire protection efficiency among the cooperating state and federal agencies by facilitating the exchange of personnel, equipment, supplies, services, and funds. DNR continues to provide wildland fire protection for all of Willapa's forested refuge lands. Through this cooperative agreement, resources are made available to assist in initial attack efforts and the cost of providing fire protection services is reimbursed according to the agreement. The cooperative agreement provides details on items such as payment among cooperators, a list of response areas, and radio communication frequencies. The Master Cooperative Fire Protection Agreement is reviewed and updated every five years.

Since structural firefighting is not the functional responsibility of the Service, the Service is currently negotiating a memorandum of understanding (MOU) with the Pacific County Fire District # 1 (PCFD #1) (Appendix K) to allow the fire district to respond primarily to structure fires and secondarily to wildland fires on refuge lands on a cost reimbursable basis and under similar protocols as in the Master Cooperative Fire Protection Agreement. The MOU will also be reviewed and updated every 5 years.

However, at this time the Willapa headquarters and service buildings, Leadbetter visitor facilities, and Quarters 88 at the Bear River Unit are outside the district's response area for both structural and wildland fires. Response to structural and wildland fires in those areas may be given by the PCFD #1, if the district has available resources and the fire is accessible with available equipment. DNR may also respond to wildfires in these areas.

Willapa NWR will use the Incident Command System as a guide for fire line organization. Qualifications for individuals will adhere to the Department of the Interior Wildland Fire Qualifications and Certification System, which is part of the National Interagency Incident Management System and the National Wildland Fire Coordination Group Prescribed Fire Qualification Guide. Depending on fire complexity, some positions may be filled by the same person.

PROTECTION OF SENSITIVE RESOURCES

Natural Resource Protection

In order to insure adequate protection of sensitive natural resources from the effects of fire suppression activities the following actions will be taken:

- < Resource Advisor will be required to conduct fire suppression activities on any wildland fire on the refuge that is outside of agricultural lands (Tarlatt Slough, Riekkola, and Wheaton Unit pastures).
- < Minimum impact fire suppression tactics will be used to the fullest extent possible.
- < If new occurrences of state or federally threatened species are discovered during a wildfire, they will be marked and protected the same as those that are known on the refuge and the Resource Advisor will recommend suppression activity protection measures to the Incident Commander.
- < Resource Advisor approval is required prior to the using heavy equipment to construct *new* fire lines outside of agricultural areas, unless there is an imminent threat to human life and/or structures. Resource Advisor suppression are allowed in the Leadbetter RNA to protect or restore habitat of threatened and endangered species or protect human life and structures in imminent danger from the fire.
- < In old growth and late seral stage forest at Long Island, Teal Slough, and the Headquarters Units, unburned snags will not be felled along fire lines, except where necessary to protect human life and property. When possible, the use of fire chemicals should be used to protect snags from burning.
- < Resource Advisor approval is required prior to the use of all fire chemicals on the refuge. To protect natural resources on the refuge from the harmful effects of fire chemicals, the following restrictions are to be applied:
 - § Fire chemicals will not be applied in or near shorelines, streams, seeps, ponds, marshes or surface water of any type, except to protect human life or property in imminent danger of wildfire. It is standard operating procedure in fire fighting operations not to mix, load or apply these chemicals near water.
 - § Fire chemicals will be cautiously and conservatively used in wildfires and prescribed fires, such as to protect very high value wildlife habitats (e.g. old growth, large snags used for cavity nesters such as spotted owls and pileated woodpeckers) and to reinforce fire lines.
 - § Fire-trol® fire retardant will not be used on the refuge due to its cyanide component and toxicity to aquatic organisms.
 - § Silv-ex® and Phos-chek® wildland fire foams will not be used on the refuge, since they are more toxic to aquatic organisms than other types of fire foams. Other foam suppressant chemicals may be used judiciously on the refuge.

Cultural Resource Protection

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" form (Appendix E) will be used to inform the Regional Archaeologist of impending fire management 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 (36 CFR 800), 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); although, no historic properties currently exist on the refuge.

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 wildfire holding actions.

The following actions will be taken to protect archaeological and cultural resources during 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 archaeology staff for more detailed information on cultural resources existing in a particular area and protection advice.
- § Foam suppressant use will be minimized in areas known to harbor surface artifacts.
- § Mechanized equipment (e.g., dozers) 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 protected as necessary and reported to the Regional Archaeologist.
- § Fire rehabilitation plans will address cultural resources impacts and will be submitted to the Regional Archaeologist using the RCRC form.

During prescribed fires:

- § The Refuge Fire staff will submit a completed RCRC form 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 form, the Regional Archaeologist and/or his/her staff will be responsible for consulting with the Fire Management Officer 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 known cultural significance.
- § The location of any sites discovered as the result of fire management activities will be reported to the Regional Archaeologist.

WILDLAND FIRE ACTIVITIES

Fire program management describes the operational procedures necessary to implement fire management at Willapa NWR and includes fire prevention, preparedness, emergency preparedness, fire behavior predictions, staffing priority levels, fire detection, fire suppression, minimum impact suppression, minimum impact rehabilitation, and documentation.

All fires not classified as prescribed fires are wildland fires and will be appropriately suppressed. Refuge engine(s), DNR, or Pacific County Fire District #1 or # 4 (PCFD #4) would be the first to respond to a wildfire on the refuge, depending on the fire's location. PCFD #1 is stationed in Ocean Park; PCFD #3 is stationed in Raymond; and PCFD # 4 is stationed in Naselle (see Appendix S, Figures 7-11 for maps of Fire District #1, #3, and #4 boundaries). Heavy equipment with trained operators may also be available and may include tractors with large discs, bulldozers, and road graders. DNR would be called for assistance if a wildfire exceeded the ability or capability of qualified refuge personnel. The refuge is within DNR's Central Region that is managed from an office in Chehalis, WA. The Pacific County Sheriff's Department may be notified during wildfires or structure fires, as appropriate.

FIRE MANAGEMENT STRATEGIES

Although resource impacts of suppression actions must always be considered in selecting a fire management strategy, appropriate suppression action will be taken to ensure firefighter safety and public safety first and protection of natural resources second. Critical protection areas, such as structures, facilities, research natural areas, and adjacent private lands, will receive priority consideration in fire control planning efforts. However, the primary concern of fire suppression personnel at all times shall be safety; and if needed, all individuals not involved in the suppression effort may be evacuated.

Suppression strategies should be applied so that equipment and tools used to meet the desired fire management objectives are those that create the least impact to natural and cultural resources. MIST 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 and must be approved by the Resource Advisor. Sites impacted by fire suppression activities or by the fire will be rehabilitated as necessary, based on an approved rehabilitation plan for each incident.

Specific fire management strategies for the refuge include those outlined in the Protection of Sensitive Resources section above and the following:

- § All wildland fires will be controlled using an appropriate suppression strategy which considers human safety, personal property, natural resources, and economics.
- § Mechanical treatment will be used to reduce hazardous fuels near structures, on the boundaries of the refuge where wildfires may threaten private land or structures, and land improvements, as needed.
- § Prescribed fire will be utilized to meet ecological and fire management needs of the refuge.
- § Known cultural resource areas will be excluded from fire management activities, including fire line construction, fire chemical use, and adverse fire effects.
- § Fire breaks will be constructed using a combination of existing roads and logical topographic breaks (i.e., wet areas) on Long Island to separate large areas of dense fuel, create fire breaks between common ignition sources (campgrounds) and the remaining forest, and provide greater fire protection for the old growth area.

PREPAREDNESS

Preparedness is the work accomplished prior to fire occurrence that ensures that the appropriate response, as directed by the Fire Management Plan, can be carried out. Preparedness activities include budget planning, equipment and supply acquisition, equipment maintenance, dispatch (initial attack, extended, and expanded), equipment and supply inventory, personnel qualifications inventory, and personnel training. The preparedness objective is to have a well trained and equipped fire management organization ready to manage all fire situations likely to occur within the refuge. Preparedness efforts are to be accomplished outside the normal fire season dates from April 15 through October 15.

Historical Weather Analysis

The Willapa Bay area is characterized by a mild coastal climate with annual precipitation averaging 80-115 inches. Precipitation occurs mostly in the form of rain during the months of October through April. June, July and August are normally the driest months of the year, averaging 2.4, 1.2, and 1.3 inches per month respectively. Average high and low temperatures during these months are 51.5EF and 66.8EF.

The most accurate way of displaying the relationship of weather and fuels to the fire danger is through the Burning Index or BI. The BI is an estimate of the potential difficulty of containment of a wildland fire as it relates to the flame length at the head of the fire. The BI value is a function of the spread component (how fast the fire could spread) and the energy release component (how hot the fire could burn). The BI is scaled such that a BI value of 40 would indicate a predicted average flame length of 4 feet. Wildland fires where the flame length exceeds 4 feet are judged to be too hazardous for hand crews and engines to attack along the direct edge of the fire. The BI may also communicate the relative fire danger in a rating area. The 90th percentile is defined as 90 percent of all BI's are at or below this index for the time period calculated, and the same is true for the 97th percentile. When overlaid with historic fire occurrence, a relationship with fire weather can assist with more accurate preparedness planning.

The refuge's fire season established by DNR is from April 15 through October 15. Periodic dry summers and easterly winds can desiccate dead fuels and stress live vegetation resulting in a high risk of wildfire. Periods of high fire risk typically occur each year for several weeks in August and September, during which time fires are restricted locally by order of county or DNR fire officials.

No remote area weather stations (RAWS) that meet fire weather analysis standards are currently available in the southeast region of Washington. The closest RAWS is at Mount Abernathy, in Lewis County, Washington. Consequently, fire weather data for the refuge will be collected through the Pacific Northwest Coordination Center intelligence web page, or a portable RAWS will be put in place if needed for more site specific weather data.

Fire Prevention

An active fire prevention program will be conducted as needed and in conjunction with other agencies to provide for the protection of human life and property, wildlife habitats, and physical facilities.

Most wildfires on the refuge have been caused by escaped fires built for recreational purposes, such as campfires, beach bonfires and hunters' warming fires. Wildfires on the refuge have typically started in beachgrass areas at the Leadbetter Unit and in forested areas on Long Island, where visitor use is highest during periods of high fire danger. When commercial tree harvest activities were active on Long Island, wildfires caused from logging equipment and slash burning posed a significant fire danger; therefore some industrial fire precautions were used and industrial operation bans have been issued by the state. Although wildfires on the refuge are infrequent, most can be easily prevented through simple fire prevention methods, such as fire prevention education, visitor contacts, posted notices, handouts and interpretive displays or programs used to increase visitor awareness of fire hazards. A notice that beach fires were prohibited at Leadbetter Point Unit was incorporated into an interpretive sign at the Leadbetter

Point public parking area. The use of motorized equipment and vehicles by the public on Long Island has been prohibited for many years and serves the dual purpose of fire prevention on the island. A camping permit system was implemented in 2002 at Long Island to control peak use at the camp grounds and reduce resource damage. The permit system and subsequent law enforcement patrolling aids in fire prevention. Free camping permits are required from one week prior to early elk season in September until the last day of the season, approximately four weeks later. Campsites are limited to five people per site, which results in a maximum of 105 people using 21 campsites on the entire island. Effort will be made through public contacts and printed recreation information to educate the public on the potential danger of campfires and hunters' warming fires causing wildfires at Long Island. During periods of extreme or prolonged fire danger emergency restrictions regarding refuge operations, forest management activities or area closures may become necessary. Such restrictions, when imposed, will be consistent with those implemented by DNR and will be authorized by the Project Leader when initiated by the refuge.

Structure Protection

Burnable structures, besides wooden fences, are present on the Leadbetter, Riekkola, Bear River, Headquarters, Long Island and Wheaton Units. Areas containing structures are shown in Table 1 as "developed" under the column "Other Areas" and a real property inventory of all refuge structures is located in the headquarters office files. Hazard reduction is conducted to prevent wildland fires from spreading onto structures owned by the USFWS and private landowners. Most structures do not have roads which encircle them to provide sufficient fire breaks; therefore vegetation around structures will be periodically removed, reduced or kept green. Vegetation found around buildings consists of grass, ornamental shrubs, coniferous trees and ornamental trees. If a fire ignites in these areas, a four foot firebreak is generally sufficient to halt fire spread. To minimize the chance of a wildland fire destroying government owned structures, firebreaks are mowed around structures during spring and summer. Additionally, herbicides and manual thinning are used on these areas to limit fuel build-up. Residential and office lawns are kept mowed and green all year.

Since all major structures on the refuge are outside the fire district's response area boundary, structural fire protection for refuge structures will be sought after through a memorandum of understanding (in draft phase) with Pacific County Fire District #1 (See Appendix K for MOU; Appendix S for maps of the fire districts). At a minimum, obtaining structural fire protection for occupied structures such as the headquarters office and Quarters 88 will be a priority.

The majority of lands adjacent to the refuge are utilized for agricultural, timber production, residential or recreational purposes. There are several scattered homes and structures on lands adjacent to the refuge. A list of land owners that have structures adjacent to the refuge is located in Appendix N and will be updated annually. Roads, rivers, and other land features provide buffers between the refuge and some privately owned structures adjacent to the refuge, as is the case in the Bear River, Lewis, Tarlatt Slough and Wheaton Units. However, one or more substantial fire breaks in the Leadbetter Unit beachgrass area and/or the adjacent state park lands are needed to prevent wildfire from spreading south within the beachgrass area. Due to restrictions on vegetation removal within Leadbetter State Park, no substantial fire breaks within the park are proposed at this time, but the refuge and state park continue to work towards achieving better fire prevention in beachgrass areas in and near state and federal lands.

Wildland Urban Interface (WUI) Projects are used to reduce the spread of wildfire to adjacent property owners. The Tarlatt Slough Unit is primarily pasture land with several created wetlands and a natural slough that has several houses, a public utilities office and a electric substation immediately adjacent to the refuge. The county roads surrounding the refuge provide a buffer between the refuge and the structures; however, the number of structures, their use (residential and utilities), the large amount of traffic on the road buffer led to the decision to improve the fire break along the county roads that surround Tarlatt Slough Unit. A WUI project to create a more substantial fire break around the Tarlatt Slough Unit

by removing woody vegetation, tilling and mowing along the road will be executed in August 2002. Contract specifications for the Tarlatt Slough WUI project are located in Appendix P.

There are no private in-holdings within the refuge boundaries, except a 1.25 acre parcel of land on Long Island that has no structures on it and is partially surrounded by tidally influenced water.

Staffing Priority Levels

Willapa NWR currently has no permanent fire staff. Fire staff is needed to address the forest health needs on the refuge, i.e., a fire crew to thin and conduct prescribed burns.

Fire data processing will be done by the PFS and Regional Office fire staff, as needed. Fire danger calculations and objectives are necessary on this refuge for communicating the fire danger and growth potential on a given day and determining the precautions necessary when performing certain field work.

Fire staff limitations on the refuge require that all severity augmentation of staff come from repositioning personnel and equipment to the refuge. All severity actions will follow USFWS *Fire Management Handbook* direction for wildland fire preparedness in Section 3.1, which gives guidance on when severity action, such as refuge closure/evaluation, is warranted and the process for implementation.

Training

Departmental policy requires that all personnel engaged in suppression and prescribed fire duties meet the standards set by the National Wildfire Coordinating Group. Willapa NWR will conform strictly to the requirements of the wildland fire management qualification and certification system and USFWS guidelines.

Basic wildland fire training refreshers are offered annually for red-carded firefighters and training records are kept in a centralized database. 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. Whenever appropriate, the use of fire qualification task books will be used to document fire experience of trainees. The Fire Management Officer will coordinate fire training needs with those of other nearby refuges, cooperating agencies, and the RO.

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.

Because fire suppression is an arduous duty and personnel on prescribed fire duty may be required to shift from implementation/monitoring activities to suppression, personnel performing fire management duties will maintain a high level of physical fitness. Poor physical condition of crew members can endanger safety and lives during critical situations. This requires successful completion of a fitness pack test. Personnel must complete a three mile hike with a 45 pound pack in less than 45 minutes to qualify for arduous duty. Annual refresher courses are mandatory for all fire qualified personnel and are either completed in-house or in cooperation with other federal/state agencies.

Supplies and Equipment

Willapa NWR will maintain a three person fire cache in the basement or shop of the Willapa headquarters office and a small cache of fire suppression supplies suitable for initial attack at the Long Island and Riekkola shops. The Refuge Manager will be responsible for annually ensuring fire cache equipment and supplies are properly maintained, stored, inventoried, replaced and available for a minimum of a three person initial attack crew (the Normal Unit Strength or NUS of the refuge). A list of required and

available refuge fire equipment (the NUS list) can be found in Appendix O. All NUS items are not to be used for routine refuge operations; therefore, items in the fire cache should be stored in a sealed or locked storage area.

Personnel qualified for fire assignments are responsible for maintaining their own personal protection equipment in a state of fire readiness.

Additional equipment and supplies are available through cooperators, the regional and the interagency cache system and would be ordered through the DNR dispatch office. Requests for additional personnel and equipment are made through the servicing DNR dispatch office for the area.

WILDFIRE DETECTION

Wildfires on the refuge are generally caused by an escaped or carelessly set recreational use fire, such as a campfire or beach bonfires. Most wildfires occur in the Leadbetter and Long Island Units and would not threaten structures, people or private land for some time. Often wildfires are detected by a refuge visitor or neighboring land owner and reported to the local fire department through the 911 emergency response system or reported to the DNR fire report hotline (1-800-562-6010). Occasionally a wildfire has been detected by refuge personnel working in or patrolling the area.

Wildfires are generally reported to the refuge office, through organizations on the fire contact list, or by emergency personnel. At present, most fires would be reported to the county, who would then notify refuge personnel. Refuge staff are currently working to improve communication with the local fire departments and DNR in notification of suppression actions on refuge lands.

Fire detection includes a determination of the fire's cause. Moreover, human-caused fires 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

Refuge communication systems include a digital radio system, cell phones and personal computers. The radio system includes base stations at the Willapa office and Julia Butler Hansen Refuge for the Columbian White-tailed Deer (JBH Refuge), twelve portable radios at Willapa NWR, seven portable radios at JBH Refuge, and mobile radios in most boats and vehicles. Joel David, the Refuge Manager at JBH Refuge, is the radio communications officer and programmer for the Complex. Four cellular phones are used on the refuge with limited coverage and ability to reach the refuge office. Three long distance land-based phone lines, a fax machine, and two portable marine VHF radios are available at the refuge office. Marine VHF radios are also aboard some boats. Electronic mail and internet communication is available through two dial-up communication lines servicing 8 personal computers at the Willapa headquarters office. The computers are not networked.

Immediate emergency notifications and contacts can be found in the refuge dispatch plan in the appendix. During emergency fire operations, mutually agreed upon command and tactical radio channels will be used. Radio frequencies, call signs and use information are found in Appendix M

PRE-ATTACK PLAN

Upon discovery of a fire, actions will include the following:

- § The Incident Commander (IC) will locate, size-up, and coordinate suppression actions. The IC will complete the pre-attack planning checklist.
- § Provide for public safety.
- § Considering the current and predicted fire conditions, the Incident Commander will assess the need

for additional suppression resources and estimate the final size of the fire. The potential for spread outside of the refuge should be predicted, as well as the total suppression force required to initiate effective containment action at the beginning of each burning period.

- § The Incident Commander will assess the need for law enforcement personnel for traffic control, investigations, evacuations, etc. and make the request to the Fire Management Officer.
- § Document decisions and complete the fire report (DI-1202).
- § Should a wildland fire move into an extended attack, a Delegation of Authority will be invoked to transfer authority for suppression actions between incident management levels. Once a Delegation of Authority has been executed the Incident Commander will make the final decisions pertaining to the fire. The Delegation of Authority form is located in Appendix R.

FIRE MANAGEMENT UNITS

Fire Management Units (FMUs) are areas on a refuge which have common wildland fire management objectives and strategies, are manageable units for wildland fire suppression, and have boundaries that are often based on natural or manmade fuel breaks. FMUs may sometimes coincide with prescribed fire burn blocks or treatment areas or units. On small refuges with similar land types and resources the whole refuge may be treated as a single FMU.

Due to limited staff, the relatively small size of land management parcels, long response times, high resource values, and the resources at risk on neighboring lands, this plan does not consider wildland fire management for resource benefits on any of the FMUs. Therefore, all wildland fires will be suppressed using the appropriate suppression response. Prescribed fires will be used to reduce hazardous fuels and to meet resource management objectives.

There are two FMUs identified on the Willapa NWR – areas within RNAs and areas outside RNAs.

All wildland fires will be suppressed in both FMUs. Minimum Impact Suppression Techniques (MIST) should be utilized whenever possible due to the high level of natural resources protection desired within wildlife refuges.

Upon discovery, wildfires in both FMUs will be monitored by all available refuge firefighters. Refuge firefighters are allowed to perform fire suppression activities to the level of their training and ability; therefore, refuge personnel may perform initial attack if qualified. One of the Pacific County Fire Districts or the Washington Department of Natural Resources will likely initiate suppression efforts, once the fire is reported to one of these fire management organizations.

A Resource Advisor will be immediately requested from the refuge for any fire occurring on the refuge. The Resource Advisor should be notified of any cultural resources or federally protected species discovered as a result of suppression actions.

FMU 1: Within RNAs

Areas within the Leadbetter Point, Diamond Point, and Cedar Grove RNAs are included in this fire management unit. These RNAs are described in the “Vegetation and Land Cover” section of this document, under the heading “Formally Designated Natural Areas.”

Fire suppression and prevention measures within RNAs will be consistent with the management objective of maintaining the area’s existing vegetation in its progression of natural ecological succession, of which fire is a part. All wildland fires within RNAs will be suppressed using MIST. Construction of dozer firelines for wildfire suppression or prevention is prohibited within the Cedar Grove and Diamond Point RNAs on Long Island. Dozer firelines for wildland fire suppression and prescribed burning are allowed in the Leadbetter RNA, but are restricted for use to protect human life and property in imminent danger from wildland fire and for use in association with prescribed burns to restore endangered or threatened

species habitat. The thin organic layer of the soils at Leadbetter Point are highly susceptible to damage by large machinery. Firelines within Leadbetter Point RNA must be pre-approved by a Resource Advisor.

FMU 2: Outside of RNAs

All remaining refuge areas outside of RNAs make up the second FMU. Areas in this FMU are either diked grasslands that are managed as pastures for cattle and waterfowl use, freshwater and saltwater marshes, or red alder and western hemlock/western redcedar/Sitka spruce forest of various ages.

Fuel Types

Fuel types on the refuge include freshwater marsh, salt marsh, pastures, young to mature western hemlock/western redcedar/Sitka spruce forest, late-successional western hemlock/western redcedar/Sitka spruce forest, lodgepole pine forest, beachgrass, and developed land containing structures. Fuel types were generated from vegetation type descriptions, older fuel maps, and aerial photos.

Freshwater marsh is found in the Riekkola, Porter Point, Lewis, and Bear River Units, along with small marshes on Long Island and Wheaton Units. Freshwater marsh areas are not subject to wildland fires; but they have been burned by prescription in the past, when the water is drained. Porter Point, Lewis and neighboring wetlands in the Riekkola Unit contain a variety of grasses, forbs, shrubs and wetland plants, including twinberry honeysuckle, western dock, American skunk cabbage, Pacific water-parsley, silverweed, starwort spp, broadleaf cattail, common lady fern, sweet vernalgrass, slough sedge, colonial bentgrass, orchardgrass, meadow foxtail, and spikerush. Areas with deeper water and better drainage in the wetlands support sedges, water knotweed, annual wildrice, and pondweeds. The dikes and raised areas adjacent to the marshes contain Himalayan blackberry, salmonberry, Pacific crab apple, red elderberry, red alder, willow species and various grasses and forbs.

Salt marshes are found on the margins of Willapa Bay, in all the refuge units bordering the south bay. The salt marshes vary in plant composition; however they are generally composed of salt tolerant grasses and forbs that range from 3 to 120 centimeters tall. Salt marshes are not usually subject to wildland fires. The Leadbetter Point salt marsh is largely composed of Virginia glasswort. The Bear River salt marshes contain plants such as tufted hairgrass, Lyngbye's sedge, seashore salt grass, sea arrow-grass, Virginia glasswort, rush spp, silverweed, broadleaf cattail, and birds-foot trefoil. Relatively large Sitka spruce are found scattered at the toe of the uplands or in raised areas of the marsh at Bear River. Willows are also scattered in drier raised portions of the salt marsh.

Pastures are found on the Riekkola, Tarlatt Slough, and Wheaton Units. Pastures are composed of various grasses and forbs. All pastures on the refuge are either grazed or hayed in summer and fall; therefore, the vegetation in them is usually short (less than 13 centimeters) during the late summer dry period. The Riekkola Unit pastures contain a mixture of colonial bentgrass, white clover, common velvetgrass, and vetch spp, as well as a significant amount of common rush, also called tussock. The Tarlatt Slough pastures are composed of a variety of grasses and forbs, primarily common velvetgrass, as well as ryegrass and colonial bentgrass. Tarlatt Slough itself is lined with blackberry, willow and rose. The "Homestead Pasture," where the cement slab is located at Wheaton, has been planted with Western redcedar, Sitka spruce, bigleaf maple and red alder, but also contains dense reed canary grass that is often 0.7 to 1.5 meters tall. Ungrazed areas and older fences in all the pastures are partially covered in shrubs such as blackberry and rose and tall grass.

The western hemlock/Sitka spruce/western redcedar forests covering the uplands of the Riekkola, Porter Point, Lewis Units, and Long Island are also described in the "Forest Resources" section. A detailed fuels inventory of forested areas on the refuge is not available. Most of these forested areas have been logged at least once within the last 100 years. Approximately 856 acres of forest was harvested from 19 units on

Long Island from 1983 to 1993. In 1991, most of the area within harvest units was said to be medium to well stocked, generally even-aged western hemlock, western redcedar and Sitka spruce that ranges from 65 to 100 years old. Remnant over-mature trees are scattered within many units. The coniferous trees range from 0.3 to 60 meters in height. Some logged and disturbed areas have produced pure stands of red alder that can be 25 meters tall. Red alder is also found associated with the hemlock, spruce and redcedar. Pure western hemlock or red alder stands are usually very dense. The western hemlock forest has a dense shrub or fern understory and substantial amounts of dead downed woody material and leaf litter. Although slash in old tree harvest units was usually piled and burned, a substantial amount of wind thrown trees are found in stands bordering openings and roads, particularly on Long Island. Second growth western hemlock on Long Island and Tarlatt Slough can be very dense, with little understory vegetation.

Late-successional western hemlock/western redcedar/Sitka spruce is found on Long Island, the Headquarters Unit and Teal Slough on the refuge. The late-successional western hemlock/western redcedar/Sitka spruce stand on Long Island has been in a climax seral stage for a very long time and has large to very large trees, a moderate tree density, and an understory of shrubs, forbs, ferns and mosses. Western hemlock and Sitka spruce trees in the Teal Slough stand are just entering a mature and over-mature state (130 years old); but scattered older trees (250 years) of these species also occur in the stand. The Headquarters stand of late-successional forest is predominantly mature western hemlock with large, older Sitka spruce and western redcedar scattered throughout. The understories of the Teal Slough and Headquarters stands consist mostly of shrubs, ferns, forbs and mosses with large woody debris and a thick litter and duff layer.

Lodgepole pine, or shore pine, is the major tree species in the early seral forest community at Leadbetter Point. The lodgepole pine is older and more established in the southeastern part of the unit. The pine becomes younger towards the north and west, gradually moving into a narrow transition zone of small pine, shrubs, grass, and forbs. Lodgepole pine is 0.5 to 12 meters tall and considered moderately flammable. The lodgepole pine stands vary in density but tend to be moderately dense with an understory of shrubs, grass and forbs that also varies in density but is most often dense. The lodgepole pine stands on the refuge are relatively young; therefore they have a thin layer of litter and duff and the trees have branches low on the trunk.

The beachgrass becomes less dense on its eastward edges as it grades into a transition zone of grass, shrubs and small lodgepole pine. Shrubs in this shrub/lodgepole pine transition zone are 1 to 3 meters in height and form a thick mat composed primarily of *Vaccinium* species and kinnikinnik (*Arctostaphylos* spp.). The lodgepole pines mixed among the shrubs are seedlings and saplings, usually 0.3 to 3.5 meters in height.

