# WILDLAND FIRE MANAGEMENT PLAN
# KLAMATH BASIN NATIONAL WILDLIFE REFUGE COMPLEX


**2001**

FIRE MANAGEMENT PLAN

KLAMATH BASIN NATIONAL WILDLIFE REFUGE COMPLEX

Tulelake, California

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## EXECUTIVE SUMMARY

When approved, this document will become the fire management plan for the six National Wildlife Refuges in the Klamath Basin National Wildlife Refuge Complex. This plan is written to provide guidelines for appropriate wildland fire suppression and prescribed fire programs at Lower Klamath, Tulelake, Bear Valley, Klamath Marsh, Upper Klamath and Clear Lake National Wildlife Refuges. Prescribed fires may be used to reduce hazard fuels, restore natural processes and vitality of ecosystems, improve wildlife habitat, remove or reduce non-native species, and conduct research. Major components include:

– updated policy for prescribed fires at the refuges in the Complex.

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

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

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

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

– establishes policy and procedure for burning agricultural debris at Lower Klamath and Tulelake National Wildlife Refuges.

This document is a revision of the current approved fire management plans for the Lower Klamath, Tulelake and Bear Valley National Wildlife Refuges. In addition, this fire management plan will set policy and procedure for Klamath Marsh, Upper Klamath and Clear Lake National Wildlife Refuges.

# INTRODUCTION

The Klamath Basin National Wildlife Refuge Complex lies at the headwaters of the Klamath River Watershed in California and Oregon. The six refuges that comprise the Refuge Complex are all located east of the Cascades Mountain Range in the Upper Klamath River Basin. The Upper Klamath River Basin is generally a transition zone between the Pacific coastal forested areas and the dry Great Basin zone. All water runoff from the refuges is tributary to the Klamath River, which begins at Klamath Falls, Oregon. A vicinity map of the Klamath Basin National Wildlife Refuges is displayed in Figure 1.

The Refuge Complex shares common ecological elements between the different refuges. Vegetation and wildlife are generally similar between the refuges. Wildland fuel model types are also generally similar. Variation in vegetation is most marked at the Bear Valley NWR, which is largely forested. Most of the Refuge Complex Fire Management Plan components are similar between the refuges. These similar elements of this plan will be commonly described and the differences separated.

Fire activities at the Refuge Complex consist of management of wildland and prescribed fire. The Klamath Basin area has a well recorded history of wildland fire suppression activities. Both the neighboring Modoc and Winema National Forests have extensive wildland fire records that begin in 1910. Wildland fire records for the Complex Refuges extend back 40 years. The Complex Refuges also have an extensive record of prescribed fire management. Fire has been used as a tool in vegetation management on the refuges since the late 1940's, although is well documented only since 1990. Recent prescribed fire management activities have varied between 5,000 to 30,000 acres annually, depending on vegetation management needs and available prescriptive weather.

The Complex Refuges lie adjacent to the Modoc National Forest and Lava Beds National Monument in California and adjacent to the Winema National Forest in Oregon. Properties managed by the USDI Bureau of Land Management, State of Oregon, USDI Bureau of Reclamation and private lands also lie adjacent to the refuges. Fire management planning and operations at the Complex Refuges are conducted with close inter-agency communications.

Klamath Falls, Oregon is listed by the Bureau of Land Management as one of the most threatened communities in their assessment of communities at risk from wildland fire. Keno, Oregon, a suburban area of Klamath Falls, lies directly adjacent to the Bear Valley NWR.

The headquarters for the Klamath Basin NWR Complex is at the Tulelake National Wildlife Refuge near Tulelake, California. A dedicated fire management staff consisting of a Fire Management Officer, Assistant Fire Management Officer and a Prescribed Fire Specialist works year around out of the Complex Headquarters. The Complex has a fire engine crew based at the headquarters during fire season. A second fire engine crew is staffed during fire season at the headquarters for the Klamath Marsh National Wildlife Refuge. The Klamath Marsh NWR headquarters is a remote station approximately 100 miles north of the Tulelake NWR headquarters.

The fire management staff at the Refuge Complex is also responsible for a fire management zone. The Klamath fire management zone includes the Humbolt Bay National Wildlife Refuge, south of Eureka, California, and the Modoc National Wildlife Refuge, south of Alturas, California. The Refuge Complex fire management staff has annually conducted prescribed fire activities at Modoc NWR. Humboldt Bay NWR has not yet had a fire program. Both refuges require zone fire management staff time for completion of Refuge Fire Management Plans and prescribed fire burn plans. Modoc NWR will probably become party to the preparedness agreement with the Modoc National Forest.

All prescribed fire operations conducted by the Refuge Complex are executed by qualified personnel, using modern equipment and required personal protective equipment. All prescribed burns have a prescribed burn plan that has been approved by the Project Leader. The Project Leader is briefed prior to ignition of prescribed fire.

Air quality management is a consideration in every agency conducted prescribed fire. Smoke management in the Upper Klamath Basin is complex. Smoke management involves cooperating with two states, as well as three county governments. Klamath Falls, Oregon is a federal non-attainment area for air quality.

The Tulelake and Lower Klamath NWR's are unique in the National Wildlife Refuge system as approximately 20,000 acres of the refuges are farmed under leases administered by the USDI Bureau of Reclamation (BOR). The farm lease program is authorized under special legislation, the Kuchel Act, PL-88-567 (Appendix D), which directly addresses the management of the Tulelake, Lower Klamath, Clear Lake and Upper Klamath NWR's. The Kuchel Act requires that these refuges be managed for two objectives: waterfowl management and agricultural production. Under the BOR leasing program, prescribed fire guidelines for burning crop stubble are incorporated into the leases. Currently the leases allow for approximately 15,000 to 20,000 acres of crop stubble to be burned annually during the springtime. Although some elements of a prescribed burn plan are incorporated into the leases, there are no individual prescribed burn plans prepared for the agricultural lease lands, per se. The lease holders, BOR and Irrigation District personnel are not required to meet federal agency fire qualification standards.

Additionally, 5,000 acres per year are cooperatively farmed to small grains for waterfowl. Crop stubble from the cooperatively farmed areas are burned for site preparation by the farmer or the FWS. Prescribed fire burn plans are prepared only for burns conducted by the FWS.

The FWS, BOR and Tulelake Irrigation District conduct burning operations for maintenance of the reclamation project water delivery system. The burning operations include maintenance of vegetation, cleaning water delivery canals of accumulated vegetation, clearing vegetation around control structures and preparation for canal and drain maintenance. These burns are conducted without prescribed fire burn plans.

## COMPLIANCE WITH FISH AND WILDLIFE SERVICE POLICY

This plan will assist in achieving resource management goals as defined in the refuge's Habitat Management Plans and Environmental Assessments (EA) for projects. It implements the approved course of action described in the Habitat Management Plans and the Wildland Fire Management Plan Environmental Assessments. The EAs for the Complex's refuges fire management programs are located in Appendix C. The FWS fire policy is based on the Departmental Manual (620 DM 1) and the Federal Wildland Fire Policy and Program Review (1995, 2001). FWS policy states:

1. Firefighter and public safety is the first priority of the Fire Management Program. With the possible exception of instances where the life of another is threatened, no FWS employee, contractor, or cooperator will be purposely exposed to life-threatening conditions or situations. All Fire Management Plans and activities must reflect this commitment.

1. Only trained and qualified people will be assigned to fire management duties. Fire Management personnel will meet training and qualification standards established or adopted by the FWS for the position they occupy. Agency Administrators will meet training standards established or adopted by the Service for the position they occupy.

1. Employees who are trained and certified will participate in the wildland fire management program as the situation demands. Non-certified employees with operational, administrative, or other skills will support the wildland fire management program as needed. Agency Administrators will be responsible, be held accountable, and make employees available to participate in the wildland fire management program.

1. Fire management planning, preparedness, wildland and prescribed fire operations, monitoring, and research will be conducted on an interagency basis with the involvement of all partner when appropriate.

1. Every area with burnable vegetation must have an approved Fire Management Plan. Fire Management Plans must be consistent with firefighter and public safety, values to be protected, and land, natural, and cultural resource management plans, and must address public health issues. Fire Management Plans must also address all potential wildland fire occurrences and may include the full range of appropriate management responses. Fire Management Plans must be coordinated, reviewed, and approved by the responsible agency administrator, to ensure consistency with approved land management plans.