The beachgrass community found along the immediate shoreline (from the high tide line to the lodgepole pine) varies in width. The narrower areas of older, well established beachgrass cover taller dunes at the southern end of Leadbetter Point Unit and wider areas of younger, less dense beachgrass cover shorter dunes nearer the tip of Leadbetter Point. Beachgrass forms an almost continuous band of fire fuel along the outer beach of the peninsula. The beachgrass is generally 0.5 to 1.5 meters tall. The beachgrasses are perennial and become dormant in winter, at which time their leaves die and remain attached to the root base. Beachgrass fires produce 6 to 12 foot flame lengths and can spread rapidly in windy conditions. On dunes that are not actively accreting sand, older, more established *Ammophila* beachgrass has less above-ground leaf matter and below-ground biomass than newer *Ammophila* plants growing on the actively accreting foredune (Wallen 1980).

The wet areas, paved roads and parking lots are the only areas on the refuge which do not contain burnable fuels. Fire breaks around the office, residences, and shops are mowed during the summer to

reduce fuels and minimize the chances that a fire would spread to the buildings. Dikes are mowed to improve driving conditions, maintain the structure and reduce the risk of fires from vehicles' hot engine parts and farm equipment.

Thirteen standard National Forest Fire Laboratory (NFFL) fuel models, or vegetation parameters, assist in estimating spatial fuel data for large areas without directly collecting the data by providing suggested reasonable values for each fuel property based upon the stand species composition and site conditions. Representative fuel models were assigned to vegetation types on the refuge (Table 4), based on Anderson's (1982) *Aids to Determining Fuel Models for Estimating Fire Behavior*.

Table 4. NFFL Fuel Models for Vegetation Types on the Willapa NWR.

Refuge Vegetation Type	Estimated Acres	Typical Fuel Complex	Fuel Model
Pastures (grass, excluding beachgrass)	529	Short grass (1 ft)	1
Lodgepole pine	690	Timber (grass and understory)	2
Beachgrass	252	Tall grass (2.5 ft)	3
Freshwater Marsh	247	Tall grass (2.5 ft)	3
Saltwater Marsh	1,599	Tall grass (2.5 ft)	3
Shrub	88	Brush (2 ft)	5
Western redcedar/Sitka spruce (late-successional)	365	Closed timber litter	8
Western hemlock/Sitka spruce/western redcedar forest (young to mature forest)	5,829	Timber (litter and understory)	10
Total Estimated Acres	9,599		

Fire Behavior

Grass fuels in pastures will likely burn quickly until the fire reaches a ditch or moist wetland. Grass fires in managed pastures are not expected to produce tall flame lengths, since the grass is usually short during the fire season. Pastures that have not been grazed, mowed, or hayed could have tall grass that would burn rapidly, producing tall flame lengths. The growth stage of the grass, whether the grass is actively growing or cured, would also effect potential fire behavior.

Fresh and saltwater marsh vegetation does not burn easily, but if ignited will burn less rapidly and more unevenly than pastures. Vegetation in dry elevated areas will burn more readily than lower moist areas in the marsh and will contain longer burning fuels in the form of shrubs and some trees.

Beachgrass areas are highly susceptible to human-caused fires and burn easily and rapidly. When the grass leaves are dry, they burn quickly and produce flame lengths of 6 to 12 feet and large amounts of thick black smoke. Beachgrass fires move quickly with the influence of almost constant coastal winds. A few small, scattered areas of common gorse and Scotchbroom in the beachgrass and lodgepole pine transition area would burn hot and more rapidly than grass and other shrubs in the area, since common gorse and Scotchbroom foliage is highly volatile.

Lodgepole pine forest would burn quickly under normal wind conditions on the peninsula. The ground fire intensity would not be great due to limited ground fuel. Under normal fire season conditions, the potential for crown fires in lodgepole pine is high and the fire would move quickly through the pine. The beachgrass grades into the transition area of small lodgepole pine and shrubs. The shrubs and grass grow into and under less dense pine stands. Young lodgepole pine has lower branches near to the ground and understory vegetation, thereby naturally creating ladder fuels.

The hemlock/spruce/redcedar forest areas have a variety of fuel conditions, irregular topography and occasional natural and man-made fire breaks that will influence fire behavior. Typically, fires in unlogged forested areas burn slowly and unevenly on the ground. Fire is generally carried in the surface fuels composed of litter cast by the shrubs, grasses and forbs in the understory. Shrub fires in this area are generally not intense because surface fuel loads are light, many shrubs are evergreen and the native forest shrub species do not have volatile foliage. During severe fire conditions in areas with logging slash or wind throw and dry fine fuels, intense crown fires can develop and progress. These crown fires can be very intense, fueled by large amounts of long burning fuels on the ground and canopy.

Table 5. Predicted Fire Behavior for Representative Fuel Models on the Willapa NWR.

Fuel Model	Midflame Wind Speed (mph)	Rate of Spread (chains/hr)	Flame Length (ft)	Fireline Intensity (BTU/ft)
NFFL 1 – Short grass	5	8	1	4
	10	25	2	25
NFFL 2 – Timber (grass and understory)	5	40	6.25	320
	10	155	9	600
NFFL 3 – Tall grass	5	115	12.5	1400
	10	260	18	3100
NFFL 5 – Brush (2 ft)	5	8.5	2.5	40
	10	20	5	60
NFFL 8 – Closed timber litter	5	2	1	6
	10	2	1	4
NFFL 10 – Timber (litter and understory)	5	5	3.5	90
	10	16	6.5	350

Effects of Fire on Vegetation and Wildlife

Wildland fires are most likely to occur in areas traversed and used by the public, which are primarily the pastures along the well-traveled county roads in the Tarlatt Slough Unit, beachgrass and lodgepole pine at Leadbetter Point Unit, forested areas along State Highway 101, and forested areas near campgrounds on Long Island. The effects of wildland fire in areas that are likely to have unplanned burns are described below. The effects of suppression activities on threatened and endangered species are explained in the Section 7 Biological Evaluation in Appendix D.

Pastures in the Tarlatt Slough Unit are primarily perennial grasses and forbs that are grazed and mowed in early summer and fall. The vegetation is generally short during the fire season. Fire in these pastures

would not be harmful to the vegetation in the long term. Vegetation in riparian areas would remain somewhat protected from fire due to moist soil conditions.

The fire ecology of coastal dune plant communities in Washington is not well studied. Based on the effects and role of wildland fire in northwestern prairies and their similarity to the plant composition of coastal dune communities, periodic wildfires in the beachgrass, lodgepole pine and transition zone between them probably do not substantially harm plants in those communities. The beachgrasses and dunegrass primarily spread vegetatively through a deep vigorous root and rhizome system. European beachgrass roots can be over 2 meters deep. The above-ground biomass of beachgrass would be consumed by fire and some shallow rhizomes and root bases would be burned or killed. Fire would probably not kill a significant amount of beachgrass, but could be a useful vegetation management tool when used to efficiently remove the above-ground biomass, instead of using time consuming and soil disturbing mechanical means.

Lodgepole pine has a moderate to low degree of fire resistance, and because of its thin bark will likely be killed by most wildland fires, even if it were not consumed in a fire. Fire in older lodgepole pine stands that have more fuel in the understory could easily crown, kill the stand, and consume most of the available above-ground fuels. Ground fuels and the pine stands are not always dense or well distributed; therefore a slow burning fire could burn irregularly on the ground and not crown, in some areas.

The long fire interval of western hemlock/Sitka spruce/western redcedar forest is indicative of the role fire plays in the ecology of these tree species. Western redcedar fire resistance is low to moderate because of its thin bark, shallow root system, low dense branching habit, and highly flammable foliage; however, older trees often survive an infrequent wildland fire because of their large size and thick bark. Western hemlock has a low degree of fire resistance due to the same factors exhibited by redcedar. In addition, hemlock grows in dense stands and often has lichen-covered branches, which increases its susceptibility to fire damage. Sitka spruce is very susceptible to fire damage, due to its thin bark and shallow root system. Small to medium height conifers in the stand understory do provide ladder fuels for the fire to reach the tree crowns. Large crown fires are not typical but can be produced under severe fire conditions.

Old growth western hemlock/Sitka spruce/western redcedar forest is more protected from stand replacing crown fires than younger forest of this type, since the trees are very large with fewer lower limbs, less dense than younger stands, and the understory is less dense and more uneven. The higher density of snags and dead topped trees in old growth do make old growth susceptible to spot fires. The higher density of large downed wood from natural stand thinning and dead trees provides more long-burning fuel at the ground level. There is evidence of small fires less than two acres in size occurring within the old growth area in the last 200 to 300 years. A large stand replacement fire starting in the old growth at Long Island is unlikely but could occur within the old growth under unusual weather and fuel conditions. A stand replacement fire in the old growth is now more likely due to the dense surrounding second growth and its ability to carry a large, hot fire.

Red alder is somewhat fire resistant. Red alder bark is thin but will protect the trees from light surface fires. The foliage and litter do not carry fire well. Red alder stands grow on moist sites and do not burn frequently or easily. Red alder can also regenerate easily from seed or suckers following a fire.

Salal, blackberry and salmonberry are all fire resilient and are not easily killed by fire. These shrubs regenerate vegetatively from extensive roots and rhizomes. They also quickly establish and re-establish in burned areas and other disturbed sites by vegetative means and/or stored seed.

Fire effects on wildlife are variable depending on the vegetation type and the behavior and intensity of the fire. Direct mortality is generally less significant than the effects of habitat changes resulting from the fire. Some species benefit from increased forage which regenerates after a fire, while others are harmed by other factors such as changes in vegetation or increased erosion. Fires in grassland, brush, or forest understory generally have less dramatic effects on wildlife populations than forest stand-replacing fires, which are likely to cause major changes in wildlife communities, with some species increasing and others decreasing or even disappearing from the burned area.

Fires usually cause little direct mortality to animals, except during the spring and early summer when mortality of young may be severe. In coastal Washington, fires are rare during the spring and early summer because of the high rainfall. Adults of large mammals and birds move to avoid the fire, while small mammals, amphibians, and reptiles find refuge underground or in streams. The following discussion will focus on the effects on wildlife of fire-induced habitat changes.

Grass and Brush Fires

These fires tend to be stand-replacing, i.e., virtually all of the above-ground vegetation is killed and often burned away. Grass fires generally have either no effects or short-lived effects on wildlife populations because the habitat replaces itself so quickly. There may be a temporary shift in bird communities, but only fires that are very large and/or repeated at short intervals are likely to have a significant impact on any single species. Grassland bird communities often return to pre-burn status within three years following a fire.

Large mammals typically show either a neutral or a positive response to grass fires. Ungulates may be attracted to burn sites where they graze on the new growth of nutritious grasses and forbs. Large predators such as mountain lions follow. Small mammals show a mixed response. Species such as deer mice (*Peromyscus maniculatus*) and ground squirrels often increase following a burn, while voles decrease.

There is little information available on the effects of grass fires on reptiles and amphibians. Presumably, the effects are minor. Marsh fires may increase the amount of open water and enhance vegetative structure preferred by reptiles and amphibians.

Fish are unlikely to be affected by grass fires at Willapa, because the fires would be relatively small and not result in erosion or excessive nutrient loading of water bodies.

Grass fires could occur in several refuge units, but the greatest potential for a large fire is at Leadbetter Point because of the many acres of dense beachgrass, considerable public use, dry summer weather, and typically strong winds. Western snowy plovers and streaked horned larks would probably benefit from fires, except possibly during the nesting season. They prefer habitat that is sparsely vegetated and fire would remove, at least temporarily, the dense growth of beachgrasses that occupies much of the Point. Ground dwelling birds that nest in shrubs, such as savannah sparrows, would probably decline for a time.

Grass fires could also occur in other refuge units, including Riekkola, Tarlatt, Lewis, and Porter Point. These fires would likely be small (<50 acres) and have minimal effects on wildlife. Fires in the marsh units at Lewis and Porter Point would probably be irregular and spotty in nature and could benefit waterfowl and amphibians by enhancing the interspersion of water and vegetation, as well as reducing undesirable plant species.

Brush fires can have significant effects on bird communities. Shrub nesting species would lose their nest sites unless unburned patches remained. Ground nesting species would probably increase in the years following the fire. The effects of brush fires are prolonged because it may require ten years or more for

the vegetative structure to be restored. Shrub/scrub habitat is limited in extent at Willapa, thus any brush fires are likely to be small and of little consequence to wildlife.

Forest Understory Fires

Understory fires burn surface fuels, brush, and small trees beneath the main forest canopy. These fires (or fires of any type) are uncommon in the hemlock/redcedar/Sitka spruce forests of western Washington and Oregon, thus the interval between burns is long. Understory fires are often patchy in nature because of the uneven distribution of surface fuels and brush. This patchiness reduces impacts to wildlife because islands of unburned habitat remain throughout the fire site.

Infrequent understory fires may cause major changes in bird communities. Shrub dwelling species such as hermit thrush (*Catharus guttatus*) and Hammond's flycatcher (*Empidonax hammondi*) may decline significantly. Woodpeckers may increase in response to greater abundance of wood boring insects in fire-killed understory trees. However, these changes will not occur if substantial patches of unburned habitat remain. Canopy dwelling birds are generally not affected by understory fires.

Large mammals tend to be unaffected by understory fires. Ungulates shift their range temporarily, but return when grasses and forbs sprout. Small mammals, such as shrews, decline if the litter and duff on the forest floor is burned away.

Terrestrial amphibians and reptiles in forests are associated with woody debris and duff on the forest floor. Understory fires that consume much of the debris would have a negative effect on species such as western red-backed, Dunn's, Van Dyke's and northwestern salamanders, although the effect would be minor if the fire were sufficiently patchy. The more aquatic species such as tailed frogs (*Ascaphus truei*) and Columbia torrent and Cope's giant salamanders would be little affected unless large amounts of ash washed into streams.

The effects of understory fires on fish are not well documented. Presumably, there would be little direct effect because the fire would not be intense enough to overheat the water in small streams. Abrupt changes in water chemistry due to ash deposition are unlikely. Indirect effects such as increased erosion and warming due to loss of riparian cover could occur, although to a lesser extent than would be the case with stand-replacing fires. Increased stream temperature and sedimentation would negatively impact fish eggs and fry. Sensitive species that could be affected at Willapa include coastal cutthroat trout and chum and coho salmon that spawn in streams in the Headquarters, Lewis, Long Island, and possibly Leadbetter Point Units.

Forest Stand-Replacing Fires

The fire history of the Willapa Hills is of infrequent (fire interval of several centuries) stand-replacing forest fires. Crown fires carry readily through dense stands of western hemlock. Willapa NWR units with sensitive resources that are vulnerable to stand-replacing fire include Long Island (the redcedar grove and Diamond Point trees are especially sensitive), Leadbetter Point shore pine forest, Teal Slough, and Headquarters.

Large stand-replacing fires cause major changes in habitats and bird communities. Many of the species present before the fire will be replaced by new species. In general, bark probing insect eaters, raptors, aerial insectivores, ground dwellers, and birds of open spaces will increase; and canopy dwellers and birds that reside in old growth forests with abundant understory will decrease.

The fire-killed trees are attractive to a host of wood boring insects, which in turn attract woodpeckers, swallows, nighthawks, and other birds. Over time, cavities develop in the burned trees and provide nesting sites for species such as western bluebirds (*Sialia mexicana*), tree (*Tachycineta bicolor*) and

violet-green swallows (*T. thalassina*), wood ducks (*Aix sponsa*), and northern flickers (*Colaptes auratus*). On the other hand, species that utilize the canopy and/or understory will be greatly reduced or even eliminated. Examples include golden-crowned kinglet (*Regulus satrapa*), western tanager (*Piranga ludoviciana*), yellow-rumped warbler (*Dendroica coronata*), red-breasted nuthatch (*Sitta canadensis*), hermit thrush, Swainson's thrush and Hammond's flycatcher. The marbled murrelet, a federally threatened species, would lose important nesting habitat if the Long Island old growth stands at the redcedar grove and Diamond Point were killed. Potential nesting habitat for the spotted owl would be lost as well. The changes in bird communities resulting from stand-replacement fires can be long lasting. It may take centuries to replace old growth stands.

Large mammals may avoid the burned area for a time. By the first spring after the fire, deer and elk will be attracted to the lush growth of grasses and forbs in newly shade-free areas. Predators such as mountain lions and coyotes will follow. The emergence of berry producing shrubs within a few years will create excellent black bear habitat and provide a food resource for beavers.

Small mammals exhibit a varied response to stand replacing fires. Major population declines would be expected for snowshoe hares, chickarees (*Tamiasciurus douglasi*), and northern flying squirrels (*Glaucomys sabrinus*). Shrews may decline if most of the litter and duff on the forest floor has burned. Species that would benefit from the change from arboreal to ground vegetation include deer mice and Townsend chipmunks (*Eutamias townsendi*). We are not aware of studies of the effects on bats of forest stand-replacing fires. At least some species would probably increase in response to the abundant insects associated with the fire-killed wood, although other species may not prefer the open terrain and thus may leave the area.

Amphibians would respond in either a neutral or negative manner, depending on the species and the severity of the burn. As previously discussed, terrestrial salamanders would decrease if a substantial portion of the duff and debris on the forest floor were burned away. A stand-replacing fire would have potential to adversely affect the more aquatic amphibians, including tailed frogs and torrent salamanders. A very intense fire could heat small water bodies to temperatures that are lethal for eggs and larvae. The loss of overhead shade would result in higher summer stream temperatures, perhaps above the maximum tolerable for aquatic amphibians, for several years following the fire.

The impacts of stand-replacing fires on fish is a relatively new area of research and few results have been published. As was the case with amphibians, increases in water temperature either by direct heating or removal of shade could kill eggs and fry. Detrimental changes in pH and other chemical attributes of the water could result from large amounts of ash washing in. The high rainfall of the Willapa area, coupled with the refuge forests' steep slopes (with the exception of Leadbetter Point), would result in erosion and consequent sedimentation of salmonid spawning streams. Salmonid use of streams at the Headquarters, Lewis, and Long Island Units could be greatly reduced for many years.

Forest Mixed Severity Fires

Mixed severity fires typically alternate between understory and stand-replacement with some unburned areas, leaving a patchwork of vegetative structure. The effects on wildlife are a mix of the effects discussed for understory and stand-replacing fires and depend on the extent of each fire type and the distribution of remaining vegetation. Generally, mixed severity fires have the least impact on wildlife populations, because a mixture of pre-fire habitats remains. A large forest fire at Willapa is likely to be a mixed severity fire.

SUPPRESSION TACTICS

Suppression involves a wide range of possible tactics from the initial attack to final control. All wildland fires will be suppressed. Suppression actions will be conducted in a safe, aggressive, efficient and cost-

effective manner to quickly control the fire with minimal resource damage and limited smoke impacts to local communities.

The Incident Commander is responsible for directing suppression actions to be carried out through orders from the Fire Management Officer. The Incident Commander will keep the Project Leader informed of suppression actions. In addition to consulting with the Project Leader or their representative, a Resource Advisor should be assigned to the incident from the beginning to document rehabilitation needs and assist with on-the-ground tactical decisions.

Typical initial attacks initiated by the refuge will include a two person fire crew supplied with hand tools. The objective of initial attack is to prevent the escape of wildland fires and contain the fire's spread. Adjustments to these dispatch levels may be made at the discretion of the duty officer based on local conditions or initial reports.

In some refuge locations, attempts to suppress a wildland fire could potentially have greater ecological impacts than effects of the fire itself. Actions that could have significant negative effects to resources in certain areas of the refuge are restricted and the decision to use them is governed by key fire personnel. Table 6 identifies restricted suppression actions within the FMUs on the refuge and authorization personnel required for each action. *Suppression actions requiring Resource Advisor (RA) approval will not be conducted without RA approval, unless they are ordered by the Incident Commander (IC) to protect human life and/or structures on government or private land from the threat of wildland fire.*

Table 6. Restricted Suppression Actions Within FMUs and Personnel Authorizing Their Use.

Action	Inside RNAs	Outside RNAs
Off-road vehicular travel	Prohibited in all, except Leadbetter Pt. with RA approval	At IC discretion
Use of heavy equipment	Prohibited in all, except Leadbetter Pt. for certain activities with RA approval	RA approval, except IC can authorize use in pastures without RA approval
Fireline construction by hand	RA approval	At IC discretion, except RA approval in areas with known cultural resources
Fireline construction by dozer	Prohibited in all, except Leadbetter Pt. for certain activities with RA approval	RA approval
Use of fire chemicals (retardants, foams, and gels)	Silvex® and Fire-trol® are prohibited; other chemicals with RA and Project Leader approval	Silvex® and Fire-trol® prohibited; other chemicals with RA and Project Leader approval
Fireline construction by removal of vegetation by discing, mowing, use of chainsaws and/or herbicide	Prohibited in all, except Leadbetter Pt. for certain activities with RA approval	At IC discretion, except RA and Project Leader approval for use of herbicides

All fires will be assessed by the first on-scene Incident Commander and attacked using minimum impact fire suppression tactics for the refuge. Roads and natural barriers will be used as much as possible to reduce fire line construction. Decisions to construct fire line and conduct mop-up through riparian areas and thin soils at Leadbetter Point Unit should include the consideration of long-term damage to vegetation. Tree falling and bucking in mature and over-mature forest should be kept to a minimum and replaced with alternative actions whenever possible (e.g., using fire chemicals to protect snags from burning). Back-fires and burnout operations should consider head fire intensities and attempt to avoid over-heating the soil or allowing the fire to burn into riparian areas. Where wildland fires cross roads, the burned area adjacent to the road should be mopped up and dangerous snags felled. Wetland areas can generally burn without resource damage, and then be suppressed at roadsides or other appropriate locations. Effort will be made to rehabilitate the damages done by suppression activities and the burned area.

Public safety will require coordination between all refuge staff and the IC. Signs and notices should be posted to warn visitors, close trails, control traffic, etc. Where wildland fires cross roads, the burned area adjacent to the road should be mopped up and dangerous snags felled. Every attempt will be made to utilize natural and constructed barriers, including changing fuel complexes, in the control of wildland fire.

Suppression Conditions

A full suppression alternative was selected for this refuge which requires containment and control of all wildland fires. Guidelines discussed under Suppression Tactics have been developed to assist with this strategy while protecting the refuge from unnecessary resource damage. The use of heavy equipment and fire chemicals is restricted due to cultural, habitat, and wildlife concerns and requires consultation with the RA prior to their use. At the Annual Operating Plan Review, issues pertaining to restrictions should be discussed with cooperators. Changes in restrictions and areas of concerns should be documented.

The refuge has primary responsibility for all pre-suppression and prevention activities on refuge lands. Refuge personnel will make immediate initial attack on all fires occurring on the refuge until assistance arrives. All wildland fires will be actively suppressed, but safety will be the first concern in suppression actions.

Fire threatening occupied residences, administrative buildings, shop/storage buildings, and adjacent privately owned structures are to be protected first and controlled at all cost. Structural fire suppression by Service personnel will only be conducted when there is a threat to human life. Service personnel may assist in protecting wild lands around structures, when such actions can be accomplished safely. Second priority suppression areas are recreation facilities, including bathrooms and signs. Protection of permittee cattle, equipment, and habitat is third priority for suppression.

Wildland Fire Situation Analysis

The purpose of the Wildland Fire Situation Analysis (WFSA) is to analyze alternative methods of controlling an extended action to determine the most appropriate management strategy for the fire (See Appendix T for the format of the WFSA). An extended action is a fire that has not been contained or controlled by the initial action forces within the first burning period and continues either until transition to a higher level incident management team is completed or until the fire has been contained or controlled. Damages from the fire, anticipated suppression costs, safety, resource impacts, the probable character of suppression actions, the probable growth of the fire, and social and political consideration are often important considerations and inclusions in the WFSA. The actions needed to protect special natural and cultural resources and provide for public safety are to be documented in the WFSA. The evaluation of alternatives must clearly identify the point at which the failure of the alternative is imminent. Additional guidance for preparation of a WFSA is contained in the *USFWS Fire Management Handbook*, Chapter 3.4. A WFSA will be prepared by the Project Leader and Fire Management Officer. The Project Leader will be the approving official for the WFSA and any of its revisions.

Aircraft Operations

Aircraft may be used in all phases of fire management operations and must be Office of Aircraft Services (OAS) or Forest Service approved. The use of aircraft is directed according to the OAS Aviation Policy Department Manual which can be provided by the OAS. Only qualified aviation personnel with proper personal protection equipment will be assigned to all flight operations.

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; therefore, clearing for new helispots should be avoided. New and improved helispots will be rehabilitated following the fire.

REHABILITATION AND RESTORATION

Fire rehabilitation will be conducted for suppression effects in the burned area, and emergency stabilization. Suppression rehabilitation restores and repairs property and resources from damage caused directly from suppression activities. Suppression rehabilitation may include repairing cut fences, dozer lines, and fire campsites. Burned area rehabilitation restores natural resources and property damaged or impacted by the fire, including burned water lines and denuded hillsides. Stabilization includes efforts to stabilize soil and vegetation from the damaging effects after a fire.

Rehabilitation actions will be directed toward minimizing or eliminating the effects of suppression actions used in controlling the fire, the effects of the fire itself, and the potential hazards caused by the fire. Revegetation efforts will use only locally procured native seed and plants. Rehabilitation actions may include backfilling control lines, scarification and seeding, installing water bars and constructing drain dips on control lines, restoring altered ground contours to their natural form, removing all fire suppression flagging, equipment and litter, restoring fire camp areas and improved helispots, and revegetating sensitive areas impacted by suppression actions.

Suppression Rehabilitation

Rehabilitation of fire suppression damage should be accomplished immediately, generally within 7 days after the fire is controlled, unless the regional fire coordinator grants an extension. Funding for suppression rehabilitation will come from a specific fire cost account established by the Fire Management Officer. The Incident Commander will initiate suppression rehabilitation, after concurrence by the Project Leader. A written suppression rehabilitation plan may be appropriate on larger incidents. Contractors or equipment may be hired to accomplish specialized work.

Emergency Stabilization Versus Rehabilitation

Emergency stabilization is the use of appropriate emergency stabilization techniques to protect public safety and stabilize and prevent further degradation of cultural and natural resources within the perimeter of the burned area and to protect downstream impact areas from erosion and invasion of undesirable species. Appropriate rehabilitation techniques will also be used to improve natural resources, as stipulated in approved refuge management plans, and to repair or replace minor facilities damaged by the fire.

Total rehabilitation of a burned area cannot be done within the scope of the emergency rehabilitation funding. Emergency rehabilitation funding can be used to begin the rehabilitation process, if other funding is committed to continue the rehabilitation throughout the life of the project (beyond the initial 3 years for which emergency rehabilitation funding can be used). Major facilities must be repaired or replaced through supplemental appropriations or other funding.

Burned Area Emergency Stabilization and Rehabilitation Plan

The goal of the Burned Area Emergency Stabilization and Rehabilitation (ESR) Plan is to protect public safety and stabilize and prevent further degradation of natural and cultural resources, and to rehabilitate the stability, productivity, diversity, and ecological integrity of refuge lands after a wildland fire, as described in approved refuge management plans. The ESR Plan is tiered to the refuge Comprehensive Conservation Plan (CCP), Habitat Management Plan (HMP), Fire Management Plan, and operations or step-down plans. Development of the ESR Plan objectives is guided by resource management objectives, general management practices, and constraints identified in an approved CCP, HMP, and/or supporting step-down plans.

If burned area emergency stabilization and rehabilitation is required to reduce the negative effects of a wildland fire, then the refuge should request appropriate funding through the Burned Area Emergency Stabilization and Rehabilitation (ESR) fund. The Service representative at the National Interagency Fire Center administers the ESR fund. A rehabilitation and restoration survey, plan, and request must be prepared and submitted according to agency guidelines. Smaller incidents may only need simple plans prepared by refuge staff.

Larger incidents with extensive rehabilitation efforts should employ an ESR Team to prepare the ESR plan. An ESR Team is composed of personnel who specialize in key resource management disciplines and are experts in ESR Plan preparation. A formal request for an ESR Team should be made in consultation with the Incident Management Team as soon as it appears damage may be significant enough

to require a team, since delays in making a request may hinder funding approval and magnify resource damage. Instructions for ESR Team mobilization can be found in the National Wildfire Coordinating Group mobilization guide. Once an ESR Team is employed, the Project Leader or their representative should provide plan guidance to the ESR team leader. The Project Leader, Biologist, and Fire Management Officer will review all ESR Plans. The final plan will be submitted to the Region for review prior to submission to the Washington Office. Direction on ESR guidelines can be found in the *Fire Management Handbook* Section 5.1.