1. Fire, as an ecological process, will be integrated into resource management plans and activities on a landscape scale, across bureau boundaries, and will be based upon best available science. All use of fire for natural and cultural resource management requires an approved plan which contains a formal prescription.

1. Wildland fire will be used to meet identified resource management objectives when appropriate.

2. The FWS will employ prescribed fire whenever it is an appropriate tool for managing FWS resources and to protect against unwanted wildland fire whenever it threatens human life, property and natural orcultural resources. Once people have been committed to an incident, these human resources become the highest value to be protected. If it becomes necessary to prioritize between property and natural or cultural resources, this is done based on relative values to be

protected, commensurate with fire management costs.

3. Regions will ensure their capability to provide safe, cost-effective fire management programs in support of land, natural, and cultural resource management plans through appropriate planning, staffing, training, and equipment.

4. Management actions taken on wildland fires must consider firefighter and public safety, be cost effective, consider benefits and values to be protected, and be consistent with natural and cultural resource objectives.

5. Refuges will work with their local cooperators and the public to prevent unauthorized ignition of wildland fires on FWS lands.

6. Structural firefighting is not the functional responsibility of the FWS. FWS assistance in structural protection should only be performed on an emergency basis to save lives.

7. Fire management policies and procedures for safety, training and equipment are mandatory.

8. Fire management planning, preparedness, wildland and prescribed fire operations, monitoring, and research will be conducted on an interagency basis with the involvement of all partners when appropriate.

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

Protection Act of September 20, 1992 (42 Stat. 857; 16 U.S.C. 594)
Authorizes the Secretary of the Interior to protect from fire, land 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 within 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 an emergency or major disaster by direction of the President.

National Wildlife Refuge System Administrative Act of 1966 (80 STAT. 927; 16 U.S.C. 1601 668dd-668ee): 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.

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

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.

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

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

National Environmental Policy Act of 1969

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

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

## FIRE MANAGEMENT OBJECTIVES

Fire will be allowed to function as a natural process in the ecosystem where feasible and in balance with natural and cultural resources, private property, public and commercial uses, and other values to be protected. All wildland fires will be suppressed utilizing the appropriate management response. The strategy and tactics employed will be dictated by the strategies developed for the appropriate management response.

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

Prescribed fires may be used to meet specific resource management or fire management objectives including, but not limited to, hazard fuel reduction, wildlife management, restoration of former grazing lands, debris removal and control of non-native species, when applicable.

The following management goals for the Complex refuges center on the preservation and enhancement of wetland habitat and associated wildlife species:

1. To manage for the conservation, enhancement and recovery of threatened, endangered and sensitive species and the natural habitats on which they depend.

2. Conserve and enhance wildlife habitats with an emphasis on high quality forage production and migration habitat for migratory birds.

3. To protect and restore native habitats and associated populations of wildlife representative of the natural biological diversity of the Klamath Basin.

4. Integrate the maintenance of productive wetland habitats and sustainable agricultural systems on the Kuchel Act refuges. These should be consistent with waterfowl management and ensure that agricultural practices will conform to the principles of integrated pest management.

5. To provide high quality, wildlife-dependent visitor services with emphasis on environmental education, interpretation, wildlife observation, hunting and photography opportunities which are compatible with refuge purposes.

## DESCRIPTION OF REFUGE COMPLEX

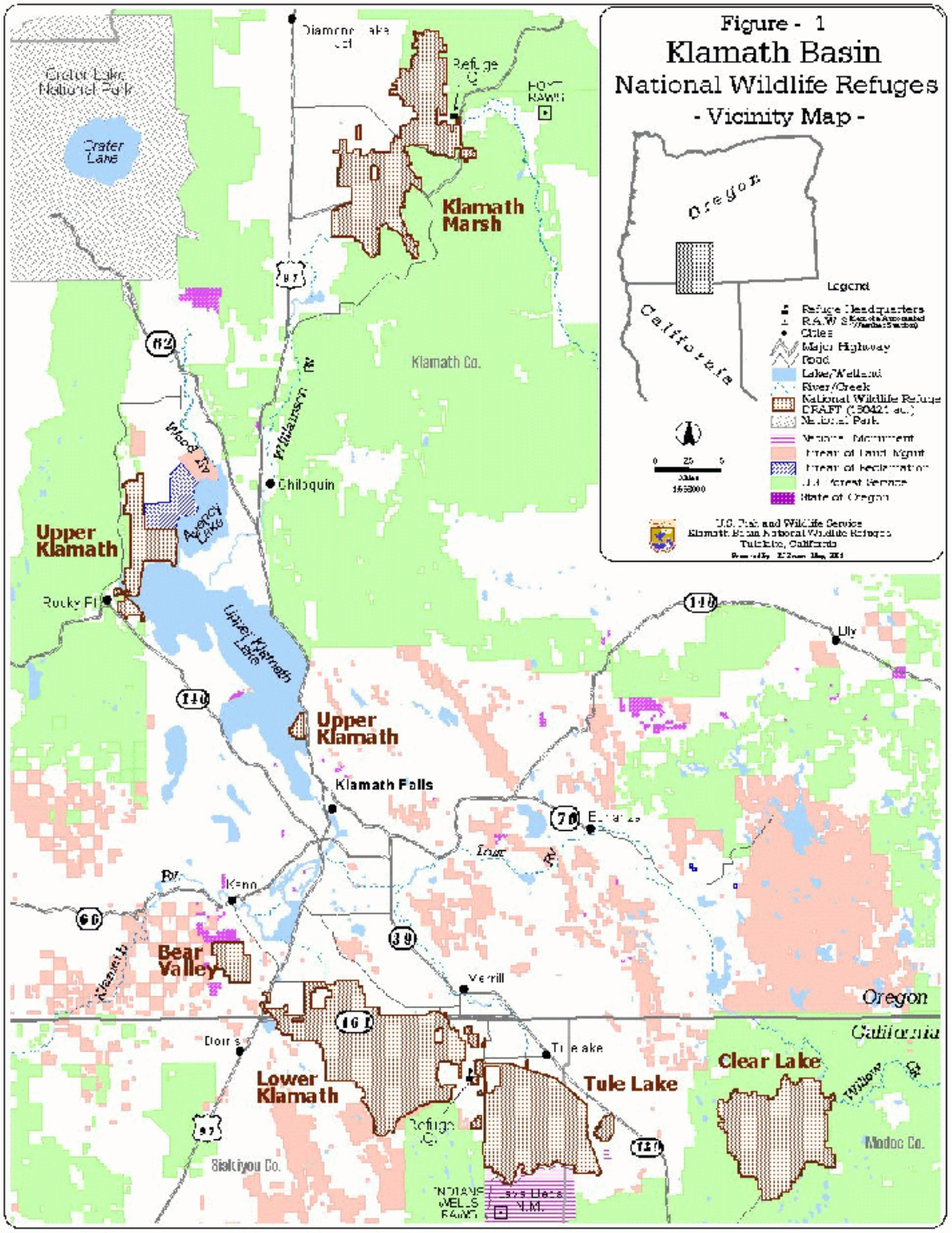
The Klamath Basin in southern Oregon and northern California, historically contained approximately 350,000 acres of wetlands (Adkins 1970). Tremendous populations of waterfowl frequented these marshes. In the fall of 1997 waterfowl numbers were the highest they have been in the Upper Klamath Basin for over 25 years with over 3.7 million birds present (U.S. Fish and Wildlife 1997). These birds visit the Basin during spring and fall to gather energy reserves for their migration along the Pacific Flyway. Additionally, the Upper Klamath Basin provides vital nesting habitat for waterfowl and colonial nesting species of pelicans, cormorants, egrets, and herons.

Early settlers were also attracted to these rich lands, and their potential to grow crops was soon realized. Water was diverted for irrigation purposes in 1882, and by 1903 approximately 10,000 acres of farm land were irrigated by means of delivery systems constructed by private landowners (Abney 1964). In 1905, the states of California and Oregon ceded to the United States the lands under Lower Klamath Lake and Tule Lake. In that same year, the U.S. Bureau of Reclamation (BOR) filed Notice of Intention to utilize all unappropriated waters of the Klamath Basin. Also in 1905, the Klamath Reclamation Project was approved. Initial construction began in 1906, with the first water deliveries in 1907 (Pafford 1971). The initial construction effort for the Klamath Project was supplemented by the completion of the Clear Lake Storage Dam in California in 1910 and the Lost River Diversion Dam in Oregon in 1912. The first homestead entries were announced in 1908 and by 1948, 13 homestead openings had been announced. Since 1922, 44,000 acres were homesteaded into 613 farm units (Pafford 1971).