REQUIRED REPORTING

The IC will be responsible for documenting decisions and completing the fire report. The Fire Management Officer will be responsible for any additional required reports.

FIRE INVESTIGATION

Prompt and efficient investigation of all suspicious fires will be carried out. Fire management personnel will attempt to locate and protect the fire's probable point of origin and record pertinent information required to determine the cause of the fire. Fire personnel will be alert for possible evidence, protect the scene and report findings to the fire Line supervisor. However, fire management personnel should not question suspects or pursue the fire investigation unless they possess a current Law Enforcement Commission qualification to conduct investigations. 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).

PRESCRIBED FIRE ACTIVITIES

PRESCRIBED BURN PROGRAM OBJECTIVES

Prescribed fire is a useful vegetation management tool and can be used to restore and maintain natural vegetation conditions and processes at Willapa NWR. The ecology of naturally caused fires and those started by Native Americans in forest and coastal dune communities on the refuge is not known and not well studied. Although stand replacement wildfires were rare in forests of the area, fire is a part of the ecological processes of most northwestern forest and grass communities.

In the past, prescribed fires were used on the Willapa NWR to aid in pasture restoration, reduce the fire hazard from logging slash, and to dispose of wood and vegetation debris from road and facility maintenance activities. Historically, most prescribed fires were associated with pasture restoration and logging slash removal. See Table 3 for a history of prescribed fire use on the refuge.

There is potential to expand upon the refuge's prescribed fire program, particularly at the Leadbetter Point Unit and in forested areas on Long Island and the mainland. Areas within the large continuous area of non-native beachgrass could be burned to control the invasive beachgrass, reduce hazardous fuel, create fire breaks, and restore the dunes to an open condition suitable for western snowy plovers to nest. Prescribed fire treatment of vegetation debris resulting from forest management practices will need to be evaluated in a forest management plan; although the opportunity exists to safely and effectively conduct slash pile burning. Piles of vegetation debris could also be burned on most areas of the refuge, where dikes, fences and other facilities are maintained.

The current goals of using prescribed fire on the Willapa NWR are to:

- § Restore and maintain native wildlife habitats, particularly habitats of federally threatened and endangered species;
- § Control invasive pest plants;
- § Remove unwanted accumulations of above-ground vegetation matter to facilitate wetland and pasture restoration;
- § Reduce hazardous fuels;
- § Economically dispose of wood and vegetation debris generated from construction projects and from road and facility maintenance activities; and
- § Dispose of vegetation debris from forest management activities (logging slash) to reduce hazardous fire fuels, facilitate tree regeneration, and improve wildlife habitat.

Specific management needs for the refuge as a whole and for specific areas will be revised annually to develop prescribed fire plans for outyears and correspond with area and/or resource management plans (i.e., forest management plan). Specific burn objectives, fire frequency, firing methodology, and prescriptions will vary from year to year, will be developed with the FMO or PFS, and will be documented in the prescribed fire plans. The Project Leader will approve prescribed fire plans for the refuge.

Prescribed fires are a resource management tool used to achieve specific resource management objectives. Actions included in the prescribed burn program include: the selection and prioritization of prescribed burns to be carried out during the year, writing prescribed fire plans, developing burn prescriptions, conducting burn operations, documenting and reporting fire activities, and conducting burn critiques. The following measures will be employed to ensure the successful implementation of the prescribed fire program:

- § Conduct a vigorous prescribed fire program with the highest professional and technological standards;

- § Identify the prescribed burn type most appropriate to specific situations and areas;
- § Efficiently accomplish resource management objectives through the application of prescribed fire;
- § Continually evaluate the prescribed fire program by refining prescriptions, treatments, and monitoring methods and by integrating applicable technical and scientific advancements into the program;
- § Prepare prescribed burn plans that are reviewed by a qualified Prescribed Fire Manager or Prescribed Burn Boss and approval by the refuge complex Project Leader.
- § Conduct prescribed burns with an adequate number of qualified personnel for the burn as well as the mop-up.

The refuge may utilize an interagency team approach for complicated or large area burns carried out on the refuge boundaries or close to developed areas. The most highly qualified and experienced personnel in the regional interagency community would be requested to serve on these fires.

FIRE MANAGEMENT STRATEGIES

Prescribed fire will be used to reduce hazard fuel accumulation, improve wildlife habitat, especially that of endangered and threatened species, control invasive pest plants, and dispose of vegetation and wood debris from maintenance and logging activities. All prescribed fire activity will comply with applicable Federal, state, and local air quality and burning laws and regulations.

All prescribed fire projects will have a prescribed fire plan (Appendix Q). Each prescribed fire plan will be prepared using a systematic decision-making process. The plan will contain measurable objectives and predetermined prescriptions and have approved environmental compliance documents associated with it, including an internal ESA Section 7 consultation document. Separate NEPA documentation and environmental compliance documentation will be required to analyze proposed prescribed fire projects done for criteria not included in this Plan. A prescribed fire plan is currently being developed for burning a small area of beachgrass within snowy plover nesting habitat at Leadbetter Point Unit in 2003 or later.

When fire is to be used to dispose of vegetation and wood debris generated in maintenance and construction activities, the debris burning project will be reviewed by the FMO. Contracts involving the generation or disposal of burnable debris will be developed and conducted in coordination and consultation with a Fire Management Officer. Contracts will specify when and how burnable debris will be disposed. If fire is used to dispose of debris under contract, the refuge FMO must review and approve the contract stipulations related to debris burning. The project/contract must include funding for planning and conducting debris burning and identify the responsible individual(s) for the burning. Burning of hazardous or toxic materials is prohibited.

Fire monitoring will be used to evaluate the degree to which burn objectives are accomplished. Monitoring can assist managers in documenting the successful achievement of overall programmatic objectives and limit the occurrence of undesirable effects in future burns.

PRESCRIBED FIRE PLANNING

Annual Activities

Prescribed fire activities will be reviewed annually. The FMO or PFS 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, a cost summary, utilized personnel, and fire effects on the refuge.

The Fire Management Plan will be reviewed annually. Necessary updates or changes to the Fire Management Plan will be accomplished prior to the next fire season. Any additions, deletions, or changes will be reviewed by the Project Leader to determine if the alterations warrant re-approval of the plan.

Annual prescribed burning activities for which the FMO/PFS is responsible are identified in Table 7. The term "burn unit" refers to a specific tract of land to which a prescribed fire plan applies.

Table 7. Annual Prescribed Fire Activities.

Month	Prescribed Fire Task
July	PFS & Refuge Manager select burn units for next fiscal year and input into FIREBASE
Jul - Aug	Prepare units for current fiscal year's burning; Pack tests, SA-130, practice shelter deployment
Aug - Nov	Burn units
Oct	Renew contracts (if any)
Nov - Feb	Order cache supplies; repair equipment; prepare prescribed fire plans; update fire management plans
Jan	Announce fire crew positions
Mar	Select fire crew positions
Apr - May	PFS and Refuge Manager check cache and equipment for fire readiness
Jun - July	Update contact lists for Smoke Management and/or Prescribed Fire Plans

Prescribed Fire Plans

The Prescribed Burn Boss will conduct a field reconnaissance of the proposed burn location with the PFS, Biologist, and/or Refuge Manager to discuss burning objectives, special concerns, resource management objectives and gather all necessary information to write the prescribed fire plan. After completing the field reconnaissance, a qualified Prescribed Burn Boss will write the prescribed burn plan.

All prescribed fires will have approved prescribed fire plans prior to ignition. The prescribed fire plan is a site specific action plan describing the purpose, objectives, fire prescription, and operational procedures needed to prepare and safely conduct the burn. The treatment area, objectives, constraints, and alternatives will be clearly outlined in the prescribed fire plan. Prescribed fire plans must include components necessary to determine if and when ignition takes place, complete the burn and mop-up, provide communication among fire personnel, ensure safety during the burn, conduct contingency actions

in the event the prescription is exceeded, notify the public of the burn, and evaluate the burn's success. No burn will be ignited unless all prescriptions of the plan are met. Fires not within prescription parameters will be suppressed. Prescribed Fire Plans will follow the format contained in Appendix Q. Each prescribed fire plan will be reviewed by the Refuge Manager, Biologist, PFS, and Burn Boss. The Project Leader will approve prescribed fire plans.

Burn Permits

A burn permit is required from local fire districts to conduct pile or land clearing prescribed burns on refuge lands within the county. Land clearing burning is the burning of trees, stumps, shrubs, or other vegetation generated from land clearing conducted to develop the land, change the land use, or leave the land unused. Burn permits are issued by PCFD #1 for burns within their district.

Burn permits issued to protect air quality, in areas within Pacific County but outside the the fire district's boundary, are issued by Olympic Air Pollution Control Authority. See the Air Quality and Smoke Management Guidelines section for more information on those subjects.

Outdoor burning permits can be obtained at no charge from local fire districts and only cover burning of small piles of vegetation that measure no greater than 4 ft wide x 4 ft long x 3 ft high. A special burn permit from PCFD #1 is required for burning piles larger than the size above and must be requested at least 48 hours prior to burning by calling PCDF #1 at 360-665-4451 between 8 am and 5 pm, Monday through Friday. The PCFD #1 will do a site inspection prior to issuance of a special permit. Burning under any permit is restricted to daylight hours on days with little wind. Piles must be 50 ft from buildings or dunegrass and more than 500 ft from forest slash. Pile burns must be continually attended by a person capable of extinguishing the fire. A shovel and water must be available at the site. Burning piles must be extinguished before leaving them. On the morning of the burn, refuge personnel must call the Pacific County Burn Line at 360-665-3508 to obtain approval to burn that day. Prescribed burns must be closely monitored in areas near the highway to ensure that weather changes do not result in smoke hazards to passing motorists.

Strategies and Personnel

Execution of prescribed burns will only be executed 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. A thorough briefing will be given by the Prescribed Burn Boss to all fire personnel involved in the burn and specific assignments and placement of personnel will be discussed.

Weather and fuel moisture conditions must be monitored closely in the burn units to determine when the prescription criteria are met. When all prescription criteria are within the acceptable range, the Prescribed Burn Boss will select an ignition time based on current and predicted weather forecasts. 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 at planned time of ignition, a test fire will be ignited to determine on-site fire behavior conditions under 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 be allowed to continue.

Contingency actions and requirements will be provided for prescribed fires that have exceeded the approved plan conditions. Minimum contingency requirements will be specified in each prescribed burn plan. 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 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 fire plan. A WFSA will be completed 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 requested from the local cooperating agencies via the servicing dispatch. A management overhead team may be requested to assume command of the fire if the fire has moved to a higher level.

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 and for building a historical record of fire information. Monitoring measures the parameters common to all fires -- fuels, topography, weather, smoke 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.

During prescribed burning, monitoring should include mapping, weather, smoke characteristics and dispersion, 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.

No past monitoring or evaluation of prescribed fires has been conducted on the refuge since the last prescribed fire was attempted in 1991.

Required Reports

All prescribed burn plans will be completed by the Prescribed Burn Boss. A monitor will be assigned to collect all predetermined information and complete all necessary forms prior to, during, and after the burn. All records will be archived in the refuge's main office files for future use and reference.

The Prescribed Burn Boss will prepare a final report on the prescribed burn. Information will include a narrative of the burn operation, a determination of whether objectives were met, weather and fire behavior data, a map of the burn area, photographs of the burn, number of work hours, and final cost of the burn. A copy of the final prescribed burn report will be kept on file at the refuge office.

Prescribed Burn Critique

A report detailing the actual burn will accompany any recommendations for changes in the refuge's fire program. This report will be submitted to the refuge Project Leader. A post-season critique of the fire management program, including the prescribed burn program, will be held each year at the conclusion of the fall fire season.

AIR QUALITY / SMOKE MANAGEMENT GUIDELINES

Smoke management associated with outdoor and land clearing burning in Pacific County is strictly regulated by the Olympic Region Clean Air Agency (ORCAA), the Washington Department of Ecology Air Quality Program, the Washington Department of Natural Resources Smoke Management Program and the Pacific County Fire District #1. ORCAA services Clallum, Grays Harbor, Jefferson, Mason, Pacific, and Thurston Counties. The refuge must abide by all state and local air pollution control requirements; therefore, burning must be done in compliance with state air quality standards established in section 70.94 of the Revised Code of Washington.

No burning permit for air quality purposes is required for the refuge to conduct prescribed burns outside of fire district boundaries; however, burning may be banned or restricted when air quality conditions are unsuitable, as determined by the ORCAA. Burning may be banned for air quality reasons at any time of year, but rarely occurs for any significant periods of time for areas within the county. Prescribed burns will be conducted in such a way as to keep smoke from unreasonably interfering with neighboring land owners' use and enjoyment of their property, as dictated by state law.

FIRE RESEARCH

Prescribed burning may be conducted when necessary to accomplish research project objectives. Although research is not generally an objective of the prescribed burn program. Also, annual fire appropriations have not recently included funding for fire-related research/monitoring and that funding is very limited.

There has been no past or on-going research on the Willapa NWR related to fire or fire-dependent species and ecosystems.

No prescribed burning for research purposes is proposed under this fire management plan.

PUBLIC SAFETY

The Willapa NWR is dedicated to providing for the safety of each visitor and residents and property adjacent to the refuge's boundary. The following measures will be taken to provide for public safety:

- § Residents adjacent to the refuge will be notified in advance of any prescribed burn and if any fire threatens to burn outside the refuge boundaries towards private land (see Appendix N for the landown
- § Public notices of prescribed and wildfire activity and burning bans in effect may be posted at the headquarters, bulletin boards, parking areas and/or interpretive signs, as necessary.
- § Refuge areas may be temporarily closed to public entry, when appropriate to protect public safety, during an
- § During prescribed burns, at least one burn team member will have completed cardio-pulmonary resuscitation and first aid training.
- § First aid kits will be in every vehicle for all fire management activities.
- § Refuge law enforcement officers will coordinate public safety for prescribed burns requiring specific
- § Local law enforcement officials will be notified as necessary regarding wildland fires on refuge lands.

PUBLIC INFORMATION AND EDUCATION

Educating the public on the value of fire as a natural ecological process is important for increasing public understanding and support for the fire management program. The refuge will use the most appropriate and effective means, for example supplemental handouts, signing, personal contacts, or media releases, to explain the overall fire and smoke management program. When deemed necessary, interpretive presentations will be conducted to address the fire management program and explain the role of fire natural resource management.

The public information program related to fire management will be developed as follows:

- § Concepts of the prescribed burn program will be incorporated, as appropriate, in publications, brochures, and handouts.
- § During periods when prescribed burns are conducted, handouts will be prepared and distributed
- § Discussion about the fire management program may be incorporated into visitor contacts,
- § News releases will be distributed to the media as appropriate.
- § The public information outlets of neighboring and cooperating agencies and the regional office
- § The fire management program will be discussed in informal talks with all employees , volunteers,

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residents

Prior to any planned ignition, information will be made available to visitors, local residents, and/or the press about what is scheduled to happen and why and any safety concerns that the public should be aware of. On-site information will be provided to alleviate visitor concern about the apparent destruction of resources by fire, the impairment of views due to temporary smoke, and possible safety concerns for neighboring land. This information will include prescribed burn objectives and control techniques, current fire location and behavior, effects caused by the fire, impacts on private and public facilities and services, and restrictions and closures.

As outlined in the prevention section, emergency closures or restrictions may become necessary during periods of extreme or extended fire danger.

FIRE CRITIQUES AND ANNUAL PLAN REVIEW

FIRE CRITIQUES

Fire reviews will be documented and filed with the final fire report. The FMO and Refuge will retain a copy of the report.

ANNUAL FIRE SUMMARY REPORT

The FMO/PFS 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. A copy of the report will be forwarded to the refuge and will be retained in the main office files.

ANNUAL FIRE MANAGEMENT PLAN REVIEW

This Fire Management Plan will be reviewed annually by the FMO and Refuge Manager. Any recommended additions, deletions, or changes will be reviewed by the Project Leader to determine if proposed alterations warrant re-approval of the plan. Necessary updates or changes to the fire plan will be accomplished prior to the next fire season.

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.

Kirsten Brennan, Wildlife Biologist, Willapa NWR, Pacific Region, USFWS, Ilwaco, WA.

Terri Butler, Refuge Manager, Willapa NWR, Pacific Region, USFWS, Ilwaco, WA.

Larry Chapman, Park Superintendent, Fort Canby State Park, Ilwaco, WA.

Alan C. Clark, Wildlife Biologist, Julia Butler Hansen Refuge for the Columbian White-tailed Deer, Pacific Region, USFWS, Cathlamet, WA.

Thomas O'Donohue, Fire Chief, Pacific County Fire District #1, Ocean Park, WA.

Marie Fernandez, Wildlife Biologist, Willapa NWR, Pacific Region, USFWS, Ilwaco, WA.

Brian Gales, Prescribed Fire Specialist and Zone Fire Management Officer, Finley National Wildlife Refuge, Pacific Region, USFWS, Corvallis, OR.

Glenn "Rico" George, Wildland Urban Interface Program Coordinator, Pacific Region, USFWS, Portland, OR.

Jessica Gonzales, Deputy Project Leader, Willapa NWRC, Pacific Region, USFWS, Ilwaco, WA.

Deborah Jaques, Wildlife Biologist, formerly at Willapa NWR, Pacific Region, USFWS, Ilwaco, WA.

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

James Roberts, Fire Planner, Pacific Region, USFWS, Portland, OR.

Arthur Shine, Outdoor Recreation Planner, Willapa NWRC, Pacific Region, USFWS, Ilwaco, WA.

Charles Stenvall, Project Leader, Willapa NWRC, Pacific Region, USFWS, Ilwaco, WA.

APPENDICES

APPENDIX A. REFERENCES CITED

- Anderson, H.E. 1982. Aids to determining fuel models for estimating fire behavior. USDA Forest Service Gen. Tech. Rep. INT-122. Intermountain Forest and Range Exp. Station, Ogden, UT.
- Buchanan, J.B. and J.R. Everson. 1997. Abundance of shorebirds at Willapa Bay, Washington. *Western Birds* 28:158-168.
- Cassidy, K.M., M.R. Smith, C.E. Grue, K.M. Dvornich, J.E. Cassady, K.R. McAllister, and R.E. Johnson. 1997. Gap analysis of Washington State, an evaluation of the protection of biodiversity. Washington State Gap Analysis Final Report. Vol. 5. Washington Coop. Fish and Wildlife Research Unit, University of Washington. 137pp.
- Franklin, J.F. and C.T. Dyrness. 1973. Natural vegetation of Oregon and Washington. Pacific Northwest Forest and Range Experiment Station, USDA Forest Service, Portland, OR.
- Hartmann, C.E., records librarian at Washington Archaeological Research Center, Washington State University, Pullman, WA. Letter to Robert C. Watson, Refuge Manager at the Lower Columbian River National Wildlife Refuge. January 7, 1976.
- Healy, Jr., M.J. 1999. Teal Slough appraisal: A summary appraisal of nearly 338.5 acres of land located in Pacific County, State of Washington. The Healy Company. Beaverton, OR.
- National Wildfire Coordinating Group. 1996. Resource advisor's guide for wildland fire. PMS 313/NFES 1831.
- Parminter, J. 1983. Fire history and fire ecology in the Prince Rupert Forest region. In: R.L. Trowbridge and A. Macadam, eds. Prescribed fire-forest soils: Symposium proceedings: March 2-3, 1982, Smithers, B.C., Canada. Land Management Rep. No. 16. Victoria, B.C.: Province of British Columbia, Ministry of Forests: 1-35.
- Parminter, J.. 1991. Fire history and effects on vegetation in three biogeoclimatic zones of British Columbia. Pages 263-272 in: S.C. Nodvin and T.A. Waldrop, eds. Fire and the environment: Ecological and cultural perspectives: Proceedings of an international symposium. March 20-24, 1990; Knoxville, TN. Gen. Tech. Rep. SE-69. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southeastern Forest Experiment Station.
- Pringle, R.F. 1986. Soil survey of Grays Harbor County Area, Pacific County, and Wahkiakum County, Washington. U.S. Dept. of Agriculture and Soil Conservation Service Report. 296 pp.
- Rogers, R.E. 2000. The status and microhabitat selection of streaked horned lark, western bluebird, Oregon vesper sparrow and western meadowlark in western Washington. A Master's thesis, Evergreen State College, Olympia, WA.
- U.S. Department of Agriculture, NRCS. 2002. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70974-4490 USA.
- U.S. Fish and Wildlife Service. 1985. Long Island Update No. 1. Willapa National Wildlife Refuge.
- Wallen, B. 1980. Changes in structure and function of *Ammophila* during primary succession. *Oikos* 34:227-238.

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.

Land clearing burning. As stated in WAC 173-425-030, 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). (RCW 70.94.750(2))

Late-successional Forest. Forest with vegetation composition and characteristics typical of the later stages of ecological development for that site and where the dominant trees in the stand are mature and over-mature or old growth.

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 natural 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 the US Forest Service at the Northern Forest Fire Laboratory, Missoula, Montana.

Non-attainment area. A clearly designated geographic area designated by the Environmental Protection Agency which does not meet or contributes to ambient air quality in a nearby area that does not meet a national ambient air quality standard or standards for one or more of the criteria pollutants, which include carbon monoxide, particulate matter (PM-10 and PM 2.5), sulfur dioxide, nitrogen dioxide, lead, and ozone.

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

Silvicultural burning. Outdoor burning related to the following activities and conducted 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 conservation areas, parks, and other wildlife areas. (RCW 70.94.660 (1))

plantsor

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 an undeveloped area.

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 wildfire that moves between wildland and developed land that threatens or involves structures.



APPENDIX C. CATEGORICAL EXCLUSION FOR FIRE MANAGEMENT ACTIONS



U.S. Department of the Interior

U.S. Fish and Wildlife Service

**Willapa National Wildlife Refuge Complex
3888 SR 101, Ilwaco, WA 98624
360-484-3482**

Memorandum

Date: July 30, 2002
To: Files
From: Charles Stenvall, Project Leader
Subject: Categorical Exclusion for Fire Management Actions on the Willapa NWR

Proposed activities and management guidelines contained in the Willapa National Wildlife Refuge Fire Management Plan meet requirements for categorical exclusion under the National Environmental Policy Act (NEPA) revised implementation procedures in the Department of the Interior's Departmental Manual (516 DM 6, Appendix 1, 1.4.B(4, 5 and 10)). The proposed fire management activities are found to individually or cumulatively have no significant effect on the human environment and to not be of significant public controversy. The proposed Fire Management Plan has been coordinated with affected Federal agencies and State and local governments.

Specific fire management objectives addressed in this plan are to:

- < Promote firefighter and public safety while managing wildland and prescribed fires.
- < Protect life, property, and resources from wildland fires at costs commensurate with resource values at risk.
- < Control all wildland fires while meeting identified resource management objectives.
- < Use appropriate suppression tactics and strategies that minimize long-term impacts of suppression actions on natural resources.
- < Use prescribed fire to reduce hazard fuel accumulation, particularly in the Long Island and Leadbetter Point Units of the refuge.
- < Use prescribed fire to restore the habitat of threatened and endangered species
- < Use prescribed fire to maintain refuge dikes and pastures where appropriate and dispose of unwanted vegetation and wood associated with refuge facilities.

A detailed description of the proposed activities can be found in the Willapa National Wildlife Refuge Fire Management Plan, which is kept on file at the Willapa NWR Complex office. The proposed actions and their associated departmental manual citations are explained below.

The Fire Management Plan proposes the use of prescribed burning to (1) restore and maintain native wildlife habitats, particularly habitats for federally threatened and endangered species, (2) control invasive pest plants, (3) remove unwanted accumulations of above-ground vegetation matter to facilitate wetland and pasture restoration, (4) dispose of wood and vegetation debris generated from road and facility maintenance activities, and (5) dispose of vegetation debris from logging activities to reduce fire danger, facilitate tree regeneration and improve wildlife habitat. These actions are categorically excluded from further NEPA analysis as stated in 516 DM 6, Appendix 1, 1.4.B (4 and 5) below:

- (4) The use of prescribed burning for habitat improvement purposes, when conducted in accordance with local and State ordinances and laws.
- (5) Fire management activities, including prevention and restoration measures, when conducted in accordance with departmental and Service procedures.

This new fire management plan contains updated policy for wildfire suppression and prescribed fires on the refuge and updates the previous Fire Management Plan completed in 1991. Updated fire management plans are categorically excluded under 516 DM 6, Appendix 1, 1.4.B (10), as stated below:

- (10) The issuance of new or revised site, unit, or activity-specific management plans for public use,

Charles Stenvall, Project Leader
Willapa National Wildlife Refuge Complex

Date

APPENDIX D1. SECTION 7 BIOLOGICAL EVALUATION: WILLAPA NWR

**Intra-Service Section 7 Biological Evaluation
United States Fish and Wildlife Service
Willapa National Wildlife Refuge**

Originating Official: Charles Stenvall
Telephone: (360)484-3482
Date: January 28, 2003

I. Region: 1 (Pacific)

II. Service Activity (Program):

Implementation of the Wildland Fire Management Plan at Willapa NWR.

III. Pertinent Species and Habitat:

A. Listed species and/or their designated critical habitat within the action area:

Western Snowy Plover (*Charadrius alexandrinus nivosus*)
Bald Eagle (*Haliaeetus leucocephalus*)
California Brown Pelican (*Pelicanus occidentalis californicus*)
Marbled Murrelet (*Brachyramphus marmoratus marmoratus*)
Northern Spotted Owl (*Strix occidentalis caurina*)
Oregon Silverspot Butterfly (*Speyeria zerene hippolyta*)

B. Proposed species and/or proposed critical habitat within the action area: None

C. Candidate species within the action area:

Streaked Horned Lark (*Eremophila alpestris strigata*)

IV. Geographic area or station name and action:

Willapa National Wildlife Refuge, Ilwaco, Washington

The Wildland Fire Management Plan is an operational guide for managing the refuge's wildland fire and prescribed fire programs and complies with a service-wide requirement for refuges with burnable vegetation to develop a fire management plan (620 DM 1). It defines levels of protection needed to ensure safety, protect facilities and resources, and restore and perpetuate natural processes, given the current understanding of the complex relationships in natural ecosystems.

The plan covers wildland fire suppression and using prescribed fire to restore and maintain wildlife habitat on the refuge. The plan sets objectives and describes methodology for using wildland and prescribed fire to meet the mission and goals of the refuge.

The Refuge has no full-time fire staff. Fire management oversight will be provided by the staff and the Washington Department of Natural Resources (DNR) in accordance with the interagency Master Cooperative Fire Protection Agreement.

Prescribed Fire S

This evaluation addresses aspects of the Wildland Fire Management Plan including wildland fire suppression and the use of prescribed fire in refuge units. A separate Biological Evaluation has

been prepared for prescribed burning to restore dune habitat at Leadbetter Point (Willapa NWR 2002).

V. Location (attach map): See Wildland Fire Management Plan for map.

A. County and State: Pacific County, Washington

B. Section, township, and range (or latitude and longitude):

The Refuge is located in T10N, R10W, Sections 5-8, 17-20; T10N, R11W, Sections 1, 2, 10-T14N, R11W, Sections 5, 6, and 9.

C. Distance (miles) and direction to nearest town:

Approximately three miles west to Long Beach, Washington

D. Include species/habitat occurrence on a map, if possible.

See the Wildland Fire Management Plan

VI. Description of Proposed Action:

The overall objectives for fire management on the refuge are to create a program that provides for firefighter and public safety, reduces the incidence of human-caused fires, ensures appropriate suppression response capability to meet expected wildland fire complexity, and increases the use of prescribed fire.