The diversion and redistribution of water, which was the life blood of the Basin's wetland, led to a reduction in waterfowl habitat. As the marshlands were dried and converted to agriculture uses, the Basin lost it's capacity to support historic numbers of waterfowl. To preserve the remaining wetland habitats, Clear Lake, Lower Klamath, Tulelake, and Upper Klamath National Wildlife Refuges were established. Klamath Marsh and Bear Valley NWR's were created later and added to the Refuge Complex, which now includes all six refuges.

On September 2, 1964, Public Law 88-567 commonly referred to as the "Kuchel Act", was signed into law. The Act declared that the lands within Lower Klamath, Tulelake, Upper Klamath, and Clear Lake National Wildlife Refuges were dedicated to the major purpose of waterfowl management, but with full consideration to optimum agriculture use. The National Wildlife Refuge Administration Act of 1966, as amended in 1976, and the National Wildlife Refuge System Improvement Act of 1997, designated the FWS as the agency to administer units of the Refuge system, including Kuchel Act lands (see Appendix D). An Interior solicitor's opinion of May 26, 1976, stated that the continued management by the BOR on Kuchel Act land was by way of a cooperative agreement. The agreement recognized the FWS as having ultimate administrative control over refuge lands. A modification to the BOR leasehold renewal procedure at this time, according to the DOI solicitor's opinion, was that the Fish and Wildlife Service must make the ultimate decision whether the renewal of a particular farming lease is consistent with proper waterfowl management, as required by the Kuchel Act. Subsequent to these Congressional actions in 1976, the Fish and Wildlife Service and the Bureau of Reclamation entered into a cooperative agreement in 1977 (Appendix E).

Figure 1: Klamath Basin NWR Complex Vicinity Map



## GENERAL DESCRIPTION OF THE REFUGES

### Lower Klamath National Wildlife Refuge

Lying astride the California-Oregon border in Siskiyou County, California, and Klamath County, Oregon the Lower Klamath National Wildlife Refuge was set aside by President Theodore Roosevelt through Executive Order in 1908. The original refuge size of 81,619 acres was reduced to 46,912 acres by Executive Orders. The refuge recently added 3,645 acres through purchase and the present size is 50,557 acres. The refuge was superimposed on lands ceded to the United States for reclamation purposes by the states of California and Oregon as part of the Klamath Reclamation Project, and became dependent upon the operation of the project for water. As the nation's first waterfowl refuge and the first large area of public land to be reserved as a National Wildlife Refuge, it was listed in the National Registry (October 15, 1966), as a National Historic Landmark and National Natural Landmark. Figure 2 is a map of the refuge.

The refuge is located on a former lake bed. Water flow into Lower Klamath Lake was restricted when a railroad was built over the inflow to the lake. The remaining lake and wetlands were drained as part of the Klamath Reclamation Project. Lower Klamath NWR is divided by roads and canals into a number of units and subunits which range from 63 to 5,665 acres. Refuge habitats include seasonal and permanent marshes, uplands, grain fields, quack grass control units, pasture and hay. Water is the key to maintaining these habitats.

### Tulelake National Wildlife Refuge

Tulelake National Wildlife Refuge is located in extreme northern California in Modoc and Siskyou counties, approximately 1 mile west of the town of Tulelake. Created by Executive Order dated October 4, 1928, and amended by two subsequent Executive Orders in 1932 and 1936, enlarging it to 11,000 acres and 30,000 acres respectively. The refuge was superimposed on lands ceded to the Untied States for reclamation purposes by the State of California as part of the Klamath Reclamation Project. The present size of the refuge is 39,116 acres. Figure 3 is a map of the refuge.

The refuge is located on a former lake bed. Water flow into Tule Lake was restricted after the construction of Clear Lake Dam on the Lost River. The lake was drained through a tunnel constructed through Sheepy Ridge and flowing into Lower Klamath Lake. Tulelake NWR is divided by roads and canals into a number of units which range from 4 to 13,000 acres. The wetlands of Tulelake Refuge are comprised of 10,500 acres of shallow open water. The refuge receives water from 2 primary sources, Upper Klamath Lake and the Lost River. Lost River originates at Clear Lake and is controlled through a series of dams.