Specific fire management objectives addressed in the Wildland Fire Management Plan are to:

- § Promote firefighter and public safety while managing wildland and prescribed fires.
- § Protect life, property, and resources from wildland fires at costs commensurate with resource
- § Control all wildland fires while meeting identified resource management objectives.
- § Use appropriate suppression tactics and strategies that minimize long-term impacts of
- § Use prescribed fire to reduce hazard fuel accumulation, particularly in the Long Island and
- § Use prescribed fire to restore the habitat of threatened and endangered species
- § Use prescribed fire to maintain refuge dikes and pastures where appropriate and dispose of

suppress

VII. Determination of Effects:

A. Explanation of effects of the action on species and critical habitats in items III. A, B, and C:

Western Snowy Plover. Leadbetter Point is one of only three recent nesting areas for western snowy plover in Washington (USFWS 2001a). This site, at the northernmost tip of the Long Beach peninsula, has been the most important and protected nesting area in the state over the last few decades (WDFW 1995, Willapa NWR data). Human disturbance is comparatively low and symbolic fencing has been used since the 1980's to prohibit access by beach walkers to the prime plover nesting habitat during the breeding season. There are no man-made structures, campsites, or houses within several miles of the traditional breeding area.

Most plover nesting and foraging occurs on the outer ocean beach, from the surf line to the foredune. There is also some use of sparsely vegetated areas inland of the foredune, although

most of the area immediately inland of the foredune has been colonized by the invasive European and eastern American beachgrasses (*Ammophila arenaria* and *Ammophila breviligulata*). These beachgrasses form a band of dense and fairly flammable vegetation along the ocean side of the peninsula, between the open beach and the interior shore pine forest.

A wildland fire at Leadbetter Point is most likely to occur during the relatively dry weather period of late spring to early fall when plovers are nesting and rearing young. Fire suppression activities could involve the movement and staging of personnel and equipment on the beach. This would be a major disturbance to the plovers and could result in nest destruction from trampling or vehicle movements.

Bald Eagle. Bald eagles forage and perch on all refuge units year round. Heaviest use occurs at Leadbetter Point where eagles scavenge carcasses that wash in. Substantial use also occurs at Long Island where there is a nest site (not successful in recent years), Riekkola, Porter Point, Lewis, and Bear River. Fire suppression or prescribed fire activities such as personnel and vehicle movements, heavy equipment operation, and low flying aircraft would likely disturb some eagles. Activities near an active nest could affect reproductive success.

California Brown Pelican. Brown pelicans occur irregularly on the outer beaches at Leadbetter Point in relatively small numbers during the summer and fall. Larger numbers of pelicans have regularly used an area on the eastern side of the tip of the peninsula as a high tide communal roost site since erosion of sand islands in the bay during 2000 and 2001. More than 900 pelicans were counted on the northeast tip of Leadbetter Point in October 2001 (Willapa NWR files). Pelicans are not present during the winter months. A wildland fire at Leadbetter Point is most likely to occur during the spring, summer, or early fall when pelicans are present. Fire suppression activities could involve the movement and staging of personnel and equipment on the beach. Pelicans may be displaced from their normal roosting/loafing areas.

Marbled Murrelet. Murrelets are known to nest in the Cedar Grove on Long Island. They have also been detected exhibiting occupancy behavior in mature forest at Long Island's Diamond Point and the Headquarters and Teal Slough Units (Willapa NWR files). Fire activities such as bulldozing fire lines through stands of mature trees could disturb murrelets and even destroy nest trees.

Northern Spotted Owl. Spotted owls formerly occupied mature forest areas on the Long Island and Headquarters Units. They are not thought to be present at this time, however, the habitat is intact so they could reoccupy. Fire activities such as clearing fire lines could damage spotted owl habitat.

Oregon Silverspot Butterfly. The Oregon silverspot butterfly formerly occurred on the Long Beach Peninsula, including Leadbetter Point. The Recovery Plan (USFWS 2001b) for the butterfly calls for reintroducing them to the area once suitable habitat is established. The refuge recently established an experimental silverspot habitat plot within the shore pine forest at Leadbetter. Silverspot larvae feed almost exclusively on early blue violet (*Viola adunca*). Bulldozing fire lines, operating fire vehicles, etc., could destroy larval habitat. At the present time, there is no known occurrence of the violet on the refuge except for the experimental plot. Future occurrences will be mapped and included in the Wildland Fire Management Plan.

Streaked Horned Lark. Horned larks are present at Leadbetter Point during spring, summer, and early fall, and they are presumed to nest there. The number of nesting pairs is unknown, but it is likely small. Rogers (2000) estimated there were less than 100 pairs in Washington. Nesting

activities begin near the end of March. Horned larks prefer habitat with low, sparse vegetation and abundant bare ground (Rogers 1999, 2000), thus their nesting habitat has undoubtedly been degraded by the invasion of beachgrass. While there is a slight potential that fire suppression activities could destroy nests or disrupt nesting behavior, fire would probably benefit larks by improving the habitat. Rogers (1999) recommended fire as a management tool to benefit horned larks.

Queen of the Forest. (State Threatened) This shrub has not been documented on the refuge, however, it does occur in other areas of Pacific County in habitats similar to some on the refuge. Queen of the Forest is usually found on steep slopes along rocky seeps and small streams. This type of habitat occurs at the Headquarters, Teal Sough, and Long Island units. There would be potential for specimens to be destroyed during firebreak clearing operations. If the plant is found on the refuge, the location will be mapped and included in the Wildland Fire Management Plan.

B. Explanation of actions to be implemented to avoid, minimize, or reduce adverse effects:

Wildland Fire Suppression. Measures to minimize impacts of fire suppression activities to sensitive natural resources (including listed and candidate species) are specified in the Wildland Fire Management Plan, Wildlife Fire Management section, under the heading of Natural Resource Protection. These measures are as follows:

§ Resource Advisor will be required to conduct fire suppression activities on any wildland

§ Minimum impact fire suppression tactics will be used to the fullest extent possible.

§ If new occurrences of state or federally threatened species are discovered during a
from fire suppression activities.

§ Resource Advisor approval is required prior to the use of heavy equipment to construct
Dozer fire lines for wildfire suppression or prevention are not allowed in the
Cedar Grove and Diamond Point RNAs on Long Island. Dozer fire lines for
wildland fire suppression are allowed in the Leadbetter RNA, but should be used
judiciously.

§ In old growth and late seral stage forest at Long Island, Teal Slough, and the Headquarters

§ Resource Advisor approval is required prior to the use of all fire chemicals on the refuge.

- < Fire chemicals will not be applied in or near shorelines, streams, seeps, ponds,
apply these chemicals near water.
- < Fire chemicals will be cautiously used in prescribed fires, such as to protect very
- < Silv-ex® wildland fire foam will not be used on the refuge, since it is more toxic

Prescribed Fires. All prescribed burn plans will be reviewed by refuge biological staff. The refuge biologist will perform the duties of Resource Advisor for the burn. No burns that would harm listed species or their habitats will be conducted. A Biological Evaluation will be prepared for each prescribed burn. The protocols for prescribed fires are given in the Prescribed Fire Activities section of the Wildland Fire Management Plan.

VIII. Effect determination(s) and response(s) requested: [* = optional]

A. Listed species/designated critical habitat:

<u>Determination</u>	<u>Response requested</u>
<input type="checkbox"/> No effect/no adverse modification	<input type="checkbox"/> *Concurrence
<input checked="" type="checkbox"/> May affect, but is not likely to adversely affect species/ adversely modify critical habitat:	<input checked="" type="checkbox"/> Concurrence
Western Snowy Plover (<i>Charadrius alexandrinus nivosus</i>) Bald Eagle (<i>Haliaeetus leucocephalus</i>) California Brown Pelican (<i>Pelicanus occidentalis californicus</i>) Marbled Murrelet (<i>Brachyramphus marmoratus marmoratus</i>) Northern Spotted Owl (<i>Strix occidentalis caurina</i>) Oregon Silverspot Butterfly (<i>Speyeria zerene hippolyta</i>)	
<input type="checkbox"/> May affect, and is likely to adversely affect species/ adversely modify critical habitat	<input type="checkbox"/> Formal Consultation

B. Proposed species/proposed critical habitat: None

C. Candidate species:

<u>Determination</u>	<u>Response requested</u>
<input type="checkbox"/> No effect	<input type="checkbox"/> *Concurrence
<input checked="" type="checkbox"/> Is not likely to jeopardize candidate species:	<input checked="" type="checkbox"/> Concurrence
Streaked Horned Lark (<i>Eremophila alpestris strigata</i>)	
<input type="checkbox"/> Is likely to jeopardize candidate species	<input type="checkbox"/> Conference

IX. Signatures:

Initiating Officer:

Charles Stenvall, Project Leader
Willapa National Wildlife Refuge Complex

Date

Rewriting ESO Evaluation:

- A. Concurrence _____ Nonconcurrence _____
- B. Formal consultation required _____
- C. Conference required _____
- D. Informal conference required _____
- E. Remarks (attach additional pages as needed):

Signature
[Include title/office of reviewing official]

Date

REFERENCES

- Rogers, R.E., Jr. 1999. Natural history: streaked horned lark and land management. Environmental Practice
- Rogers, R.E., Jr. 2000. The status and microhabitat selection of streaked horned lark, western bluebird, Oregon
- United States Fish and Wildlife Service. 2001. Western snowy plover (*Charadrius nivosus*) Pacific coast po
- United States Fish and Wildlife Service. 2002. Oregon silverspot butterfly (*Speyeria zerene hippolyta*) revised m
- Washington Department of Fish and Wildlife. 1995. Washington state recovery plan for the snowy plover.
- Willapa NWR. 2002. Prescribed burning to remove nonnative invasive beachgrass (*Ammophila arenaria*)

APPENDIX D2. SECTION 7 BIOLOGICAL EVALUATION: LEADBETTER POINT PRESCRIBED BURNING

**Intra-Service Section 7 Biological Evaluation
United States Fish and Wildlife Service
Willapa National Wildlife Refuge**

Originating Official: Charles Stenvall
Telephone: (360)484-3482
Date: January 28, 2003

I. Region: 1 (Pacific)

II. Service Activity (Program):

Prescribed burning to remove nonnative invasive beachgrass (*Ammophila arenaria* and *Ammophila breviligulata*) to restore dune habitat at Leadbetter Point, Willapa NWR.

III. Pertinent Species and Habitat:

A. Listed species and/or their designated critical habitat within the action area:

Western Snowy Plover (*Charadrius alexandrinus nivosus*)
Bald Eagle (*Haliaeetus leucocephalus*)
California Brown Pelican (*Pelicanus occidentalis californicus*)

B. Proposed species and/or proposed critical habitat within the action area: None

C. Candidate species within the action area:

Streaked Horned Lark (*Eremophila alpestris strigata*)

IV. Geographic area or station name and action:

Willapa National Wildlife Refuge, Ilwaco, Washington: Leadbetter Point Unit.

A Section 7 Evaluation for mechanical and chemical control of beachgrass to restore snowy plover nesting habitat at Leadbetter Point was previously submitted (FWS Reference 1-3-00-FWI-0346). The present Evaluation builds upon the previous one by adding controlled burning for beachgrass removal and also considering effects on the streaked horned lark which recently became a Candidate species.

The proposed action is to use prescribed burns to remove invasive nonnative beachgrass from snowy plover nesting habitat at Leadbetter Point. The purpose is to improve plover breeding success by restoring high quality nesting habitat behind the foredune that is presently unusable because of the proliferation of beachgrass. Burning would be done in conjunction with mechanical and/or chemical treatment (see Sec. 7 Evaluation # 1-3-00-FWI-0346) of beachgrass regrowth. In some cases, burning to remove the standing cover might follow chemical control. The result would be an increase in the amount of nesting habitat available to plovers. The quality of breeding habitat would also be improved because the rehabilitated areas would be behind the foredune and thus sheltered from the strong wind and blowing sand that often cause the failure of nests on the beach.

V. Location (attach map): See Wildland Fire Management Plan for map.

- A. County and State: Pacific County, Washington.
- B. Section, township, and range (or latitude and longitude): 46E38'N, 124E04'W.
- C. Distance and direction to nearest town:

Approximately 8 miles south to Ocean Park, Washington.
- D. Include species/habitat occurrence on a map, if possible:

See the Wildland Fire Management Plan.

VI. Description of Proposed Action:

The project is expected to be an expanding multi-year effort, requiring annual maintenance of restored areas. The goal is to restore at least 40 acres of native dune habitat at Leadbetter Point by 2005 to benefit western snowy plovers and streaked horned larks. A 2-acre plot where beachgrass was removed during the winter of 2001/2002 attracted nesting plovers the first year. Beachgrass would be removed by a combination of prescribed burning, mechanical removal, and herbicide application. Mechanical and chemical control were considered in the previous Evaluation. The present discussion will focus on the use of prescribed fire.

Three or four small (approximately 1 to 6 acres) plots would be burned to remove the standing crop of beachgrass. Burning would be conducted in accordance with the guidelines in the Willapa NWR Wildland Fire Management Plan. Firebreaks would be established to prevent the fire from spreading beyond the treatment plots. Mechanical (bulldozer, etc.) or chemical (fire retardant) means would be used to create the firebreaks. When retardants are used, the least toxic formulations would be selected and care would be taken to avoid having the chemical enter a water drainage. Subsequent to burning, beachgrass sprouts would be controlled by selective application of the herbicide glyphosate (Rodeo) mixed with LI-700 surfactant. Alternative approaches that might be used would be to (a) first spray the mature beachgrass and then burn to remove the standing dead leaves and stems which otherwise might persist and inhibit plover nesting for up to a year, (b) mow the beachgrass and then burn to remove the mat of stems and leaves, and (c) rip or blade the beachgrass out with a bulldozer, push it into piles, and burn the piles. Burning would take place between September 15 and March 15, outside the expected plover and horned lark breeding seasons. Follow up treatments with chemical or mechanical techniques may occur at any time of year providing the conditions in VII (B) of this document are met.

New plots would be burned in following years until the goal of 40-50 acres of restored habitat is achieved. The restoration program will be evaluated annually to determine if the techniques should be modified.

VII. Determination of Effects:

- A. Explanation of effects of the action on species and critical habitats in items III. A, B, and C:

Western Snowy Plover. Leadbetter Point is one of only three recent nesting areas for Western Snowy Plover in Washington (USFWS 2001). This site, at the northmost tip of the Long Beach peninsula, has been the most important and protected nesting area in the state over the last few

decades (WI

plover nesting habitat during the breeding season (approx. 200 acres). There are no man-made structures, campsites, or houses within several miles of the traditional breeding area.

Habitat changes caused by the encroachment of *Ammophila* may be the most important factor limiting the primary causes for endangerment of the pacific coast population (USFWS 2001). Breeding success at Leadbetter Point over the last decade has averaged less than one chick per pair (Willapa NWR data), and may not be high enough to sustain a viable population (WDFW 1995, USFWS 2001). A solid meadow of beachgrass currently extends to the extreme northern tip of the peninsula, which was formerly an important open nesting area. In recent years, plovers have become increasingly attracted to a newly accreted, privately owned beach north of Willapa Bay (Sundstrom 2000). Plovers have also begun to nest further south along the Long Beach peninsula on state park and private lands (Willapa NWR data). Dispersal of the population to these relatively unprotected areas may reflect the deteriorating habitat conditions on refuge lands. Habitat restoration by removal of beachgrass was recommended in both the federal and state snowy plover recovery plans.

The habitat restoration project is expected to have a positive effect on the population and reproductive success of snowy plovers nesting at Leadbetter Point. Similar efforts in Oregon have been used the first spring that they are available (J. Heaney, pers. comm., Willapa NWR data). Areas where beachgrass is treated with herbicide generally do not offer suitable open habitat until the dead vegetation is burned, mechanically removed, or naturally erodes away- which may take up to a year (D. Segotta, pers. comm., K.Kritz, pers. comm).

Bald Eagle. Small numbers of Bald Eagles occur on the outer beaches at Leadbetter Point year-round. They are expected to relocate a short distance away or return to the same site after the disturbance has passed. Eagles have not been seen using interior beachgrass habitat, therefore no long term displacement during the construction period is expected.

Brown Pelican. Brown Pelicans occur irregularly on the outer beaches at Leadbetter Point in relatively small numbers. More than 900 were counted on the northeast tip of Leadbetter Point in October 2001 (Willapa NWR files). They are easily disturbed by the movement of people and equipment on the beach. Pelicans are not present during the winter months.

Streaked Horned Lark. Horned larks are present at Leadbetter Point during spring, summer, and early fall, and they are presumed to nest there. The number of nesting pairs is unknown, but it is likely small. Rogers (2000) estimated there were less than 100 pairs in Washington. Nesting activities begin near the end of March. Horned larks prefer habitat with low, sparse vegetation and abundant bare ground (Rogers 1999, 2000), thus their nesting habitat has undoubtedly been degraded by the invasion of beachgrass. Control of beachgrass by burning, coupled with mechanical and chemical treatments, would be expected to improve lark habitat. Rogers (1999) recommended fire as a management tool to benefit horned larks.

B. Explanation of actions to be implemented to avoid, minimize, or reduce adverse effects:

Western Snowy Plover. To avoid disturbance to nesting plovers, no burning will take place in areas where plovers are present during the breeding season. Herbicide application will not be conducted within 300 yards of active nests. Surveys of wintering plovers will take place prior to and during the treatment period to document any regularly used roosting and foraging areas. All personnel involved in the project will be educated on typical plover habitat use and will be informed of any particular locations that should be avoided. A biologist or refuge manager will be present on site during most of the restoration activities. Nest success will be monitored each

year to determine the response of plovers to the restoration efforts. Surveys will be conducted according to the refuge protocol approved as part of the 2000 Recovery Permit (WNWR-4, April 11, 2000).

Bald Eagle. When eagles are seen on the beach, equipment operators and others will be instructed to veer away, to the extent safely possible, to avoid displacing birds.

Brown Pelican. When pelicans are seen on the beach, equipment operators and other personnel will be instructed to veer away, to the extent safely possible, to avoid displacing the birds. A 400 meter buffer zone will be established from the traditional roosting area at the northeast tip of the peninsula when large numbers of birds (>50) are present in the general area. No access to that roost site, or other regularly used roost sites that may develop on Leadbetter Point, will be allowed during the period that pelicans are present in Willapa Bay and in potential need of those specific locations. Much of the work will take place during the winter when pelicans are not present in the area.

Streaked Horned Lark. The primary beachgrass control activities would occur between September 15 and March 15, outside of the horned lark nesting period. Horned larks would not likely be present during most of that time (they might start arriving by mid February). Should herbicide application during the spring or summer be necessary, it will be done only if nesting larks are not present on the site. A refuge biologist will determine presence or absence of nests.

No toxic effects from herbicide applications are expected. Glyphosate is practically non-toxic to birds and insects (USFWS 1997, USFS 2000).

Silv-Ex foam fire suppressant, which can cause temporary lethargy and loss of equilibrium in birds, would not be used. Other common fire retardants/suppressants such as Fire-Trol are relatively nontoxic to terrestrial organisms (Finger 2002).

VIII. Effect determination(s) and response(s) requested:

[* = optional]

A. Listed species/designated critical habitat:

Determination

Response Requested

No effect

*Concurrence

May affect, but is not likely to adversely affect species

Concurrence

Western Snowy Plover (*Charadrius alexandrinus nivosus*)
 California Brown Pelican (*Pelicanus occidentalis californicus*)
 Bald Eagle (*Haliaeetus leucocephalus*)

May affect, and is likely to adversely affect species

Formal Consultation

B. Proposed species/proposed critical habitat: None

C. Candidate Species:

Determination

Response Requested

_____ No effect

_____ *Concurrence

 X Is not likely to jeopardize candidate species

 X Concurrence

Streaked Horned Lark (*Eremophila alpestris strigata*)

_____ Is likely to jeopardize candidate species

_____ Conference

IX. Signatures

Initiating Officer:

Charles Stenvall, Project Leader
Willapa National Wildlife Refuge Complex

Date

Reviewing ESO Evaluation:

- A. Concurrence _____ Nonconcurrence
- B. Formal Consultation Required
- C. Conference Required
- D. Informal Conference Required
- E. Remarks (attach additional pages as needed):

Signature
[Include title/office of reviewing official]

Date

REFERENCES

- Castelein, K.A., D.J. Lauten, K.J. Popper, D.C. Bailey, and M.A. Stern. 2000. The distribution and reproductive success of the western snowy plover along the Oregon coast - 2000. Unpubl. Report. The Oregon Natural Heritage Program, Portland, Oregon.
- Finger, S. 2002. Toxicity of fire retardant and foam suppressant chemicals to plant and animal communities. Report for Interior Fire Coordination Committee, Boise, Idaho.
- Heaney, Jim. Wildlife Biologist. BLM. Coos Bay District. Personal communication.
- Jaques, D.L. 2001. Snowy plovers at Leadbetter Point, Washington. 2000 Annual Report. Unpubl. Report. Willapa NWR. Ilwaco. WA.
- Kritz, Kevin. Wildlife Biologist. BLM. Coos Bay District. Personal communications.
- Rogers, R.E., Jr. 1999. Natural history: streaked horned lark and land management. Environmental Practice 1(2):77-78.
- Rogers, R.E., Jr. 2000. The status and microhabitat selection of streaked horned lark, western bluebird, Oregon vesper sparrow and western meadowlark in western Washington. M.S. Thesis, The Evergreen State College, Olympia, WA.
- Segotta, Dan. Forest Botanist, Oregon Dunes National Recreation Area. Reedsport, Oregon. Personal communication.
- Sundstrom, Cyndie. 2001. 2000 Snowy plover surveys in coastal Washington (Moclips - Tokeland). Unpubl. Report. Washington Dept. of Fish and Wildlife, Montesano, WA.
- U.S. Forest Service. 1997. Glyphosate, herbicide information profile. Portland, OR.
- U.S. Fish and Wildlife Service. 1997. Control of smooth cordgrass (*Spartina alterniflora*) on Willapa National Wildlife Refuge. Environmental Assessment. Willapa NWR, Ilwaco, WA.
- U.S. Fish and Wildlife Service. 2001. Western Snowy Plover (*Charadrius nivosus*) Pacific Coast Population Draft Recovery Plan. Region 1. California/Nevada Operations Office.
- Washington Dept. of Fish & Wildlife. 1995. Washington State Recovery Plan for the Snowy Plover. Olympia, WA.

APPENDIX E. REQUEST FOR CULTURAL RESOURCE COMPLIANCE FORM

REQUEST FOR CULTURAL RESOURCE COMPLIANCE

Project Name:

USFWS Unit:

(Office Name and/or Org Code)

Willapa National Wildlife Refuge

Org Code **13552**

Ecoregion: **North Coast / Pacific Islands Ecoregion**

(By ARD; CBE, IPE, KCE, NCE)

Program: Refuges

(Partners, WSECP, Refuges, Hatcheries, Jobs, Federal Aid, Other)

Location:

(nearest town)

County: **Pacific**

State: **Washington**

Township(s) Range(s) Section(s) 7.5' USGS Quad(s): Name, date

Project acres or linear meters/feet:

Date you want to start the project:

Date of this request:

USFWS Contact:

Phone: **360-484-3482**

Address: **Willapa NWR, 3888 SR 101, Ilwaco WA 98624**

Fax: **360-484-3109**

Directions to project: *(if not obvious)*

The Undertaking: *Describe the proposed project and means to facilitate it (e.g., provide funds to revegetate 1 mile of riparian habitat, restore 250 acres of seasonal wetlands, and construct a 5-acre permanent pond). How is the project designed (e.g., install 2 miles of fence and create approximately 25 feet of 3 foot high check dam)?*

Attach to this form:

- ! A **project (sketch) map** showing the Area of Potential Effect with locations of specific ground altering activities *(required)*.
- ! A **photocopy** of the **USGS quad** clearly marking the project area *(required)*.
- ! A **photocopy** of an **air photo** showing the project may be attached *(if available)*.

Area of Potential Effect: *Describe where disturbance of the ground will occur. What are the dimensions of the area to be disturbed? How deep will you excavate? How long is the ditch, fence, etc? Where will fill be obtained? Where will spoil be*

NHPA COMPLIANCE

Appendix _____ Item _____
of the Programmatic Agreement applies.

36CFR800.4 to 800.6 applies.

Cultural Resources Team Date

dumped? What tools or equipment will be used? Are you replacing or repairing a structure? Are you moving dirt in a relatively undisturbed area? Will the project reach below or beyond the limits of prior land disturbance? Differentiate between areas slated for earth movement versus areas to be inundated only. Is the area to be inundated different from the area inundated today, in the recent past, or under natural conditions? Provide acres and/or linear meters or feet for all elements of the undertaking.

Environmental Setting: *Describe the environmental setting of the Area of Potential Effect. A) What was the natural habitat prior to modifications, reclamation, agriculture, settlement? B) What is the land-use history? When was it first settled, modified? How deep has it been cultivated? Grazed? etc. C) What is the land-use and habitat today? What natural agents (e.g., sedimentation, or vegetation) or cultural agents (e.g., cultivation) might affect the ability to discover cultural resources? D) Do you (or does anybody else) know of cultural resources in or near the project area?*

Return form and direct questions to:

USFWS Region 1 Cultural Resources Team, c/o Tualatin River NWR, 20555 SW Gerda Ln, Sherwood, OR 97140
(503) 625-4377 Fax (503) 625-4887

APPENDIX F. PLANT LIST (SPECIES MENTIONED IN THE DOCUMENT)

Scientific and common names shown are those listed in the National PLANTS Database (USDA, NRCS 2002).

* Denotes species not native to Washington.

() Denotes synonyms.

Common Name

Scientific Name

Forbs

American skunk cabbage	<i>Lysichiton americanus</i> (Hutten and St. John)
coastal sand verbena (yellow sand verbena)	<i>Abronia latifolia</i> Eschsch.
Pacific silverweed	<i>Potentilla anserina</i> L. ssp <i>pacifica</i> (T.J. Howell) Rousi
Pacific water-parsley	<i>Oenathe sarmentosa</i>
pondweed	<i>Potamogeton</i> L.
San Francisco bluegrass (ocean-bluff bluegrass)	<i>Poa unilateralis</i> Scribn.(also <i>P. pachypholis</i>)
stinking willie (tansy ragwort)*	<i>Senecio jacobaea</i> L.
vetch	<i>Vicia</i>
Virginia glasswort (American glasswort)	<i>Salicornia virginica</i> L.
water howellia	<i>Howellia aquatilis</i> Gray
water knotweed (water smartweed)	<i>Polygonum amphibium</i> L.
western dock	<i>Rumex occidentalis</i> L. var. <i>fenestratus</i> (Greene) Dorn
white clover*	<i>Trifolium repens</i> L.

Ferns

common lady fern	<i>Athyrium filix-femina</i> (L.) Roth
deer fern	<i>Blechnum spicant</i> (L.) Sm.

Mosses

sphagnum	<i>Sphagnum</i> L.
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Grasses, Sedges and Rushes

American beachgrass*	<i>Ammophila breviligulata</i> Fern.
American dunegrass	<i>Leymus mollis</i> Trin. Pilger
annual wildrice*	<i>Zizania aquatica</i> L.
broadleaf cattail	<i>Typha latifolia</i> L.
colonial bentgrass*	<i>Agrostis capillaris</i> L.
common rush	<i>Juncus effusus</i> L.
common velvetgrass*	<i>Holcus lanatus</i> L.
European beachgrass*	<i>Ammophila arenaria</i> L. Link
inland saltgrass (seashore saltgrass)	<i>Distichlis spicata</i> (L.) Greene
Lyngbye's sedge	<i>Carex lyngbyei</i> Hornem.
meadow foxtail*	<i>Alopecurus pratensis</i> L.
orchardgrass*	<i>Dactylis glomerata</i> L.
shortstem sedge	<i>Carex brevicaulis</i> Mackenzie
slough sedge	<i>Carex obnupta</i> Bailey
spikerush	<i>Eleocharis</i> R. Br.
starwort	<i>Stellaria</i> L.
sweet vernalgrass*	<i>Anthoxanthum odoratum</i> L.
tufted hairgrass	<i>Deschampsia cespitosa</i> (L.) Beauv.

Shrubs

bog Labrador tea
California huckleberry (evergreen huckleberry)
common gorse*
cutleaf blackberry (evergreen blackberry)*
Himalayan blackberry*
kinnikinnik
Oregon crab apple
Pursh's buckthorn (cascara
purshiana)
queen of the forest
red elderberry
red huckleberry
rusty menziesia (fool's huckleberry)
salmonberry
scotchbroom (Scot's broom)*
salal
twinberry honeysuckle (black twinberry)

Ledum groenlandicum Oeder
Vaccinium ovatum Pursh
Ulex europaeus L.
Rubus laciniatus Willd.
Rubus discolor Wiehe & Nees
Arctostaphylos uva-ursi (L.) Spreng.
Malus fusca (Raf.) Schneid
Frangula purshiana DC. Cooper (formerly *Rhamnus*
Filipendula occidentalis (S. Wats.) T.J. Howell
Sambucus racemosa L.
Vaccinium parvifolium Sm.
Menziesia ferruginea Sm.
Rubus spectabilis Pursh
Cytisus scoparius (L.) Link
Gaultheria shallon Pursh
Lonicera involucrata Banks ex Spreng

Trees

Douglas-fir
lodgepole pine (shore pine)
red alder
Sitka spruce
western hemlock
western redcedar
willow

Pseudotsuga menziesii (Mirbel) Franco var. *menziesii*
Pinus contorta Dougl. ex Loud. var. *contorta*
Alnus rubra Bong.
Picea sitchensis (Bong.) Carr.
Tsuga heterophylla (Raf.) Sarg.
Thuja plicata Donn ex D. Don
Salix L.

APPENDIX G. FEDERAL AND STATE LISTED SPECIES FOUND AT WILLAPA NWR.

Table 8. Federal and State Listed Species Found at Willapa NWR.

Common Name	Species	Status*		Habitat(s)	Refuge Unit
		State	Federal		
Animals					
Brown pelican	<i>Pelecanus occidentalis</i>	E	E	off shore in ocean and bay, beaches, shallow islands in bay and mouth of Columbia R.	Leadbetter Pt
Aleutian Canada goose	<i>Branta canadensis leucopareia</i>	T		off shore in ocean and bay, pastures	Leadbetter Pt, off shore of Long Is., Riekkola, Tarlatt Sl.
American white pelican	<i>Pelecanus erythrorhynchos</i>	E		off shore in ocean and bay	Headquarters (off shore of Teal Sl.), probably Leadbetter Pt (unconfirmed)
Bald eagle	<i>Haliaeetus leucocephalus</i>	T	T	ocean beaches, bay, mature and old growth forest	Long Is., Leadbetter Pt, Lewis, Porter Pt, Bear River, Tarlatt Sl, Headquarters (Teal Sl.), Riekkola
Coho salmon	<i>Oncorhynchus kisutch</i>		C	spawning streams	Lewis, Porter Point, Bear River
Columbia torrent salamander	<i>Rhyacatriton kezeri</i>	C		small cold water streams and seeps	Headquarters (Headquarters Stream and Teal Sl.)
Dunn's salamander	<i>Plethodon dunni</i>	C		streams and seeps	Long Is., Headquarters (Teal Sl.)
Marbled murrelet	<i>Brachyramphus marmoratus marmoratus</i>	T	T	mature and old growth forest, ocean, ocean bay	Long Is., Headquarters (Teal Sl.)
Northern spotted owl	<i>Strix occidentalis caurina</i>	E	T	mature and old growth forest	Long Is., Headquarters (Teal Slough)
Peregrine falcon	<i>Falco peregrinus</i>	E	C	ocean and bay beaches, marshes	Leadbetter Pt, Lewis, Porter Pt, Tarlatt Sl., Bear River
Streaked horned lark	<i>Eremophila alpestris strigata</i>	C	C	sparse grasslands	Leadbetter Pt
Van Dyke's salamander	<i>Plethodon vandykei</i>	C		rocky streams, talus, rocks, woody debris near water	Long Is.

Common Name	Species	Status*		Habitat(s)	Refuge Unit
		State	Federal		
					Western snowy plover
Insects					
Oregon silverspot butterfly	<i>Speyeria zerene hippolyta</i>	E	T	coastal grasslands	Leadbetter Pt (no confirmed sightings, future reintroduction site)
Plants					
San Francisco bluegrass	<i>Poa unilateralis</i>	T	C	coastal bluffs, sand dunes, open grassy slopes	Leadbetter Pt (not documented; grows in similar habitats in OR)
Queen of the forest	<i>Filipendula occidentalis</i>	T		upland hemlock forest, rocky slopes	Long Is., Headquarters (not documented; grows in similar habitats in Pacific CO, WA)

* E = Endangered; T = Threatened; C = Candidate.

APPENDIX H. PLANT LIST FOR LEADBETTER POINT, WILLAPA NWR.

Table 9. Species List for Leadbetter Point.

Leadbetter Point: Dunes, beaches, salt marshes, freshwater habitats			
Ferns & Fern Allies			
family	scientific name	common name	note
Lycopodiaceae	<i>Lycopodium clavatum</i>	ground pine	coastal forest
Ophioglossaceae	<i>Botrychium multifidum</i>	leathery grape fern	open dunes
Polypodiaceae	<i>Athyrium filix-femina</i>	common lady fern	freshwater, along sloughs, wet sites
	<i>Polypodium glycyrrhiza</i>	licorice fern	dunes
	<i>Polypodium scolieri</i>	leather-leaved polypody	between young dunes and coastal forest
	<i>Polystichum munitum</i>	swordfern	coastal forest, and old to young dunes
	<i>Pteridium aquilinum</i>	bracken	all habitats except youngest dunes
Conifers			
family	scientific name	common name	note
Cupressaceae	<i>Thuja plicata</i>	western redcedar	older coastal forests, wet
Pinaceae	<i>Picea sitchensis</i>	Sitka spruce	coastal forest, seacliffs
	<i>Pinus contorta</i> ssp. <i>contorta</i>	lodgepole pine (shore pine)	all habitats except outer dunes
	<i>Tsuga heterophylla</i>	western hemlock	older forests, needs wood-based fungi in soil
Monocots			
family	scientific name	common name	note
Cyperaceae	<i>Carex brevicaulis</i>	shortstem sedge	dunes
	<i>Carex cusickii</i>	Cusick's sedge	dunes
	<i>Carex lenticularis</i>	lenticular sedge	brackish wetlands
	<i>Carex lyngbyei</i>	Lyngbye's sedge	edges of salt marshes in tidelands
	<i>Carex macrocephala</i>	big-headed sedge	beaches
	<i>Carex obnupta</i>	slough sedge	freshwater wetlands, common
	<i>Carex pansa</i>	sanddune sedge	old dunes
	<i>Carex phyllomanica</i>	coast stellate sedge	wetlands among dunes
	<i>Carex sitchensis</i>	Sitka sedge	wetlands
	<i>Eleocharis palustris</i>	common spike-rush	marshes
	<i>Eleocharis parvula</i>	small spike-rush	salt marshes, open ground
	<i>Scirpus americanus</i>	three-square bulrush	salt water intertidal
	Iridaceae	<i>Sisyrinchium californica</i>	golden-eyed grass
<i>Sisyrinchium littorale</i>		coastal blue-eyed grass	old dunes, back of salt marsh
Juncaceae	<i>Juncus acuminatus</i>	tapered rush	marshes
	<i>Juncus articulatus</i>	jointed rush	interdunal wetlands
	<i>Juncus balticus</i>	Baltic rush	brackish upper edges of salt marshes
	<i>Juncus bolanderi</i>	Bolander's rush	fresh to salt marshes
	<i>Juncus bufonius</i>	toad rush	open, freshwater marshes

	<i>Juncus covillei</i>	Coville's rush	fresh marshes, formerly considered part of <i>J. falcatus</i> complex
	<i>Juncus effusus</i> var. <i>pacificus</i>	soft rush	damp to wet, common
	<i>Juncus ensifolius</i>	dagger-leaved rush	fresh marshes
	<i>Juncus gerardii</i>	mud rush	salt marshes
	<i>Juncus lesueurii</i>	salt rush	salt to fresh marshes, also lowground among old dunes; wet sandy places
	<i>Juncus pelocarpus</i>	brown-fruited rush	introduced, fresh marshes, very sim to toad rush
	<i>Luzula parviflora</i>	small-flowered woodrush	forests
Juncaginaceae	<i>Triglochin concinnum</i> var. <i>concinnum</i>	graceful arrowgrass	salt marsh
	<i>Triglochin maritimum</i>	seaside arrowgrass	salt marsh
Liliaceae	<i>Lilaea scilloides</i>	flowering quillwort	brackish edge of salt marsh
	<i>Maianthemum dilatatum</i>	false lily-of-the-valley	coastal forest
Orchidaceae	<i>Goodyear oblongifolia</i>	western rattlesnake plantain	coastal forest
	<i>Spiranthes romanzoffiana</i>	lady's tresses	old dunes
Poaceae	<i>Agrostis pallens</i>	dune bentgrass	old dunes
	<i>Agrostis capillaris</i>	colonial bentgrass	introduced, grasslands, old name - <i>A. tenuis</i>
	<i>Agrostis stolonifera</i>	fiorin	introduced, grasslands
	<i>Aira caryophyllea</i>	silver hairgrass	introduced, grasslands
	<i>Aira praecox</i>	little hairgrass	introduced, grasslands
	<i>Alopecurus geniculatus</i>	water foxtail	marshes, open wet sites
	<i>Ammophila arenaria</i>	European beachgrass	introduced, young dunes
	<i>Ammophila breviligulata</i>	American beachgrass	introduced, young dunes
	<i>Anthoxanthum odoratum</i>	sweet vernalgrass	introduced, old and young dunes
	<i>Bromus mollis</i>	soft brome	introduced, young dunes
	<i>Bromus pacificus</i>	Pacific brome	old dunes
	<i>Bromus sitchensis</i>	Sitka brome	old dunes
	<i>Calamagrostis nutkaensis</i>	Nootka reed grass	pine forest near bay, north of old dune
	<i>Deschampsia caespitosa</i>	tufted hairgrass	salt marsh, near upper edge
	<i>Distichlis spicata</i>	salt grass	salt marsh
	<i>Leymus mollis</i>	American dunegrass	all dune prairies, back of salt marshes; former name <i>Elymus mollis</i>
	<i>Festuca arundinacea</i>	tall fescue	introduced, dunes
	<i>Festuca rubra</i> var. <i>littoralis</i>	red fescue	old dunes, back of salt marshes
	<i>Festuca rubra</i> var. <i>rubra</i>	red fescue	old dunes, seacliffs

		<i>Holcus lanatus</i>	common velvetgrass
	<i>Holcus mollis</i>	creeping velvetgrass	introduced, dunes
	<i>Hordeum jubatum</i>	foxtail barley	introduced, salt marsh
	<i>Poa annua</i>	annual bluegrass	introduced, dunes
	<i>Poa confinis</i>	coastline bluegrass	old dunes
	<i>Poa douglasii</i> ssp. <i>macrantha</i>	seashore bluegrass	old dunes
	<i>Poa praetensis</i>	Kentucky bluegrass	introduced, dunes
	<i>Puccinellia pumila</i>	dwarf alkaligrass	salt marsh
	<i>Sieglingia decumbens</i>	heathgrass	introduced, forest
	<i>Spartina alterniflora</i>	smooth cordgrass	introduced, salt water intertidal and salt marsh
	<i>Vulpia bromoides</i>	barren fescue	introduced, dunes
	<i>Vulpia microstachys</i>	small fescue	forests, dunes
Zosteraceae	<i>Zostera japonica</i>	dwarf eelgrass	introduced, saltwater intertidal
	<i>Zostera marina</i>	big eelgrass	saltwater intertidal
Dicots			
family	scientific name	common name	note
Apiaceae	<i>Angelica lucida</i>	seacoast angelica	back of salt marshes
	<i>Glehnia leiocarpa</i>	beach-carrot	open sand, beaches
	<i>Heracleum lanatum</i>	cow parsnip	wet areas, often back edge of salt marsh
Asteraceae	<i>Achillea millefolium</i>	yarrow	dunes
	<i>Agoseris exarata</i>	seaside agoseris	dunes
	<i>Ambrosia chamissonis</i>	silver bursage	beaches
	<i>Anaphalis margaritacea</i>	pearly everlasting	dunes
	<i>Aster subspicatus</i> var. <i>douglasii</i>	Douglas' aster	wetlands
	<i>Chrysanthemum leucanthemum</i>	ox-eye daisy	introduced, dunes
	<i>Cirsium edule</i>	edible thistle	old dunes, back of salt marsh, seacliffs
	<i>Cirsium vulgare</i>	bull thistle	introduced, dunes
	<i>Cotula coronopifolia</i>	brass buttons	introduced, brackish back of salt marshes
	<i>Gnaphalium chilense</i>	cotton-batting cudweed	dunes
	<i>Gnaphalium purpureum</i>	purple cudweed	dunes
	<i>Gnaphalium uliginosum</i>	marsh cudweed	introduced, marsh
	<i>Grindelia integrifolia</i>	gumweed	salt marsh
	<i>Hypochaeris radicata</i>	hairy cat's ear	introduced, dunes
	<i>Jaumea carnosa</i>	jaumea	salt marsh

	<i>Leontodon nudicaulis</i>	hairy hawkbit	introduced, dunes
	<i>Microseris biglovii</i>	coast microseris	dunes
	<i>Senecio jacobea</i>	stinking willie (tansy ragwort)	introduced, dunes
	<i>Senecio sylvaticus</i>	wood groundsel	dunes
	<i>Senecio vulgare</i>	common groundsel	introduced, dunes
		<i>Solidago spathulata</i>	coast goldenrod
	<i>Tanacetum douglasii</i>	seaside tansy	dunes
	<i>Taraxacum officinale</i>	common dandelion	introduced, dunes
	<i>Taraxacum laevigatum</i>	red-seeded dandelion	introduced, dunes
Betulaceae	<i>Alnus rubra</i>	red alder	coastal forest, wet and dry
Boraginaceae	<i>Myosotis laxa</i>	small-flowered forget-me-not	dunes
Brassicaceae	<i>Barbarea orthoceras</i>	American wintercress	back of salt marsh
	<i>Brassica sativa</i>	wild mustard	introduced, wet areas
	<i>Cakile edentula</i>	European searocket	introduced, beaches
	<i>Cakile maritima</i>	American searocket	introduced, beaches
	<i>Capsella bursa-pastoris</i>	shepherd's purse	introduced, dunes
	<i>Honkenya peploides</i>	honkenya	beaches
	<i>Lepidium perfoliatum</i>	clasping peppergrass	introduced, marshes
	<i>Lilaeopsis ranunculoides</i>	lilaeopsis	brackish marshes
	<i>Teesdalia nudicaulis</i>	teesdalia	open sand in dunes
Caprifoliaceae	<i>Lonicera involucrata</i>	twinberry honeysuckle	wetlands
Caryophyllaceae	<i>Arenaria stricta</i>	slender sandwort	dunes, new name <i>Minuartia stricta</i>
	<i>Cardionema ramosissima</i>	sandbur	open sand in dunes
	<i>Cerastium arvense</i>	field chickweed	dunes
	<i>Cerastium vulgatum</i>	common chickweed	dunes
	<i>Cerastium viscosum</i>	sticky chickweed	introduced, dunes
	<i>Sagina maxima</i> ssp. <i>crassicaulis</i>	stick-seeded pearlwort	dunes, seacliffs
	<i>Spergularia canadensis</i> var. <i>occidentalis</i>	Canada sandspurry	upper salt marsh
	<i>Spergularia macrotheca</i>	beach sandspurry	beaches, open sand
	<i>Spergularia marina</i>	salt marsh sandspurry	salt marshes
	<i>Stellaria humifusa</i>	low starwort	salt marshes
	<i>Stellaria longipes</i>	long-stalk starwort	dunes
Chenopodiaceae	<i>Atriplex patula</i>	shore orache	salt marsh
	<i>Chenopodium album</i>	lamb's quarter	introduced, salt marsh
	<i>Salicornia virginica</i>	pickleweed	salt marsh
	<i>Suaeda maritima</i>	seablite	salt marsh, southern end of range
Clusiaceae	<i>Hypericum anagalloides</i>	bog St John's wort	marshes

	Convolvulaceae	Calystegia sepium	Rutland beauty

	<i>Calystegia soldanella</i>	beach morning-glory	beaches; formerly <i>Convolvulus</i>
Cuscutaceae	<i>Cuscuta salina</i>	dodder	salt marsh, primarily parasitic on pickleweed
Ericaceae	<i>Arctostaphylos uva-ursi</i>	kinnikinnick, bear berry	coastal forest, and grassland-forest transition zone
	<i>Gautheria shallon</i>	salal	coastal forest
	<i>Pyrola asarifolia</i>	common pink wintergreen	marshes
	<i>Vaccinium ovatum</i>	California huckleberry	coastal forest
	<i>Vaccinium parviflorum</i>	red huckleberry	coastal forest
Fabaceae	<i>Cytisus scoparius</i>	Scots' broom	introduced, grasslands, disturbed sites
	<i>Lathyrus japonicus</i>	beach pea	open sand, edge of dunes
	<i>Lathyrus littoralis</i>	beach peavine	dunes
	<i>Lotus corniculatus</i>	birds'foot trefoil	introduced, dunes
	<i>Lotus formosissimus</i>	seaside lotus	edge of salt marsh, dunes
	<i>Lupinus littoralis</i>	seashore lupine	open sand, edge of dunes
	<i>Trifolium wormskjoldii</i>	springbank clover	wetter areas in dunes
	<i>Ulex europaeus</i>	common gorse	introduced, grasslands, disturbed sites
	<i>Vicia gigantea</i>	giant vetch	edge of salt marsh
	<i>Vicia sativa</i>	common vetch	dunes, introduced
	<i>Vicia villosa</i>	woolly vetch	dunes
Gentianaceae	<i>Centaurium umbellatum</i>	rosy centauray	introduced, dunes
Malvaceae	<i>Sidalcea hendersonii</i>	Henderson's sidalcea	back of salt marsh
Myricaceae	<i>Myrica californica</i>	Pacific wax myrtle	dunes, esp. pine forests
Nyctaginaceae	<i>Abronia latifolia</i>	coastal sand verbena	beaches
Onagraceae	<i>Epilobium angustifolium</i>	fireweed	dunes
	<i>Epilobium brachycarpum</i>	tall willow-herb	dunes
	<i>Epilobium ciliatum</i> spp. <i>gladulosum</i>	common willow-herb	dunes
	<i>Epilobium minutum</i>	small-flowered willow-herb	dunes
	<i>Ludwigia palustris</i> var. <i>pacifica</i>	water-purslane	seasonal wetlands, sloughs
	<i>Oenothera glazioviana</i>	red-sepaled evening primrose	open sand in dunes
Plantaginaceae	<i>Plantago coronopus</i>	tooth-leaved plantain	edge of salt marsh near slough, introduced
	<i>Plantago lanceolata</i>	ribwort	introduced, dunes
	<i>Plantago major</i> var. <i>major</i>	common plantain	introduced, dunes

		Plantago maritima	seaside plantain
	Plantago subnuda	Mexican plantain	dunes
Plumbaginaceae	Armeria maritima	sea thrift, sea blush	open sand, dunes
Polygonaceae	Polygonum polystachya	Himalayan knotweed	wetter sites
	Polygonum paronchya	black knotweed	dunes
	Rumex acetosella	sorrel	introduced, dunes
	Rumex crispus	curly dock	introduced, salt marsh
	Rumex maritimus	seaside dock	salt marsh
	Rumex occidentalis	western dock	salt marsh
	Rumex salicifolius	willow-leaved dock	dunes, salt marshes
Portulacaceae	Montia parviflora	littleleaf montia	dunes
	Montia perfoliata	miners' lettuce	dunes
Primulaceae	Glaux maritima	saltwort	salt marshes
Ranunculaceae	Ranunculus flammula	creeping spearwort	marshes
	Ranunculus repens	creeping buttercup	introduced, dunes
	Ranunculus scleratus	celery-leaved buttercup	marshes
Rhamnaceae	Rhamnus purshiana	Pursh's buckthorn (cascara)	forests
Rosaceae	Fragaria chiloensis	beach strawberry	dunes
	Malus fusca (Pyrus fusca)	western crabapple	swamps, willow thickets
	Potentilla edgii var. groenlandica	marsh silverweed	back of salt marsh, fresh marshes
	Potentilla palustris	purple cinquefoil	marshes
	Pyracantha coccinea	firethorn	introduced, dune-forest transition zone
	Rosa gymnocarpa	baldhip rose	coastal forests
	Rosa nutkana	Nootka rose	coastal forests
	Rubus armeniacus	Himalayan blackberry	Introduced, dunes, forests (old names- R. procera, R. discolor)
	Rubus laciniatus	cut-leaved blackberry	Introduced, dunes, forests
	Rubus spectabilis	salmonberry	forests, swamps
	Rubus ursinus	Pacific blackberry	old dunes, forests
	Spirea douglasii	hardhack, Douglas' spirea	marshes
Rubiaceae	Galium aparine	goose-grass, cleavers	dunes, introduced
	Galium cymosum	Pacific bedstraw	dunes
	Galium trifidum var. pacificum	small bedstraw	dunes
Salicaceae	Populus balsamifera ssp. trichocarpa	black cottonwood	swamps, only known plant along coast

		Salix hookeriana	Hooker's willow
	Salix lucida ssp. lasiandra	Pacific willow	swamps
	Salix rigida var. mackenzieana	Mackenzie willow	swamps; very long leaves
	Salix scouleriana	Scouler's willow	swamps, hybridizes with Hooker's willow
Scrophulariaceae	Castilleja ambigua	paint-brush owl-clover	former name Orthocarpus castilljoides, back of salt marsh on low plain
	Digitalis purpureum	foxglove	dunes
	Orthocarpus pusillus	dwarf owl-clover	dunes
	Veronica scutellata	marsh speedwell	marshes
Valerianaceae	Plectritis congesta	sea blush	back of salt marsh

APPENDIX I. TREE HARVEST AND POST-HARVEST ACTIVITIES ON LONG ISLAND, 1984 - 1993.

Years in italics indicate the primary year in which the activity took place. These forest management activities were all administered by the USFWS.

Table 10. Tree Harvest and Post-Harvest Activities on Long Island, 1984-1993.

Harvest Unit	Plan Acres	Year Harvested	Year Burned	Notes
C	100	1984 & 1985 & 1986, 1989 downed redcedar salvaged	Oct 1986 slash piles near landings, Jan 1988 slash piles	34 ac of C unharvested due to high alder content (alder mill prices down at the time)
I	31	1985, 1989 & 1990 downed redcedar salvaged		
L	44	1984 & 1985, 1989 & 1990 downed redcedar salvaged	Oct 1986 slash piles near landings	
N	15	1986 & 1987 high lead cable, 1987 & 1989 & 1990 downed redcedar salvaged	Fall 1988 slash piles, Fall 1989 slash piles along roads and landings	
O	67	1986 & 1987 high lead cable, part done by tractor and tractor loader (shovel), 1987 & 1989 downed redcedar salvaged	Fall 1988 slash piles, Oct 1990 slash piles (some piles not burned due to fuel conditions)	O modified in 1987 by adding area north of road to unit R, some standing trees in O were topped after logging to protect from blow down
P	12	1986 & 1987 high lead cable, 1987 downed redcedar salvaged, 1989 helicopter used to salvage downed redcedar in N	Fall 1988 slash piles, Fall 1989 slash piles along roads and landings	
Q	27	1987 high lead cable and tractor loader (shovel), 1987 & 1993 downed redcedar salvaged	Fall 1989 slash piles along roads and landings	Q modified to include 5 acres of S harvested with Q, 6 acres of S outside buffer were harvested in 1993; some standing trees in Q were topped after logging to protect from blow down
B	87	1988 & 1989 cable	Oct 1990 slash piles	

K	59	1988 partly done by tractor shovel and cable, 25 acres harvested in 1989, 1989 helicopter used to salvage downed redcedar, 1990 redcedar salvaged		23 trees topped in K
M	60	1988 by tractor shovel and cable, 1989 helicopter used to salvage downed redcedar, 1990 redcedar salvaged	Fall 1989 slash piles along roads and landings	18 trees topped in M
A	39	1991	1991 slash piles; 1993 slash piles	
D	81	1991	1991 slash piles; 1993 slash piles	wildlife trees topped
J	63	1991, 1991 redcedar salvaged	1993 slash piles	wildlife trees topped
H	38	1991, 1991 redcedar salvaged	1993 slash piles	wildlife trees topped
F	53	1993		
G	80	1993		
T	40	not harvested		40 acres not harvested to buffer redcedar grove from wind throw and fire
R	47	not harvested		Originally R was 72 acres; R was modified in 1987 by adding 25 acres south of the road in R to Unit O; Remaining 47 acres of mature second-growth forest in R was not harvested to buffer redcedar grove from wind throw and prescribed fire in this unit
S	39	not harvested		Originally S was 50 acres; 11 acres of S was added to Q; 39 acres not harvested to buffer redcedar grove from wind throw and fire

---DRAFT---
Memorandum of Understanding
Between
PACIFIC COUNTY FIRE PROTECTION DISTRICT #1
And
U.S. FISH AND WILDLIFE SERVICE

This agreement is made and entered into by the U.S. Fish and Wildlife Service, **Willapa National Wildlife Refuge**, hereinafter referred to as the Service, and the **Pacific County Fire Protection District #1**, hereinafter referred to as the District.

I. AUTHORITIES

The Service has entered into this memorandum of understanding under the authority of the Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66, 42 U.S.C. 1856a-d), which allow the Service to enter into reciprocal agreements with state and local government entities.

[enter District authorities, if any]

II. PURPOSE

The purpose of this agreement is to coordinate and provide *cooperative fire protection* between the Service and District, in order to more efficiently and effectively suppress fires on lands managed by the Service. This agreement may serve as a supplement to existing mutual aid or interagency agreements.

Emergency services that may be requested, other than for *cooperative fire protection*, will require negotiation under a separate authority or agreement. [Is this needed? What other services should be included.. search and rescue?]

III. RECITALS

Whereas both parties have fire protection responsibilities upon lands of their respective jurisdiction, have intermingled and adjoining fire protection responsibilities, and limited fire protection resources.

Whereas the Service has limited specialized equipment and qualified personnel required to fight structural fires.

Whereas the Service is the *jurisdictional agency* responsible for fire protection on Service managed lands.

Whereas the District can provide a fire engine fleet for fire suppression activities within the District's jurisdiction, including suppression of accessible wildland fires on Service lands within and a short distance outside the District's fire protection boundary.

Whereas the District can provide initial attack capability on fires outside the District's fire protection boundary to support and supplement the Service's and other fire protection cooperator's resources.

IV. DEFINITIONS OF TERMS

- A. Annual Operating Plan. This annual plan, also called a dispatch plan, provides detailed direction and information needed for efficient implementation of this agreement and current reimbursable costs for aiding in fire operations.
- B. Cooperative Fire Protection. Specific fire protection services furnished by one party to the other party on a reimbursable basis pursuant to the *Annual Operating Plan*.
- C. Direct Costs. Costs directly related to the *suppression* effort. These costs do not include dispatch or other administrative costs.
- D. Jurisdictional Agency. Agency which has overall land and resource management and/or protection responsibility as provided by Federal or State law.
- E. Overhead Costs. Costs not directly chargeable to *suppression* efforts, but which are part of the overall cost of operation.
- F. Suppression. All work of confining and extinguishing a fire beginning with its discovery.

V. FIRE PROTECTION AND GENERAL PROVISIONS

The Service shall:

- A. Reimburse the District for all reimbursable work performed in the first 48 hours
- B. Payments for reimbursable services under this Agreement shall be made no less frequently than 30 days. When the District performs work or otherwise incurs expenses for which the Service is responsible, the officers-in-charge shall reach agreement on the specific work to be performed. The total cost of such work, including *overhead costs*, will be reimbursed as per the State Marshal Standardized Cost Schedule, Washington Fire Service Mobilization hourly reimbursement rate table, that is updated annually in the Annual Operating Plan. [Is this the correct title of the document for Washington???

The District shall:

- C. Make initial attack on wildfires occurring on Service lands identified for *cooperative fire protection* in the *Annual Operating Plan*
- D. Provide resources as current conditions permit. Assistance will only be provided when the resources are available and can be committed without severely impacting the District's ability to protect it's own jurisdiction.
- E. Adhere to the fire *suppression* and mop-up standards of the Service.
- F. Upon discovering or receiving reports of wildfires on Service lands, report such wildfires promptly to the responsible party as described in the *Annual Operating Plan*.
- G. Forward the necessary fire report data to the responsible Service official identified in the Annual Operating Plan, when the District suppresses wildfires burning wholly or in part on Service lands.
- H. Dispatch only personnel who meet or exceed the minimum training requirements of the National Interagency Fire Qualification System, when the District provides reimbursable cooperative fire protection services to the Service.

Both the Service and District shall:

- I. Meet annually to discuss and prepare an *Annual Operating Plan* prior to the initiation of fire season. The annual operating plan will identify initial attack areas and include protection area maps for all parties,

current rates for equipment use, a list of principal personnel, dispatching procedures, special use permits needed for fire control purposes and other items needed to efficiently implement this agreement.

J. Waive all claims between and against each other which may arise from the performance of work under his Agreement, including compensation for loss or damage to each other's property and personal injury, including death, of employees, agents and contractors. This waiver shall not apply to intentional torts or acts of violence against such persons or property.

K. Remain responsible for the training of their respective fire *suppression* personnel.

L. Agree that the officer-in-charge who arrives first to a wildfire burning on or near lands of both parties will act as Incident Commander. When representatives of both parties have arrived at a fire, the officers-in-charge for each party will mutually agree to designate an Incident Commander.

M. Consider personnel dispatched by the District, under the terms of the Annual Operating Plan, as employees of the District. The District shall be responsible for the training and welfare of personnel they dispatch, including the treatment of any personal injuries which may result on any fire or en route to or from any fire, as provided by the laws and regulations under which each party operates.

N. Each be responsible for operating, servicing, repairing, and replacing their own equipment, except as agreed to in writing and in advance by both parties.

O. Make employees of the District and Service subject only to the laws, regulations, and rules governing their employer, regardless of an incident's location, and shall not make employees entitled to compensation or benefits of any other agency, other than those specifically provided by the terms of their employment.

VI. GENERAL PROVISIONS

P. Neither party shall be bound to make any expenditures under the terms of this Agreement, except as authorized by law.

Q. Parties shall furnish each other or otherwise make available upon request maps, documents, instructions, and law enforcement reports, which either agency considers necessary to conduct work associated with this agreement.

R. Both parties shall comply with all Federal statutes relating to nondiscrimination and all applicable requirements of other Federal laws, executive orders, regulations and policies, including but not limited to: (a) Title VI of the Civil Rights Act of 1964 (42 USC 2000d), which prohibits discrimination on the basis of race, color, handicaps, or national origin.; (b) Title IX of the Education amendments of 1972, as amended (20 USC 1681-1683), which prohibits discrimination on the basis of sex.

S. Either party, through any of their authorized representatives, may have the right and access to examine all books, papers, or documents related to this Agreement.

T. Modification of this Agreement shall be made by mutual consent of the parties, through the issuance of a written modification that is signed and dated by both parties, prior to any changes being performed or taking effect.

U. Either party may terminate this Agreement by providing a written notice to the other, 60 days prior to termination.

V. Unless terminated by written notice this Agreement shall remain in effect for 5 years from the date of execution.

The parties hereto have executed this memorandum of understanding by and through their authorized representatives on the day and year last written below.

Thomas O'Donohue, Fire Chief
Pacific County Fire Protection District #1

Date

Brian Gales, Prescribed Fire Specialist
Pacific Region, U.S. Fish and Wildlife Service

Date

Pam Ensley, Regional Fire Management Coordinator
Pacific Region, U.S. Fish and Wildlife Service

Date

APPENDIX L. WILLAPA NWR WILDFIRE DISPATCH PLAN.

Update plan annually; last updated August 20, 2002.

REPORTING A WILDFIRE

When report of smoke or fire is received get as much information from the caller to fill out the following list:

Fire's Location

§ Location of smoke or fire:

Informant

§ Name and telephone number of caller:

§ Location of caller:

Fire Description

§ Color of smoke:

§ Size of fire:

§ Type of Fuel:

§ Character of fire (running, creeping, smoldering, spotting, etc.):

§ Anyone trying to tend or suppress the fire?

§ Anyone in the area or vehicles leaving the area?

DISPATCH CHECK LIST

1. Check map location and ownership/protection status.
2. *If fire is on or threatening refuge* dispatch at least two qualified staff and possibly a small (200 gal.) pumper.
3. *If fire is not on or threatening refuge*, notify Washington DNR at 1-800-527-3305.
4. Notify Washington Department of Natural Resources at 1-800-562-6010
Report the information collected above on the fire.
5. Notify Project Leader, Deputy Project Leader and Refuge Manager.
6. Notify Fire Management Officer, Brian Gales
7. Assign a station dispatcher to maintain a log of all radio and telephone communications.
8. As long as the fire is not contained, have at least one refuge employee remain on duty and dispatch or provide assist

SUPPORT ITEMS

See Appendix N for Neighboring Land Owners Contact List.

REFUGE PERSONNEL AND FIREFIGHTING QUALIFICATIONS

<u>Name</u>	<u>Position</u>	<u>Office Phone</u>	<u>Home Phone</u>	<u>Pager/ Cell Phone</u>	<u>Fire Qualifications</u>
Charles Stenvall	Project Leader (WLP)	360-484-3482	360-484-3650	360-751-1662	
Jessica Gonzales	Deputy Project Leader (WLP)	360-484-3482	360-665-2594	none	
Angie Chapman	Office Admin. Assistant (WLP)	360-484-3482	360-465-2143	none	
Deanna Wilson	Purchasing Agent (WLP)	360-484-3482	360-484-3159	none	
Art Shine	Outdoor Rec Planner/LE (WLP)	360-484-3482	360-642-8792	503-791-6611	Firefighter Type 2 Crew Boss Engine Boss
Terri Butler	Refuge Manager (WLP)	360-484-3482	360-642-8918	503-791-4840	Firefighter
Royce Baxter	Maintenance Worker (WLP)	360-484-3482	360-642-3553	360-751-2251	Firefighter
Jonathan Bates	Eng. Equip. Operator (WLP)	360-484-3482	360-484-7749	360-751-1353	
Don McGuigan	Eng. Equip. Operator (WLP)	360-484-3482		541-945-8808 pers. cell	
Marie Fernandez	Wildlife Biologist (WLP)	360-484-3482	360-642-5033		Firefighter
Kirsten Brennan	Wildlife Biologist (WLP)	360-484-3482	360-484-3180	360-751-2252	
Joel David	Refuge Manager (JBH)	360-795-3915	360-795-8008	360-430-9582 pager: 360-439-1902	Firefighter
Al Clark	Wildlife Manager (JBH)	360-795-3915	360-795-3905	360-749-3696	
Calvin McFall	Eng. Equip. Operator (JBH)	360-795-3915	none	360-749-3155	
Tom Kollash	Wildlife Biologist (JBH)	360-795-3915	503-325-4843	360-749-3577	

FIRE MANAGEMENT CONTACT LIST

<u>Fire Management Agency</u>	<u>Phone Numbers</u>
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Willapa NWR 3888 SR 101, Ilwaco, WA 98624	360-484-3482 360-484-3109 fax
Pam Ensley USFWS, Regional Fire Management Coordinator	503-2316174 Portland office
Forest Cameron USFWS, Refuge Supervisor	503-872-2723 Portland office 503-807-7568 home
Washington Department of Natural Resources Central Region 1405 Rush Rd., Chehalis, WA 98532-8763	1-800-562-6010 to report fires or 1-800-527-3305 at this number, Press 0 to report a fire; Press 1 for directory, then 1 again for Central Fire Region Office (Chehalis Direct Phone: 360-748-2383) Press 2 for industrial fire precaution requirements by region
Washington Department of Natural Resources Fire Regulation & Outdoor Burning Program Coordinator P.O. Box 47037, Olympia, WA 98504-7037	(360) 902-1754 fax (360) 902-1757
Olympic Region Clean Air Agency 2940-13 Limited Lane NW, Olympia, WA 985032	360-586-1044, 1-800-422-5623
Washington Department of Ecology Air Quality Program P.O. Box 47600, Olympia, WA 98504-7600	360-407-6889
Pacific County Burn Information Line	360-665-3508
Ilwaco Fire Department 301 SE Spruce St. P.O. Box 342, Ilwaco, WA 98624	360-642-3145 or 911 fax 360-642-3155
Long Beach Fire Department N 7 th & Washington P.O. Box 537, Long Beach, WA 98631	360-642-3688 or 911
Raymond Fire Department 212 Commercial St, Raymond, WA 98577	360-942-3442 fax 360-942-2531
Thomas O'Donohue, Fire Chief Pacific County Fire District #1 Ocean Park Station, 26110 Ridge Ave P.O. Box 890, Ocean Park, WA 98640	360-665-4451 fax 360-665-4909 email: chief@pcfd1.org
Pacific County Fire District #2 Chinook Valley, Valley & Hwy 101 P.O. Box 235, Chinook, WA 98614	360-77-8209
Pacific County Fire District #3 Raymond 212 Commercial St., Raymond, WA 98577	360-942-3442 fax 360-942-2531

Pacific County Fire District #4 Naselle, Junction SR 4 & 401 P.O. Box 54, Naselle, WA 98638	360-465-2835
Ocean Beach Hospital	1-800-611-1875
Washington Dept. of Transportation - Raymond	360-942-2092 Report road issues
Public Utility District No. 2	360-484-7212 Report electrical issues
Federal Occupational Safety and Health Administration (OSHA)	1-800-321-6742 Report employee fatalities or hospitalization of >3 employees

APPENDIX M. WILLAPA NWR RADIO FREQUENCIES AND USE POLICY

Revised July 17, 2002

Radio Assignments

Portable radios are assigned to all permanent field staff. Other staff are assigned radios on an “as needed basis.” Twelve radios are currently assigned to Willapa Refuge and seven to Julia Butler Hansen Refuge. Radios will be moved between refuges for specific projects as needed.

Base Station Monitoring

The base station at the Willapa Office will be monitored during normal work hours from 7:30 a.m. to 4 p.m. daily. The administrative assistant or a designate will be responsible for monitoring radio traffic. As a backup, the Refuge Manager or a designate at JBH Refuge will, when practical, maintain radio contact.

Frequency Use and Monitoring

“FWS A” will be the standard frequency used for most refuge radio traffic. “FWS D” may be used as a backup or secondary channel to “FWS A.” Both of these are direct (radio to radio) communication frequencies that do not use repeaters. Over longer distances, the “Radar A” repeater channel will be the standard frequency used. Since the “FWS A” and “FWS D” and “Radar A” channels are on different frequencies, all channels should be monitored using the scan feature. “Radar D” will not work until the repeater site is upgraded to a digital format. The Larch Mtn. Repeater, “Larch A”, near Vancouver may be used for communication in the areas upriver of JBH Refuge, including the Wallace, Crimms, Lord and Walker Island areas.

Radio Programming

The radios can be field programmed by the designated Radio Communications Officer (currently the Refuge Manager at Julia Butler Hansen Refuge). Before programming frequencies of other agencies or organizations into the refuge radios, written permission will need to be obtained from the agency whose frequency is being used.

Radio Equipment Storage

Radios will be stored in a secure location when not in use. Unassigned radios should be stored in a locked or otherwise secure area. Generally, one area in each maintenance shop and one area in each headquarters should be designated as a centralized portable radio site. Each centralized site will have radio chargers, extra batteries, and copies of the radio user guides. Programming software, computer programming cable and a cloning cable are located at the JBH Refuge headquarters.

WILLAPA NWR COMPLEX RADIO CALL SIGNS

Revised July 2002

WILLAPA NWR

JBH NWR

Base	W30		Base	C40
Project Leader-Stenvall	W21		Refuge Manager-David	C41
Deputy Project Leader-Gonzales	W22		Maintenance-McFall	C42
Admin. Officer-Chapman	W23		Maintenance 2-	C43
Purchasing Agent-Wilson	W24		Maintenance 3-	C44
Boat Operator-Zavodsky	W25		Temp. 1- Aaron David	C45
Boat Operator-McClain	W26		Biologist-Clark	C46
Refuge Manager-Butler	W31		Biologist-Kollash	C47
Boat Operator-Bates	W32		Non-Refuge Call Signs:	
Maintenance-McGuigan	W33		USFW Law Enf.- Ed Wickersham	J225
Maintenance-Baxter	W34		DNR Sign-off	KE9669
Maintenance Temp.-	W35		WDFW-Jay Brightbill	Wildlife 97
Biologist-Fernandez	W36		WDFW-Pat Miller	Wildlife 900
Biologist-Brennan	W37		WDFW Law Enf.-Mike Cenci	Wildlife 23
Recreation Planner-Shine	W38		WDFW Law Enf.-Dan Bolton	Wildlife 201
YCC Crew Leader- Lanz	YCC1		WDFW Terri Ray-Smith	Wildlife 171
			WDFW Dan Chadwick	Wildlife 170

WILLAPA NWR COMPLEX RADIO FREQUENCIES

ZONE USFWS

Name	Description	Type/Area	Frequency
FWS A	Refuge Direct	Analog	
Radar A	Government repeater on Radar Ridge, WA	Analog, Naselle	
Radar D	Government repeater on Radar Ridge, WA	Digital, Naselle	
Larch A	Government repeater on Larch Mtn, WA	Analog, Vancouver	
Larch D	Government repeater on Larch Mtn, WA	Digital, Vancouver	
Captl A	Government repeater on Capitol Pk, WA	Analog, Olympia	
Captl D	Government repeater on Capitol Pk, WA	Digital, Olympia	
User 1	Open frequency		
User 2	Open frequency		

Marine 06	Marine safety		
Marine 16	Marine distress		
Marine 22	Coast Guard information		
Marine 68	Cathlamet Marina, WA		
WX 1	National Weather Service Astoria		
WX 2	National Weather Service Olympia		
FWS D	Refuge Direct	Digital	
FWSold	Ridgefield Direct, Old complex frequency		

ZONE STATE

Name	Description	Type/Area	Frequency
DNRCOM	DNR Direct Channel		
STATECOM	State Interagency Channel		
DNRABNTY	DNR Repeater at Abernathy Mtn, WA		
DNRNICOL	DNR Repeater at Mt. Nicholai, WA		
DNRLARCH	DNR Repeater at Larch Mtn., WA		
DNRRADAR	DNR Repeater at Radar Ridge, WA		
COMRADAR	DNR Common Repeater at Radar Ridge, WA		

ZONE PHONE

Name	Description	Type/Area	Phone No.	Frequency
RADARPHO	Gov't Repeater Phone Patch to Radar Ridge	Analog	360-875-9439	
LARCHPHO	Gov't Repeater Phone Patch to Larch Mtn.	Analog	360-750-7082	
CAPTLPHO	Gov't Repeater Phone Patch to Capital Peak	Analog	360-586-5300	

WILLAPA NWR COMPLEX RADIO REPEATER INSTRUCTIONS

RADIO TO RADIO

1. Turn Scan off and Select **Radar A** or **Larch A** channels.
2. Make certain green transmit light on radio is off before proceeding. (Note: When the light is on, someone else is
3. Hold transmit button in and press "1" on key pad and then release transmit button.
4. Wait another ½ second and then press transmit button and enter "023" on the key pad and release transmit button.
5. When radio rings press transmit button to stop ringing and call unit number you are trying to reach.
6. After you punch in the "023" be aware that all complex radios will ring. (Note: Any non-refuge unit with the proper f
7. Press the "#" on the key pad to terminate the connection. Listen for 3 beeps which is the termination signal for the rep

RADIO TO PHONE

1. Turn Scan off and Select **RADARPHO** or **LARCHPHO** Channel.
2. Make certain green transmit light on radio is off before proceeding. (Note: When the light is on, it means someone
3. Hold transmit button in and press "*" on key pad; release transmit button and wait for a dial tone.
4. Press transmit button. Enter "9" on the key pad; release transmit button, wait for second dial tone.
5. Press transmit button and then dial the local number or a calling card number to dial a long distance.
6. When using a calling card you will need to wait for a tone and then enter a calling card number, wait again, and then c
7. Press the "#" on the key pad to terminate the connection. Listen for 3 beeps which is the termination signal for the rep

Notes

- (Local calls for the 875 prefix cover the Nasalle/South Bend area including the Willapa NWR Office. The JBH Office
- (You must begin dialing the desired phone number within six seconds.
- (If you are on hold, key the transmit button every 15 seconds to maintain the connection
- (The phone connection has an automatic hangup after 10 minutes.
- (If you get a busy signal, or if the party you are talking to hangs up before you do, use the "#" button to terminate the

PHONE TO RADIO

1. Dial the phone number for the **RADAR RIDGE** or **LARCH MTN REPEATER**.
2. When the tone is heard dial "023". (Note: Any non-refuge unit with the proper frequency will be able to monitor y
3. After four rings wait five more seconds for the user to answer. The repeater will disconnect automatically if there is no answer.

Notes

- * All Complex Radios will ring when using "023".
- * The **RADAR A** and **LARCH A** channels should be used to monitor phone calls.

APPENDIX N. NEIGHBORING LAND OWNER CONTACT LIST

Land owners bordering the refuge and within one quarter mile are included in this list. Tract numbers on County Assessor’s maps are listed in parenthesis. "Acres Owned" shows figures from the Willapa NWR Additions Environmental Assessment; figures in parentheses are County Assessor acres. The phone number listed for businesses is either for the main office or specific for reporting fires. Information regarding structures on the property is based on visual observations from public roads and topographic maps; this information has not been verified.

Table 11. Neighboring Land Owner Contact List.

Legal Location	Tract # on Map	Owner’s Name and Address	Phone Number	Acres Owned	Structures on Property	Neighboring Refuge Unit
T11N, R10W, S22, NWNW	2c (Lot 4)	WA State-Dept of Natural Resources Resources Protection Division 1111 Washington St. SE Olympia, WA 98504-7037	360-902-1300	27	none	Headquarters
T11N, R10W, S22, S½ of NW & SW		Lincoln Timber LLC (Cathlamet Timber) One SW Columbia St., #1720 Portland, OR 97258		280	none	Headquarters
T11N, R10W, S16, SWSW	2d (Lot 7)	WA State-Dept of Natural Resources Resources Protection Division 1111 Washington St. SE Olympia, WA 98504-7037	360-902-1300	10 (8)	none	Headquarters
T11N, R10W, S16, SESW	(Lots 5,6)	Harlan H. Herrold, Jr. 4109 SR 101 Ilwaco, WA 98624	360-642-2933	35	Residence Oyster business	Headquarters
T11N, R10W, S28, NE¼ and S½		The Nature Conservancy 217 Pine St., Suite 1100 Seattle, WA 98101	800-964-0636	480	none	Headquarters
T11N, R10W, S29, SWSW	78a (Lot 9 N.of SR 101)	Peter G. Heckes P.O Box 27 Oysterville, WA 98641	360-665-4409	16 (14)	none	Headquarters
T11N, R10W, S29, SWSW	78b (Lot 9)	Peter G. Heckes P.O Box 27 Oysterville, WA 98641	360-665-4409	5	none	Headquarters
T11N, R10W, S29, SW	85a, 85b	<i>(Sale to Service pending as of 5/2002)</i> Mid-Valley Resources, Inc. 42235 Old Hwy 30 Astoria, OR 97103	503-458-6970	177	none	Headquarters
T11N, R10W, S32, S½ of SW, SWSE	83 (Incl. Lot 4)	The Nature Conservancy 217 Pine St., Suite 1100 Seattle, WA 98101	800-964-0636	130	none	Headquarters

Legal Location	Tract # on Map	Owner's Name and Address	Phone Number	Acres Owned	Structures on Property	Neighboring Refuge Unit
T11N, R10W, S32, N½ of NW¼	83a, 83b (Incl. 01)	The Nature Conservancy 217 Pine St., Suite 1100 Seattle, WA 98101	800-964-0636	71	none	Headquarters
T11N, R10W, S32, S½ NW¼, N½ of SW¼	86, 86a (Incl. Lots 2 and 3)	Lincoln Timber LLC One SW Columbia St., #1720 Portland, OR 97258		140	none	Headquarters
T11N, R10W, S33, NENW; S½ of NW¼, SW¼, NE¼, SE¼		Lincoln Timber LLC One SW Columbia St., #1720 Portland, OR 97258		600	none	Headquarters
T10N, R10W, S5, N½ of NE¼, NWNE		The Nature Conservancy 217 Pine St., Suite 1100 Seattle, WA 98101	800-964-0636	119	none	Headquarters
T10N, R10W, S5, NWNW east of Hwy 101	84, 84a	Wilbur and Claire McCollum 217 Skees Rd Raymond, WA 98577	E. McCollum 360-934-8329	17, 12	none	Headquarters
T10N, R10W, S½ of S5, SWNW and SENW	incl. 82, 82b, 82c, rock pit	Bear River Investments, LLC j Fred Pickering 21546 NE Lucia Falls Rd Yacolt, WA 98675	360-686-3108	450	none	Bear River
T10N, R10W, S7, W½ of SW¼		Cathlamet Timber Co One SW Columbia St, #1720 Portland, OR 97258		79		Bear River
T10N, R10W, S8, W½	85 and 82	Bear River Investments, LLC j Fred Pickering 21546 NE Lucia Falls Rd Yacolt, WA 98675	360-686-3108	236	Possible residence	Bear River
T10N, R10W, S8, NE¼		Mid-Valley Resources, Inc. 42235 Old Hwy 30 Astoria, OR 97103	503-458-6970	160	none	Bear River
T10N, R10W, S8, SE¼		Lincoln Timber LLC (Cathlamet Timber) One SW Columbia St, #1720 Portland, OR 97258		160	none	Bear River
T10N, R10W, S17, NESW and SESW		Tracy H. Bacon 75 Ronald Ct Ramsey, NJ 07446	James Bacon 201-825-0229	80	none	Bear River
T10N, R10W, S17, E½		Lincoln Timber LLC (Cathlamet Timber) One SW Columbia St, #1720 Portland, OR 97258		320	none	Bear River
T10N, R10W, S17, NW¼		Bear River Investments, LLC j Fred Pickering 21546 NE Lucia Falls Rd Yacolt, WA 98675	360-686-3108	160	none	Bear River

Legal Location	Tract # on Map	Owner's Name and Address	Phone Number	Acres Owned	Structures on Property	Neighboring Refuge Unit
T10N, R10W, S17, part of SWSW	(1)	Raymond J & Jeanette A Provo 39 Jeldness Rd Ilwaco, WA 98624	360-642-2667	5	Residence	Bear River
T10N, R10W, S18, part of NESE	2a	WA State - Dept of Natural Resources Resources Protection Division 1111 Washington St. SE Olympia, WA 98504-7037	360-902-1300	3	none	Bear River
T10N, R10W, S18, part of SWNE and SWSE	(Bal of 002)	Raymond J. Provo 39 Jeldness Road Ilwaco, WA 98624	360-642-2667	32	Residence	Bear River
T10N, R10W, S18, part of SWSE	(003)	Kimberly Huey P.O. Box 238 Ilwaco, WA 98624	?	0.7	Residence	Bear River
T10N, R10W, S18, part of SWSE	(Bal of 003)	Robert B. Provo 39 Jeldness Road Ilwaco, WA 98624	?	10	Residence	Bear River
T10N, R10W, S18, part of SESE	(4)	Raymond J & Jeanette A Provo 39 Jeldness Rd Ilwaco, WA 98624	360-642-2667	26		Bear River
T10N, R10W, S18, part of SWNE	(004)	Charles and Carol Williams 10427 87 th Avenue Court E Puyallup, WA 98373-3921	253-848-9392	5		Bear River
T10N, R10W, S18, part of SWNE	(005)	Kevin & Monica Nolan 3435 Airborne Road ST GTE #550 Wilmington, OH 45177-9390	?	13		Bear River
T10N, R10W, S18, part of SWNE	(006 & 007)	Theresa M. Tutupalli 1131 Stanton Way Stockton, CA 95207	?	15		Bear River
T10N, R10W, S18, part of S½ of SE¼, part of N½ of SE¼	(008)	Raymond James Provo 10787 Vista Valley Dr. San Diego, CA 92131	?	9		Bear River
T10N, R10W, S18, part of NWSE	(009)	Patrick & Marina Smith 88187 Eastwood Court Veneta, OR 97487	541-935-8132	9		Bear River
T10N, R10W, S18, part of NWSE	(010)	Bartholomew W. Provo 9548 Prospect Avenue Lakeside, CA 92040	619-443-1591	9		Bear River
T10N, R10W, S18, part of N½ of SE¼	(011)	Lauretta J. Hazen 26 Jeldness Road Ilwaco, WA 98624	360-642-2918	11	Residence	Bear River
T10N, R10W, S18, W½		Cathlamet Timber Company LLC One SW Columbia St, #1720 Portland, OR 97258		319		Bear River

Legal Location	Tract # on Map	Owner's Name and Address	Phone Number	Acres Owned	Structures on Property	Neighboring Refuge Unit
T10N, R10W, S20, NWNW west of river	(01)	Bear River Corporation P.O. Box 2442 Shelton, WA 98584-5072	Fred Pickering 360-686-3108	8		Bear River
T10N, R10W, S20, SWNW w. of river and N½ of SW¼	(02)	Richard & Ellen Wallace 3945 Heathwood Lane Norcross, GA 30092-1833	770-448-7487	68		Bear River
T10N, R10W, S20, E½ & S½ of SW¼		Lincoln Timber LLC (Cathlamet Timber) One SW Columbia St, #1720 Portland, OR 97258		380		Bear River
T10N, R11W, S12, part of SWNW, part of SWSW	(Bal of Lots 2, 3)	Archie & Dorothy Riekkola Trust 92663 Wireless Rd Box 444 Astoria, OR 97103	503-325-2452	40		Riekkola
T10N, R11W, S12, part of SW NW, part of SWSW	(002, 003, 004)	City of Long Beach City Hall Long Beach, WA 98631	Fire Dept 360-642-3688	17		Riekkola
T10N, R11W, S12, NWSE, E½ of SW¼ & NE¼		Cathlamet Timber Company LLC One SW Columbia St, Suite 1720 Portland, OR 97258		417		Riekkola
T10N, R11W, S13, NWNW		Cathlamet Timber Company LLC One SW Columbia St, Suite 1720 Portland, OR 97258		158		Riekkola
T10N, R11W, S14, NWNE	(Lot 2)	Lance E. Wright P.O. Box 731 Ilwaco, WA 98624	Edwin Wright 360-642-2743	8		Riekkola
T10N, R11W, S14, NENE	(Lot 1)	City of Long Beach City Hall Long Beach, WA 98631	Fire Dept 360-642-3688	75		Riekkola
T10N, R11W, S14, SENW and SWNE	(007, 008, 009)	Cathlamet Timber Company LLC One SW Columbia St, Suite 1720 Portland, OR 97258		96		Riekkola
T10N, R11W, S11, SW	92 (002)	Michael B. Davis and Jane Martin 42 Los Altos Road Orlinda, CA 94563-1718		102		Tarlatt Slough
T10N, R11W, S14, NWNW & NENW		Michael B. Davis and Jane Martin 42 Los Altos Road Orlinda, CA 94563-1718			Residence	Tarlatt Slough
T10N, R11W, S11, part of SW	90 (003)	Lewis and Clark Seed Co j Riekkola Farms P.O. Box 95 Boardman, OR 97818	541-481-9255	70		Tarlatt Slough
T10N, R11W, S14, NENW	(Lot 3 N of road)	Archie & Dorothy Riekkola Trust 92663 Wireless Rd Box 444 Astoria, OR 97103	503-325-2452	6		Tarlatt Slough

Legal Location	Tract # on Map	Owner's Name and Address	Phone Number	Acres Owned	Structures on Property	Neighboring Refuge Unit
T10N, R11W, S14, NWNW	(4)	James R. & Sharon Bishop P.O. Box 652 Seaview, WA 98644		4		Tarlatt Slough
T10N, R11W, S10, SWSE	88 (049)	Honkers, Inc j Jim Middleton P.O. Box 240 Hoquiam, WA 98550		90 (152)		Tarlatt Slough
T10N, R11W, S10, SESW	95 (008)	Bankers Trust Company of California 107990 Rancho Bernardo Rd San Diego, CA 92127		6	Residence	Tarlatt Slough
T10N, R11W, S10, NENE	(039)	Joe S. & May K. McHugh 4912 113 th Street Long Beach, WA 98631	360-642-3178	21	Residence	Tarlatt Slough
T10N, R11W, S10, SESE	94 (064)	Archie David Riekkola P.O. Box 774 Boardman, OR 97818	Dave Riekkola 541-481-2984	30 (50)		Tarlatt Slough
T10N, R11W, S10, SENE	(056)	Lone Fir Cemetery Association j Melinda Crowley P.O. Box 94 Long Beach, WA 98631	360-642-2891	29	Buildings Graves	Tarlatt Slough
T10N, R11W, S10, NESW	(067)	G.E. & June Wright 8309 Sandridge Road Long Beach, WA 98631	360-642-2177	17	Residence	Tarlatt Slough
T10N, R11W, S10, NESW		Lee Paul Crowley 2904 Pioneer Road Long Beach, WA 98631	360-642-2891	54	Residence	Tarlatt Slough
T10N, R11W, S10, SESW	(Sandridge Homesites 01, 02)	Robert A. Caudill P.O. Box 620 Seaview, WA 98644	?	2	Residence	Tarlatt Slough
T10N, R11W, S10, SESW	(Sandridge Homesite 03)	Gary S. & Sandra E. Edwards 3200 78 th Av, SE Everett, WA 98205	425-334-2516	1	Residence	Tarlatt Slough
T10N, R11W, S10, SESW	(Sandridge Homesite 04)	Billy E. & Reba F. Churchill 25407 32 nd Place South Kent, WA 98032	253-946-1397	1	Residence	Tarlatt Slough
T10N, R11W, S10, SESW	(Sandridge Homesite 05)	Randy L. & Peggy M. Mathena 8101 Sandridge Road Long Beach, WA 98631	360-642-4409	1	Residence	Tarlatt Slough
T10N, R11W, S10, SESW	(Sandridge Homesite 06)	William D. & Betty J Belt Trust 480 Turtleback Road Prescott, AZ 86303-6322		1	Residence	Tarlatt Slough
T10N, R11W, S10, SWSE	(Sandridge Homesite 07)	Gerald A. & Diane L. Moore P.O. Box 65 Long Beach, WA 98631	360-642-2708	1	Residence	Tarlatt Slough

Legal Location	Tract # on Map	Owner's Name and Address	Phone Number	Acres Owned	Structures on Property	Neighboring Refuge Unit
T10N, R11W, S10, NWSW	(Adams Cran Ac 08 02)	James Donnelly P.O. Box 218 Long Beach, WA 98631	360-642-2252	2	Residence	Tarlatt Slough
T10N, R11W, S10, NWSW	(Adams Cran Ac 08 01)	Robert Hamilton & Karen Snyder 3804 40 th St P.O. Box 131 Long Beach, WA 98631	360-642-2247	4	Residence	Tarlatt Slough
T10N, R11W, S10, NWSW	(Adams Cran Ac 07)	Donald Jr. & Denee Walters 16402 S. 32 nd Place Phoenix, AZ 85048	480-759-8006	5	Residence	Tarlatt Slough
T10N, R11W, S10, NWSW	(Adams Cran Ac 06 S½)	Michael M. McHale 208 W. 44 th Street Vancouver, WA 98660	360-993-2182	6	Residence	Tarlatt Slough
T10N, R11W, S10, NWSW	(Adams Cran Ac 06 N½)	Ernest W. & Susan Kroll 181 Roupe Road Sequim, WA 98382	Robert Kroll 360-683-8333	6	Residence	Tarlatt Slough
T10N, R11W, S10, SWNW	(Adams Cran Ac 05)	Harrison Smith & Lorrie Haight 9305 Sandridge Road Long Beach, WA 98631	360-642-8090	5		Tarlatt Slough
T10N, R11W, S10, SWNW	(Adams Cran Ac 05-A)	Richard E. Abo 5500 NE 31 st Avenue Ft Lauderdale, FL 33308		1		Tarlatt Slough
T10N, R11W, S10, SWNW	(Adams Cran Ac 04)	Joann E. Illias, et al 8631 NW Bailey St Portland, OR 97231	503-286-2362	6	Residence	Tarlatt Slough
T10N, R11W, S10, NENW	(Adams Cran Ac 03)	Garland B. Miller, et ux 9503 Sandridge Road Long Beach, WA 98631	360-642-2259	10	Residence	Tarlatt Slough
T10N, R11W, S10, NENW	(Adams Cran Ac 02)	Malcolm E. & Ardell G. McPhail 2500 Sandridge Road Ilwaco, WA 98624	360-642-4938	2		Tarlatt Slough
T10N, R11W, S10, NENW & NWNE	(9103-2, 057, 0580)	Public Utility District No. 2 P.O. Box 472 Raymond, WA 98577	360-942-5949	6	Business, Garage, Electric substation	Tarlatt Slough
T10N, R11W, S10, NWNE & NENE	(078, 079)	Steve & Joanne Oman P.O. Box 215 Long Beach, WA 98631	360-642-3487	55	Residence	Tarlatt Slough
T12N, R11W, S36, SESE	(Lot 13)	Gregory J. Cochran 14027 West Lake Kathleen Dr, SE Renton, WA 98059	425-226-4219	1.25	Cabin?	Long Island
T13N, R11W, S20 and S21		WA State - Leadbetter State Park Fort Canby State Park P.O. Box 488 Ilwaco, WA 98624	360-642-3078	1280 (est.)	Interpretive Signs, Restroom	Leadbetter Pt

Legal Location	Tract # on Map	Owner's Name and Address	Phone Number	Acres Owned	Structures on Property	Neighboring Refuge Unit
T13N, R8W, S2, NWNW	(025)	Christian J. & Brenda K. Antilla 70 Camp One Road Raymond, WA 98577	360-942-5927	5	Residence	Wheaton
T13N, R8W, S2, NW¼ and NWNE	(001, 003, 019, Lot 2 N of Rd)	John A. Burkhalter 15 Camp One Road Raymond, WA 98577	Jack 360-942-2703	182	Residence	Wheaton
T13N, R8W, S2, NENW, N of road	(013, 024)	Benjamin S. & Gloria Lee Ridgeway 65 Mill Creek Road Raymond, WA 98577	360-942-3669	10	Residence	Wheaton
T13N, R8W, S2, part of SWNE & NWNE	(8907-2)	Randall G. & Amy L. Dennis 125 Mill Creek Road Raymond, WA 98577	360-942-5572	4.5	Residence	Wheaton
T13N, R8W, S2, NESE	(015)	Gary & Laura Lee Salme 173 Mill Creek Road Raymond, WA 98577	360-942-3074	4	Residence	Wheaton
T13N, R8W, S2, part of SWNE & NWNE	(8907-10)	Roberta N. Zakel P.O. Box 309 Raymond, WA 98577	360-942-3780	4	Residence	Wheaton
T13N, R8W, S2, part of SENE	(027)	Ricky G. & Michelle Mittge 57 Butz Road Raymond, WA 98577-9222	360-942-4503	7	Residence	Wheaton
T13N, R8W, S2 part of SENE	(026)	Leroy D. & Mary Nott 114 First Avenue Aberdeen, WA 98520	360-533-6258	5	Residence	Wheaton
T13N, R8W, S2, NESE, NENE, and part of SENE	(Incl. Lot 01)	Frank Butz 45 Butz Road Raymond, WA 98577		101		Wheaton
T13N, R8W, S2, part of NWSE	(018)	Bill Neve 1326 Lowell Drive Walla Walla, WA 99362-9330		21		Wheaton
T13N, R8W, S2, NWSE	(023)	Richard W. Hawley 16 Camp One Road Raymond, WA 98577		5	Tree farm	Wheaton
T13N, R8W, S2, part of SWSE	(021)	Pat C. Newman 328 Lilly Wheaton Road Raymond, WA 98577	360-942-2813	1	Residence	Wheaton
T13N, R8W, S2, NESW & SWSE & SWSW & SWSE	(006, 012, 016)	Ned D. Newman 257 Lilly Wheaton Rd Raymond, WA 98577	360-942-3795	140	Residence, Dairy buildings	Wheaton
T13N, R8W, S2, NWSE	(022)	Reda G. Brown 381 Lilly Wheaton Road Raymond, WA 98577	360-942-5057	12	Residence	Wheaton

Legal Location	Tract # on Map	Owner's Name and Address	Phone Number	Acres Owned	Structures on Property	Neighboring Refuge Unit
T13N, R8W, S3, part of SWNE	(853-2)	Kim A. & Sherrie Pierson 104 Windleman Road N. Montesano, WA 98563-9726		2	Tavern, Out buildings	Wheaton
T13N, R8W, S3, part of SENE	(853-1 and 019)	John E. & Barbara J. Wilson 36 Camp One Road Raymond, WA 98577	360-942-3506	11	Barn	Wheaton
T13N, R8W, S3, part of SENE	(017)	John E. Wilson 36 Camp One Road Raymond, WA 98577		10	Residence	Wheaton
T13N, R8W, S3, part of SENE	(853-2)	Verne & Colleen Little 524 3 rd Street Raymond, WA 98577	360-942-9883	0.55	Residence	Wheaton
T13N, R8W, S3, part of SWNE	9038)	Elias F. & Jacqueline Dracobly P.O. Box 71 Raymond, WA 98577	360-942-5067	6	Residence	Wheaton
T13N, R8W, S3, part of NENE	(026)	Robert Burkhalter 212 Altoona Road Rosburg, WA 98643	360-465-2240	1.5	Residence, Barns	Wheaton
T13N, R8W, S3, part of SENE	(9522-1)	Gerald Shafer 5613 136 th East Puyallup, WA 98391	253-537-3949	4	Residence	Wheaton
T13N, R8W, S3, part of NESE	(9522-2)	Kirk D. & Jodean Jordan 765 State Route 6 Raymond, WA 98577	360-942-5459	4		Wheaton
T13N, R8W, S3, part of NESE	(9522-3)	Victor & Loraine C. Garrone 924 Fowler St. Raymond, WA 98577	360-942-3511	3		Wheaton
T13N, R8W, S3, part of NESE	(015)	Donald & Louise Taylor 3613 S. McCormick Olympia, WA 98501	360-943-8599	11		Wheaton
T13N, R8W, S3, part of SENE, part of NWNE	(20, 21)	John A. Burkhalter 14 Camp One Road Raymond, WA 98577	Jack Burkhalter 360-942-2703	29		Wheaton

APPENDIX O. FIRE SUPPRESSION EQUIPMENT AT WILLAPA NWR

Table 12. Fire Suppression Equipment at Willapa NWR.

Revised August 2002

Equipment	Qty On Hand	NUS Qty	Location	Notes
ration (MREs)		4		
fire shelters	5	4	HQ basement	With case & liner
hard hats with chin strap	3	4	HQ basement	
head lamps		4		
goggles	8	4	HQ basement	
ear plugs		6		
fire pack		4		
first aid kit, individual		4		
sleeping bags		4		
water bottles	9	12	HQ basement	1 quart
tents		3		
leather gloves, large	2 pair	3	HQ basement	
leather gloves, medium	1 pair	3	HQ basement	
leather gloves, small		3		
Nomex or Aramid pants	2	8	HQ basement	sized for red-carded individuals
Nomex or Aramid shirt, ylw	2	9	HQ basement	sized for red-carded individuals
shovels	2	7		
brush axe, sandvic	1	7		Double edge axe
Pulaski	6	7		
McLeods		7		
fire rake		7		
rippers?	3	7		
backpack water pump (plastic)	1	2		
backpack water pump (metal)	1	0		
Fold-A-Tank		1		
hose, syn. lined, 1.0 in. x 100 ft		9		
hose, syn. lined, 1.5 in. x 100 ft	5	9	HQ basement	
hose, syn. lined, 2 in. x 100 ft	1	0	HQ basement	

nozzles, 1 in. and 1.5 in. portable pump		3		
wyes		3		
tees		3		
wrenches		3		
relief valves		3		
hose clamps		4		
adapters		2		
reducers		2		
slip-on water pump	1		Riekkola Shop	200 gal 4-stage centrifugal pump, 9 hp, w/hoses; pump&hose need replacing (1984)
slip-on water pump	1		Long Is. Shop	125 gal positive displacement pump; pump&hose need replacing
Hale Fyr floating water pumps	2		Riekkola	1990
Mark III water pump	1		HQ basement	May need replacing
Husqvarna 61 chainsaw	1		HQ basement	20 inch bar, 1990
chainsaw chaps		1		
ear muffs		1		
face shield		1		
dust mask		3		

*NUS = Normal Unit Strength

APPENDIX P. 2002 TARLATT SLOUGH WUI PROJECT CONTRACT SPECIFICATIONS

**2002 Wildfire Urban Interface Project
Contract Specifications**

May 7, 2002

Location:

Willapa National Wildlife Refuge, Tarlatt Slough Unit. Tarlatt Slough Unit is located east of Long Beach, Washington, along Sandridge Road, between Olson Road (95th Place) and Lone Fir Cemetery Road (85th Place).

Objective:

The objective of this project, under the Wildfire Urban Interface Program, is to create a substantial fire break to protect adjacent land owner's homes and businesses from wildfires spreading from the Tarlatt Slough Unit to adjacent lands and vice versa.

Work Period and Accomplishment Date:

The project work must be completed by June 30, 2002 and can begin upon award of contract and notification to proceed.

Work To Be Accomplished:

Work to be completed is listed in three phases and in order of priority. Please submit bids for each phase of work cumulatively (e.g. for Phase 1 only, for Phase 1 and 2, for Phase 1-3).

Phase 1

Clear woody plants (shrubs, vines and small trees) and debris from the corner of Sandridge Road and Lone Fir Cemetery Road continuing east on Lone Fir Cemetery Road to the west side of Tarlatt Slough. Clear an area from the fence to approximately 20 feet north of the refuge fence.

Phase 2

Disc a 4 to 8 foot fireline just inside the Tarlatt Unit fence perimeter (approximately 7550 ft). The disced line will be from Tarlatt Slough, west along 95th Place, south along Sandridge Rd, and east along Lone Fir Cemetery Road to the east end of the Whitefront Wetland Unit (open wetland area).

Remove all woody plants (shrubs, vines and small trees) and debris along the fence line from the disced fireline to the pavement edge of the road.

Mow remaining grass and forbs along the fence line from the disced fireline to the pavement edge of the road to two inches in height.

Phase 3

Removal blackberries along the east and west sides of Tarlatt Slough beginning at the Lone Fir Cemetery Road and continuing north to the ditch that runs west toward Pioneer Road. Blackberries will be removed from both sides of the slough taking care not to remove native trees, shrubs and vines, such as wild rose.

Work Requirements:

The contractor will be responsible for piling vegetation and debris that is to be removed in burnable piles that are not more than 10 x 10 x 10 feet in designated areas within the Tarlatt Slough Unit. Vegetation will not be burned by the contractor.

APPENDIX Q. PRESCRIBED FIRE PLAN FORMAT

PRESCRIBED FIRE PLAN

Refuge or Station : Willapa National Wildlife Refuge	
Unit :	
Prepared By: Brian Gales, Prescribed Fire Specialist	Date:
Reviewed By: Marie Fernandez, Refuge Biologist	Date:
Reviewed By: Prescribed Fire Burn Boss	Date:
Reviewed By: Fire Management Officer	Date:
Reviewed By: Biological Investigation Unit	Date:
Reviewed By: Terri Butler, Refuge Manager	Date:

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

Approved By: Charles Stenvall, Complex Project Leader	Date:
--	-------

PRESCRIBED FIRE PLAN

Refuge: Willapa NWR			Refuge Burn Number:		
Sub Station:			Fire Number:		
Name of Area:			Unit No.		
Acres To Be Burned:			Perimeter Of Burn:		
Legal Description:	Lat.	Long.	T	R	S
County & State: Pacific County, Washington					

Is a Section 7 Consultation being forwarded to Fish and Wildlife Enhancement for review? Yes
 No___ (check one).

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

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.

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

- 2.
- 3.
- 4.
- 5.

Acceptable Range of Results (Area burned vs. unburned, scorch height, percent kill of a species, range of litter removed, etc.):

- 6.
- 7.
- 8.
- 9.

[Attach Project Map Here]

II. PRE-BURN MONITORING

Vegetation Type	Acres	% of Burn Area	FBPS Fuel Model

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: (Attach a completed copy of the Complexity Analysis worksheet to this plan.)

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

Scheduling:	Planned or Proposed	Actual
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			
ENVIRONMENTAL CONDITIONS			
Soil Moisture			
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)	B	H	
Rate of Spread (ch/hour)			
Fireline Intensity			
Flame Length			
Energy Release Component NFDRS Fuel Model <u> L </u>			

Note: Attach BEHAVE Runs as an appendix to the end of this plan.

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. Also attach pertinent smoke
- § 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
- § Particulate emissions in Tons/Acre and how calculated (This should be filled in after the burn so more precise acreage figures can be used):

variances

mop-up, r

VI. FUNDING AND PERSONNEL

Activity Code: _____ Costs

	Equipment & Supplies	Labor	Overtime	Staff Days	Total Cost
Administration (planning, permits, etc.)					
Site Preparation					
Ignition & Control					
Travel/Per Diem					
Total					

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.)

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

Unit:

	Is burn plan complete and approved?
	Are <u>all</u> fire prescriptions specifications met?
	Are <u>all</u> smoke management prescriptions met?
	Is the current and projected fire weather forecast favorable?
	Have <u>all</u> air quality considerations and smoke requirements been met?
	Have <u>all</u> required cultural resource protection objectives been met?
	Are <u>all</u> personnel required in the prescribed burn plan on-site and are they <u>all</u> qualified for their assigned duties?
	Have <u>all</u> personnel been briefed on the prescribed burn plan requirements?
	Have <u>all</u> personnel been briefed on safety hazards, escape routes, and safety zones?
	Is <u>all</u> required equipment in place and in working order?
	Are available (including back-up) resources adequate for containment of escapes under the worse-case conditions?
	Are answers to <u>all</u> of the above questions "YES"?
	In your opinion, can the burn be carried out according to the plan and will the burn meet planned objectives?
	Is there an adequate contingency plan developed and proofed?

All 14 questions have been answered "YES", proceed with test fire. Document the current conditions, location, and results.

Burn Boss	Date
Project Leader or Designee	Date

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:

X. FOLLOW-UP EVALUATION

Date: _____ Refuge Burn Number:

Length of Time after Burn:

Vegetative Transects:

Comments on Habitat Conditions, etc.:

Photo Documentation:

Other:

DAILY FIRE BEHAVIOR MONITORING SHEET		
Refuge:		
Project Name:	RX Fire Number:	
Date of Burn:		
Ignition Time:	Start:	Finish:
Weather Observations During Burn:		

Time of Weather Observations

Dry Bulb Temp							
Wet Bulb Temp							
RH							
Wind Speed							
Wind Direction							
Cloud Cover %							

Comments Concerning Weather:

Last Live Fuel Moisture Measurement:	
1-Hour Fuel Moisture:	
10-Hour Fuel Moisture (from fuel stick):	
Haines Index:	

Test Fire Results:

Firing Pattern:

Fire Behavior Characteristics (Rate of Spread, Flame Length, Fire Spread Direction, etc.):

Acres Treated:

Smoke Dispersal Narrative (venting height, transport wind speed & direction, visibility, holding problems, problem spots, complaints, etc.):

Burn Severity

Effects to Vegetation Narrative:

Ground Char (%): Unburned___ Light___ Moderate___ Deep

Soil Moisture on Day of Burn:

Were Resource Objectives Met? (If burn was successful, what conditions made it possible, *i.e.* low live fuel moisture, high winds, etc.)

Photos of Fire Area:Preburn	Yes___ No
During Burn	Yes___ No
Postburn	Yes___ No

Daily Burn Cost:	
Vehicles Used:	
Personnel Cost:	
Equipment Cost:	

Fuel Cost:	
Total:	
Cost per Acre:	

Burn Organization:

Burn Boss:	
Ignition Specialist:	
Holding Specialist:	
Lighting Crew:	
Holding Crew:	

Burn Evaluation Prepared By: _____ Date:

**Attach pertinent Spot Weather Forecast, WIMS/NFDRS, Smoke Mgt Variance, etc. information for burn day to back of sheet.

APPENDIX R. INCIDENT COMMANDER LIMITED DELEGATION OF AUTHORITY FORMAT

**Incident Commander Limited Delegation of Authority
Willapa National Wildlife Refuge, Ilwaco, Washington**

As of <time>, <date>, I have delegated authority to manage the <fire name> fire, number <fire number>, Willapa National Wildlife Refuge, to Incident Commander <commander's name> and his Incident Management Team.

The fire which originated <description of origination, e.g. lightening strike, man caused, etc> occurring on <date>, is burning <general location, e.g. at Leadbetter Point>. My considerations for management of this fire are: <the following are example considerations, edit as needed>

- 10. Provide for firefighter safety.
- 11. I would like the fire managed under a full suppression strategy with suppression actions done with as little environmental damage as possible.
- 12. Key cultural features and facilities requiring priority protection are: <list any>.

13. Key resource considerations are: <list any, including protecting endangered species by (list special measures to be taken)>
14. Restricts for suppression actions are no tracked vehicles on <list soil types or areas> except where roads exist and are identified for use, and no retardant will be utilized.
15. Minimum tools for use are Type II/III helicopters, chainsaws, flaps and weed whips.
16. The Fish and Wildlife Service Resource Advisor will be refuge Biologist <person's name>.
17. <list areas of the fire> of the fire borders private property that must be protected if threatened. <person's name> of the <fire district or department name and no> will be the local representative.
18. Managing the fire cost-effectively for the values at risk is a significant concern.
19. Providing training opportunities for <internal personnel and external cooperators> is requested to strengthen our fire organization's capabilities.
20. Minimum disruption of residential access to private property while maintaining public safety.
21. Use of tracked vehicles is authorized to protect <area>.

 Charles Stenvall, Project Leader
 Willapa National Wildlife Refuge

 Date

Amendment to Delegation of Authority

The Delegation of Authority dated <date of above>, issued to Incident Commander <name> for the management of the <fire name> fire, number <fire number> is hereby amended as follows:

<list amended items>

This amended Delegation of Authority will be effective <time>, <date>.

 Charles Stenvall, Project Leader
 Willapa National Wildlife Refuge

 Date

APPENDIX S. PACIFIC COUNTY FIRE DISTRICT MAPS

Figure 7. Pacific County Fire District Inset Map.

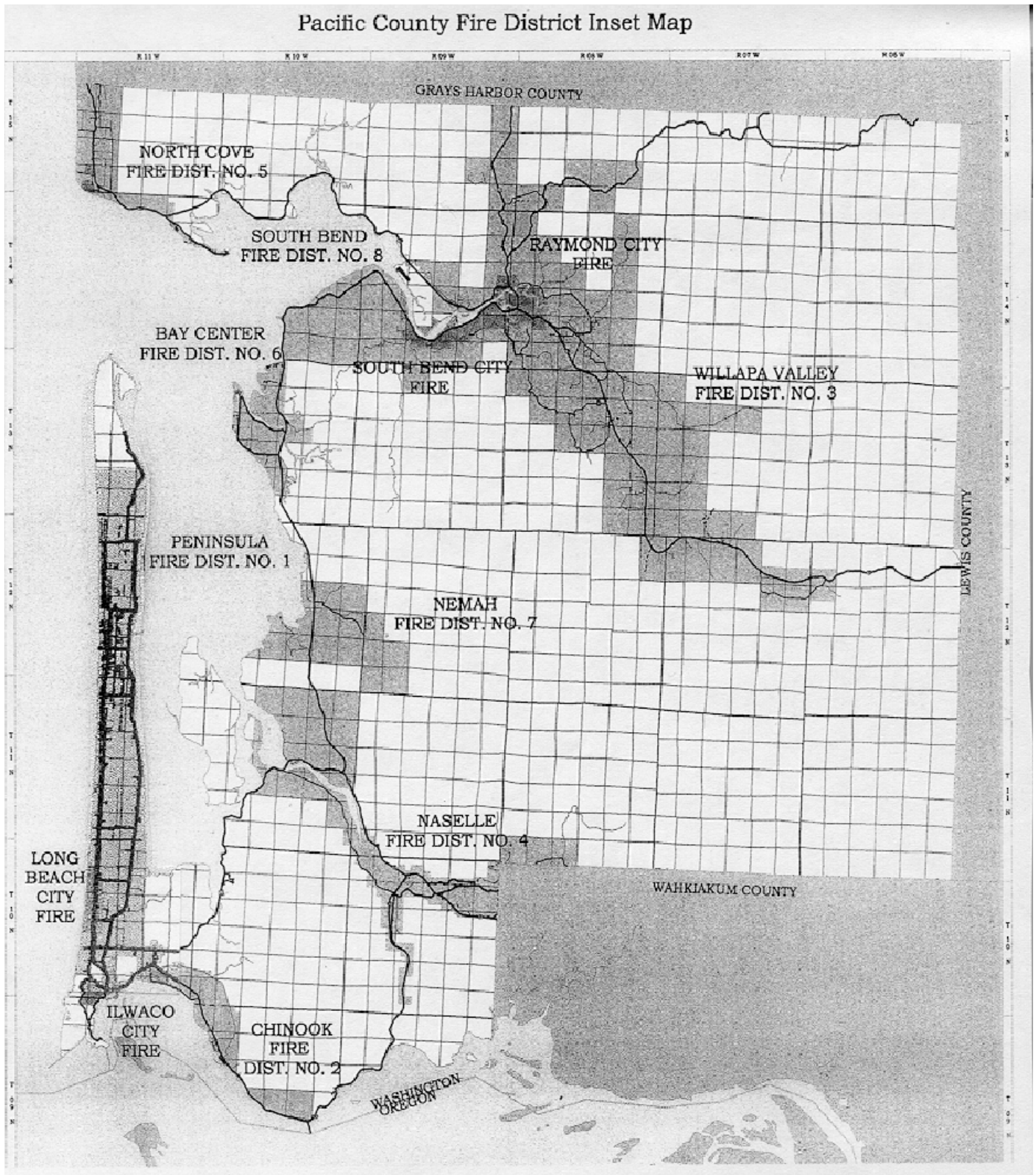


Figure 8. Pacific County Fire District #1 Map (Ocean Park Area).

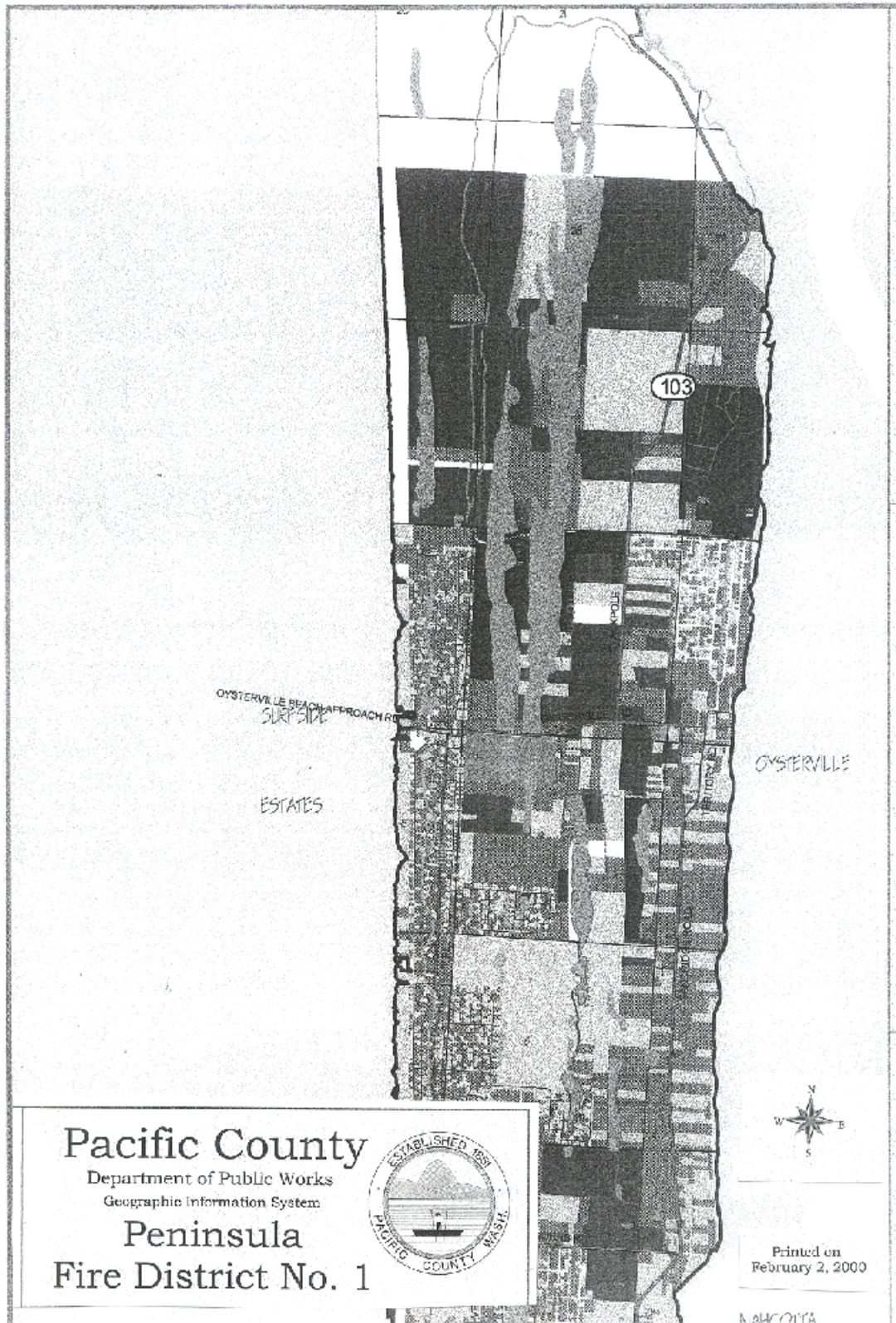


Figure 9. Pacific County Fire District #1 Map (Long Beach Area).

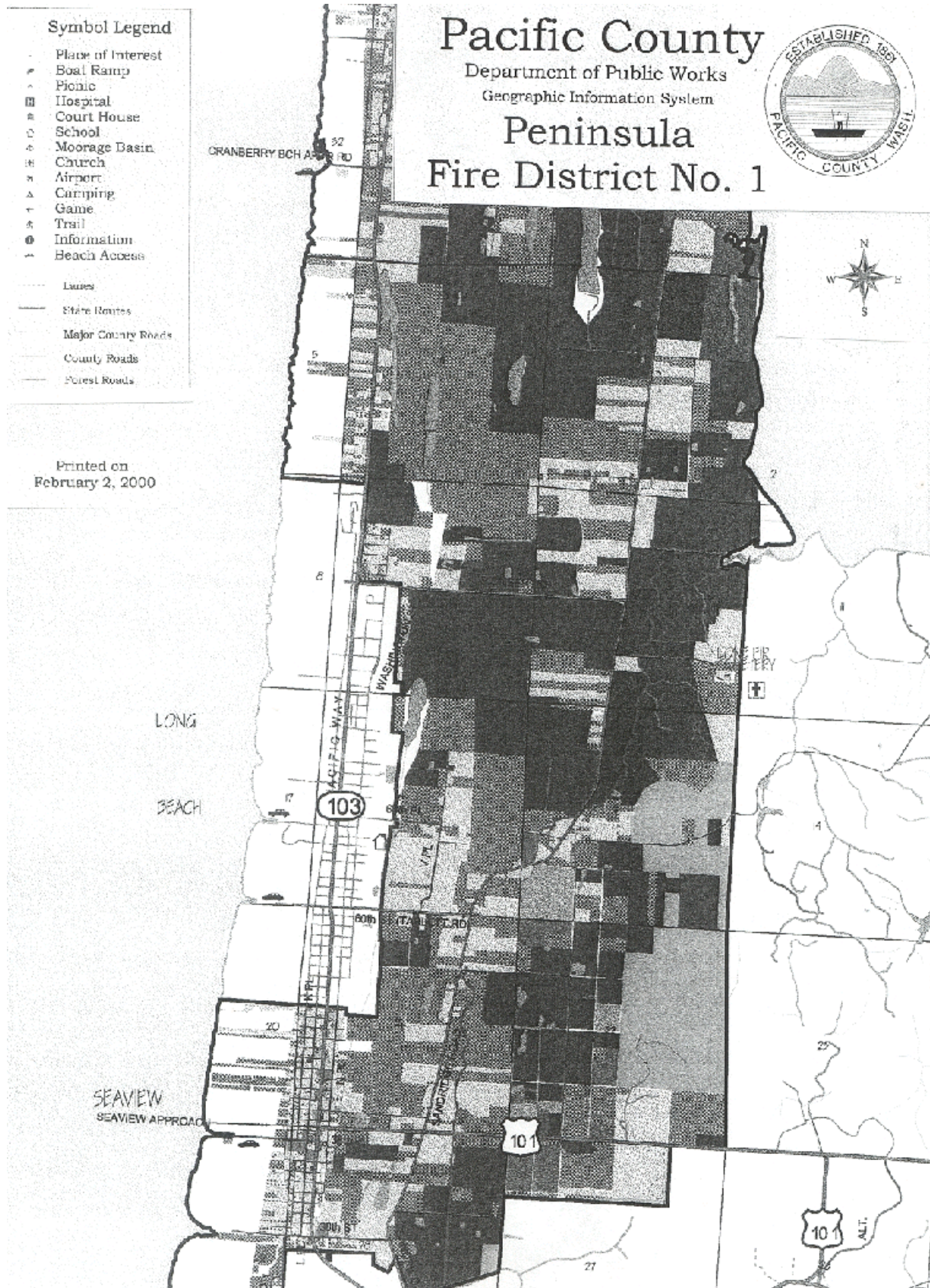


Figure 10. Pacific County Fire District #3 Map (Raymond Area).

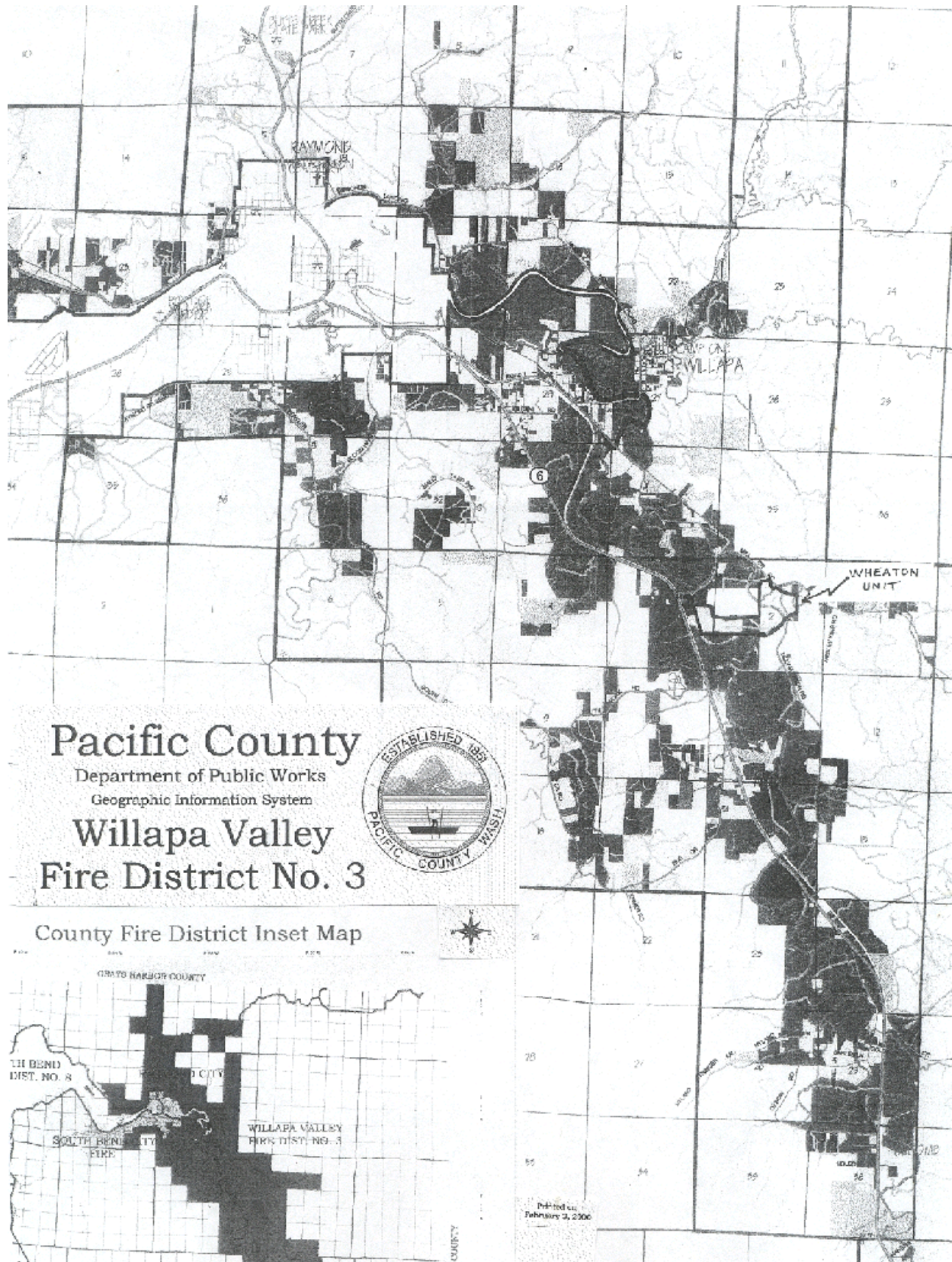
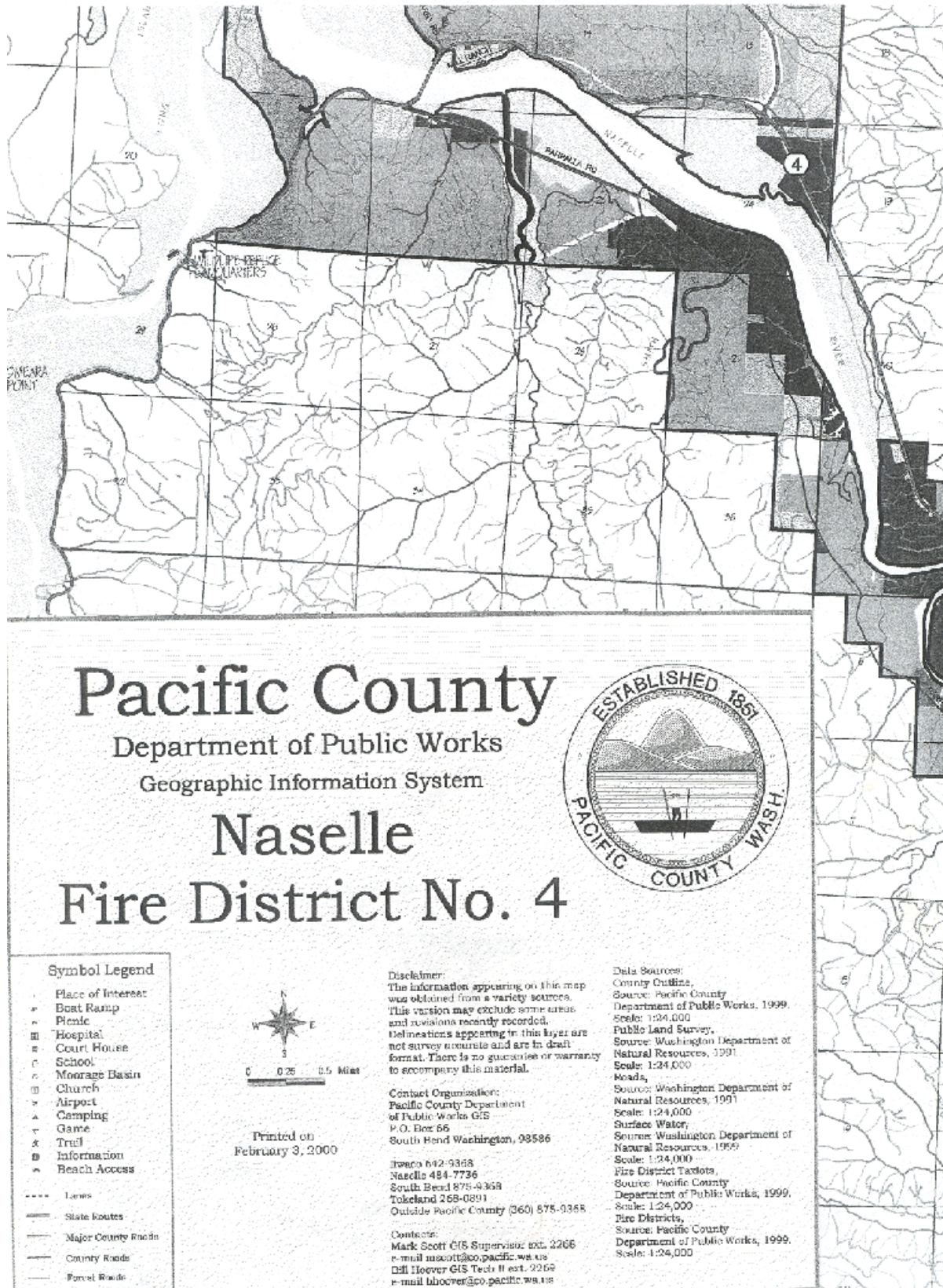


Figure 11. Pacific County Fire District #4 Map (Naselle Area).



WILDLAND FIRE SITUATION ANALYSIS

Incident Name:

Jurisdiction:

Date and Time Completed:

This page is completed by the Agency Administrator(s).

Section I, WFSA Information Page

- A. Jurisdiction(s): Assign the agency or agencies that have or could have fire protection responsibility, e.g., USFWS, BLM, etc.
- B. Geographic Area: Assign the recognized "Geographic Coordination Area" the fire is located in, e.g., Northwest, Northern Rockies, etc.
- C. Unit(s): Designate the local administrative unit(s), e.g., Hart Mountain Refuge Area, Flathead Indian Reservation, etc.
- D. WFSA #: Identify the number assigned to the most recent WFSA for this fire.
- E. Fire Name: Self-explanatory.
- F. Incident #: Identify the incident number assigned to the fire.
- G. Accounting Code: Insert the local unit's accounting code.
- H. Date/Time Prepared: Self-explanatory.
- I. Attachments: Check here to designate items used to complete the WFSA. "Other" could include data or models used in the development of the WFSA. Briefly describe the "other" items used.

Section II. Objectives and Constraints

- A. Objectives: Specify objectives that must be considered in the development of alternatives. Safety objectives for firefighter, aviation, and public must receive the highest priority. Suppression objectives must relate to resource management objectives in the unit resource management plan.

Economic objectives could include closure of all or portions of an area, thus impacting the public, or impacts to transportation, communication, and resource values.

Environmental objectives could include management objectives for airshed, water quality, wildlife, etc.

Social objectives could include any local attitudes toward fire or smoke that might affect decisions on the fire.

Other objectives might include legal or administrative constraints which would have to be considered in the analysis of the fire situation, such as the need to keep the fire off other agency lands, etc.

- B. Constraints: List constraints on wildland fire action. These could include constraints to designated wilderness, wilderness study areas, environmentally or culturally sensitive areas, irreparable damage to resources or smoke management/air quality concerns. Economic constraints, such as public and agency cost, could be considered here.

Section III. Alternatives

- A. Wildland Fire Management Strategy: Briefly describe the general wildland fire strategies for each alternative. Alternatives must meet resource management plan objectives.
- B. Narrative: Briefly describe each alternative with geographic names, locations, etc., that would be used when implementing a wildland fire strategy. For example: "Contain within the Starvation Meadows' watershed by the first burning period."
- C. Resources Needed: Resources described must be reasonable to accomplish the tasks described in Section III.B. It is critical to also look at the reality of the availability of these needed resources.
- D. Final Fire Size: Estimated final fire size for each alternative at time of containment.
- E. Estimated Contain/Control Date: Estimates of each alternative shall be made based on predicted weather, fire behavior, resource availability, and the effects of suppression efforts.
- F. Cost: Estimate all incident costs for each alternative. Consider mop-up, rehabilitation, and other costs as necessary.
- G. Risk Assessment - Probability of Success/Consequences of Failure: Describe probability as a percentage and list associated consequences for success and failure. Develop this information from models, practical experience, or other acceptable means. Consequences described will include fire size, days to contain, days to control, costs, and other information such as park closures and effect on critical habitat. Include fire behavior and long-term fire weather forecasts to derive this information.
- H. Complexity: Assign the complexity rating calculated in "Fire Complexity Analysis" for each alternative, e.g., Type II, Type I.
- I. A map for each alternative should be prepared. The map will be based on the "Probability of Success/Consequences of Failure" and include other relative information.

Section IV. Evaluation of Alternatives

- A. Evaluation Process: Conduct an analysis for each element of each objective and each alternative. Objectives shall match those identified in Section II.A. Use the best estimates available and quantify whenever possible. Provide ratings for each alternative and corresponding objective element. Fire effects may be negative, cause no change, or may be positive. Examples are: 1) a system which employs a "-" for negative effect, a "0" for no change, and a "+" for positive effect; 2) a system which uses a numeric factor for importance of the consideration (soils, watershed, political, etc.) and assigns values (such as -1 to +1, -100 to +100, etc.) to each consideration, then arrives at a weighted average. If you have the ability to estimate dollar amounts for natural resource and cultural values, this data is preferred. Use those methods which are most useful to managers and most appropriate for the situation and agency. To be able to evaluate positive fire effects, the area must be included in the resource management plan and consistent with prescriptions and objectives of the fire management plan.

Sum of Economic Values: Calculate for each element the net effect of the rating system used for each alternative. This could include the balance of:

pluses (+) and minuses (-), numerical rating (-3 and +3), or natural and cultural resource values in dollar amounts. (Again, resource benefits may be used as part of the analysis process when the wildland fire is within a prescription consistent with approved Fire Management Plans and in support of the unit's Resource Management Plan.)

Section V. Analysis Summary

- A. Compliance with Objectives: Prepare narratives that summarize each alternative's effectiveness in meeting each objective. Alternatives that do not comply with objectives are not acceptable. Narrative could be based on effectiveness and efficiency. For example: "most effective and least efficient," "least effective and most efficient," or "effective and efficient." Or answers could be based on a two-tiered rating system such as "complies with objective" and "fully complies with or exceeds objective." Use a system that best fits the manager's needs.

- B. Pertinent Data: Data for this Section has already been presented, and is duplicated here to help the Agency Administrator(s) confirm their selection of an alternative. Final Fire Size is displayed in Section III.D. Complexity is calculated in the attachments and displayed in Section III.H. Costs are displayed on page 4. Probability of Success/Consequences of Failure is calculated in the attachments and displayed in Section III.G.

- C. External and Internal Influences: Assign information and data occurring at the time the WFSAs are signed. Identify the Preparedness Index (1 through 5) for the National and Geographic levels. If available, indicate the Incident Priority assigned by the MAC Group. Designate the Resource Availability status. This information is available at the Geographic Coordination Center, and is needed to select a viable alternative. Designate "yes," indicating an up-to-date weather forecast has been provided to, and used by, the Agency Administrator(s) to evaluate each alternative. Assign information to the "Other" category as needed by the Agency Administrator(s).

Section VI. Decision

Identify the alternative selected. Must have clear and concise rationale for the decision, and a signature with date and time. Agency Administrator(s) is mandatory.

Section VII. Daily Review

The date, time, and signature of reviewing officials are reported in each column for each day of the incident. The status of Preparedness Level, Incident Priority, Resource Availability, Weather Forecast, and WFSAs validity is completed for each day reviewed. Ratings for the Preparedness Level, Incident Priority, Resource Availability, Fire Behavior, and Weather Forecast are addressed in Section V.C. Assign a "yes" under "WFSAs Valid" to continue use of this WFSAs. A "no" indicates this WFSAs is no longer valid and another WFSAs must be prepared or the original revised.

Section VIII. Final Review

This Section is completed by the Agency Administrator(s). A signature, date, and time are provided once all conditions of the WFSAs are met.

I. Wildland Fire Situation Analysis		
To be completed by the Agency Administrator(s)		
A. Jurisdiction(s)	B. Geographic Area	
C. Unit(s)	D. WFSA #	
E. Fire Name	F. Incident #	
G. Accounting Code:		
H. Date/Time Prepared _____ @ _____		
I. Attachments		
- Complexity Matrix/Analysis *	_____	
- Risk Assessment/Analysis *	_____	
Probability of Success *	_____	
Consequences of Failure *	_____	
- Maps *	_____	
- Decision Tree **	_____	
- Fire Behavior Projections *	_____	
- Calculations of Resource Requirements *	_____	

<p>- Other (specify)</p> <p>* Required</p> <p>** Required by FWS</p>	<p>_____</p>	
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This page is completed by the Agency Administrator(s).

II. Objectives and Constraints
To be Completed by the Agency Administrator(s)
<p>A. Objectives (Must be specific and measurable)</p> <p>1. <i>Safety</i></p> <ul style="list-style-type: none"> - Public - Firefighter <p>2. <i>Economic</i></p> <p>3. <i>Environmental</i></p> <p>4. <i>Social</i></p> <p>5. <i>Other</i></p> <p>B. Constraints</p>

This page is completed by the Fire Manager and/or Incident Commander.

III. Alternatives (To be completed by FMO / IC)			
	A	B	C
A. Wildland Fire Strategy			
B. Narrative			

C. Resources needed Handcrews Engines Dozers Airtankers Helicopters	—	—	—
	—	—	—
	—	—	—
	—	—	—
	—	—	—
	—	—	—
D. Final Size			
E. Est. Contain/ Control Date			
F. Costs			
G. Risk Assessment - Probability of success - Consequence of failure	—	—	—
	—	—	—
H. Complexity			
I. Attach maps for each alternative			

This page is completed by the Agency Administrator(s), FMO and/or Incident Commander.

IV. Evaluation of Alternatives			
To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander			
A. Evaluation Process	A	B	C

Safety Firefighter Aviation Public			
<i>Sum of Safety Values</i>			
Economic Forage Improvements Recreation Timber Water Wilderness Wildlife Other (specify)			
<i>Sum of Economic Values</i>			
Environmental Air Visual Fuels T & E Species Other (specify)			
<i>Sum of Environmental Values</i>			
Social Employment Public Concern Cultural Other (Specify)			
<i>Sum of Social Values</i>			
Other			

This page is completed by the Agency Administrator(s) and Fire Manager and/or Incident Commander.

V. Analysis Summary			
To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander			
Alternatives	A	B	C
A. Compliance with Objectives Safety Economic Environmental Social Other			
B. Pertinent Data Final Fire Size Complexity Suppression Cost Resource Values Probability of Success Consequences of Failure			
C. External / Internal Influences National & Geographic Preparedness Level _____ Incident Priority _____ Resource Availability _____ Weather Forecast (long-range) _____ Fire Behavior Projections _____			

VI. Decision	
The Selected Alternative is: _____	
Rationale:	
_____	_____
Agency Administrator's Signature	Date/Time

This Section is completed by the Agency Administrator(s) or designate.

VIII.		Daily Review									
To be completed by the Agency Administrator(s) or Designate											
Selected to be reviewed daily to determine if still valid until containment or control											
						P R E P A R E D N E S S L E V E L	I N C I D E N T P R I O R I T Y	R E S O U R C E A V A I L A B I L I T Y	W E A T H E R F O R E C A S T	F I R E B E H A V I O R P R O J E C T I O N S	W F S A V A L I D
Date	Time	By									
If WFSA is no longer valid, a new WFSA will be completed!											

VIII.	Final Review
The elements of the selected alternative were met on: _____	
Date	Time
By: _____	
(Agency Administrator(s))	

A GUIDE FOR ASSESSING FIRE COMPLEXITY

The following questions are presented as a guide to assist the Agency Administrator(s) and staff in analyzing the complexity or predicted complexity of a wildland fire situation. Because of the time required to assemble or move an Incident Management Team to wildland fire, this checklist should be completed when a wildland fire escapes initial attack and be kept as a part of the fire records. This document is prepared concurrently with the preparation of (and attached to) a new or revised Wildland Fire Situation Analysis. It must be emphasized this analysis should, where possible, be based on predictions to allow adequate time for assembling and transporting the ordered resources.

Use of the Guide:

1. Analyze each element and check the response "yes" or "no."
2. If positive responses exceed, or are equal to, negative responses within any primary factor (A through G), the primary factor should be considered as a positive response.
3. If any three of the primary factors (A through G) are positive responses, this indicates the fire situation is, or is predicted to be, Type I.
4. Factor H should be considered after all the above steps. If more than two of these items are answered "yes," and three or more of the other primary factors are positive responses, a Type I team should be considered. If the composites of H are negative, and there are fewer than three positive responses in the primary factors (A-G), a Type II team should be considered. If the answers to all questions in H are negative, it may be advisable to allow the existing overhead to continue action on the fire.

GLOSSARY OF TERMS

Potential for blow-up conditions - Any combination of fuels, weather, and topography excessively endangering personnel.

Rate or endangered species - Threat to habitat of such species or, in the case of flora, threat to the species itself.

Smoke management - Any situation which creates a significant public response, such as smoke in a metropolitan area or visual pollution in high-use scenic areas.

Extended exposure to unusually hazardous line conditions - Extended burnout or backfire situations, rock slide, cliffs, extremely steep terrain, abnormal fuel situation such as frost killed foliage, etc.

Disputed fire management responsibility - Any wildland fire where responsibility for management is not agreed upon due to lack of agreements or different interpretations, etc.

Disputed fire policy - Differing fire policies between suppression agencies when the fire involves multiple ownership is an example.

Pre-existing controversies - These may or may not be fire management related. Any controversy drawing public attention to an area may present unusual problems to the fire overhead and local management.

Have overhead overextended themselves mentally or physically - This is a critical item that requires judgment by the responsible agency. It is difficult to write guidelines for this judgment because of the wide differences between individuals. If, however, the Agency Administrator feels the existing overhead cannot continue to function efficiently and take safe and aggressive action due to mental or physical reasons, assistance is mandatory.

FIRE COMPLEXITY ANALYSIS

A.	FIRE BEHAVIOR: Observed or Predicted	YES/NO
	1. Burning Index (from on-site measurement of weather conditions) predicted to be above the 90% level using the major fuel model In which the fire is burning.	_____
	2. Potential exists for "blowup" conditions (fuel moisture, winds, etc.)	_____
	3. Crowning, profuse or long-range spotting.	_____
	4. Weather forecast indicating no significant relief or worsening conditions.	_____
	Total	_____
B.	RESOURCES COMMITTED	
	1. 200 or more personnel assigned.	_____
	2. Three or more divisions.	_____
	3. Wide variety of special support personnel.	_____
	4. Substantial air operation which is not properly staffed.	_____
	5. Majority of initial attack resources committed.	_____
	Total	_____
C.	RESOURCES THREATENED	
	1. Urban interface.	_____
	2. Developments and facilities.	_____
	3. Restricted, threatened, or endangered species habitat.	_____
	4. Cultural Sites.	_____
	5. Unique natural resources, special designation zones, or wilderness.	_____
	6. Other special resources.	_____
	Total	_____
D.	SAFETY	YES/NO
	1. Unusually hazardous fire line conditions.	_____
	2. Serious accidents or fatalities.	_____

3. Threat to safety of visitors from fire and related operations. _____

4. Restricted and/or closures in effect or being considered. _____

5. No night operations in place for safety reasons. _____

Total _____

E. OWNERSHIP

1. Fire burning or threatening more than one jurisdiction. _____

2. Potential for claims (damages). _____

3. Conflicting management objectives. _____

4. Disputes over fire management responsibility. _____

5. Potential for unified command. _____

Total _____

F. EXTERNAL INFLUENCES

1. Controversial wildland fire management policy. _____

2. Pre-existing controversies/relationships. _____

3. Sensitive media relationships. _____

4. Smoke management problems. _____

5. Sensitive political interests. _____

6. Other external influences. _____

Total _____

G. CHANGE IN STRATEGY

YES/NO

- 1. Change in strategy to confine/contain to control. _____
- 2. Large amount of unburned fuel within planned perimeter. _____
- 3. WFSAs invalid or requires updating. _____

Total _____

H. EXISTING OVERHEAD

- 1. Worked two operational periods without achieving initial objectives. _____
- 2. Existing management organization ineffective. _____
- 3. IMT overextended themselves mentally and/or physically. _____
- 4. Incident action plans, briefings, etc. missing or poorly prepared. _____

Total _____

Signature _____

Date _____ **Time** _____

<Insert Prescribed Fire Plan for WFSAs Here. See Appendix Q for format.>