### Bear Valley National Wildlife Refuge

Bear Valley National Wildlife Refuge is located in Klamath County, Oregon, approximately 5 miles north of the California border and 13 miles southwest of Klamath Falls. The refuge is bordered by Oregon Department of Forestry lands, public lands managed by the Bureau of Land Management (BLM) and private lands. The refuge area is a rapidly developing rural interface community. Small ranches, farms and developing sub-divisions are scattered along the north, east and south boundaries. Figure 4 is a map of the refuge.

Figure 2: Lower Klamath NWR

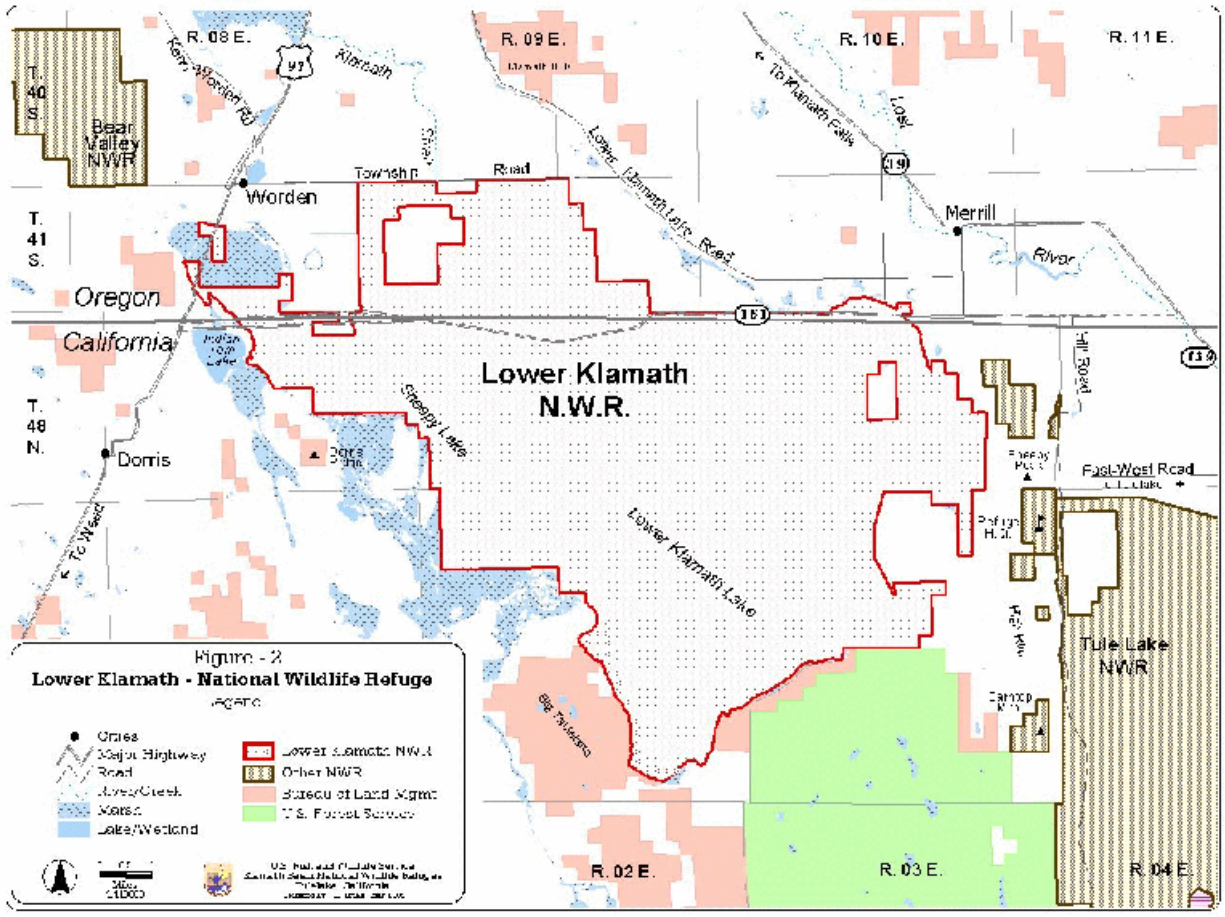


Figure 3: Tule Lake NWR

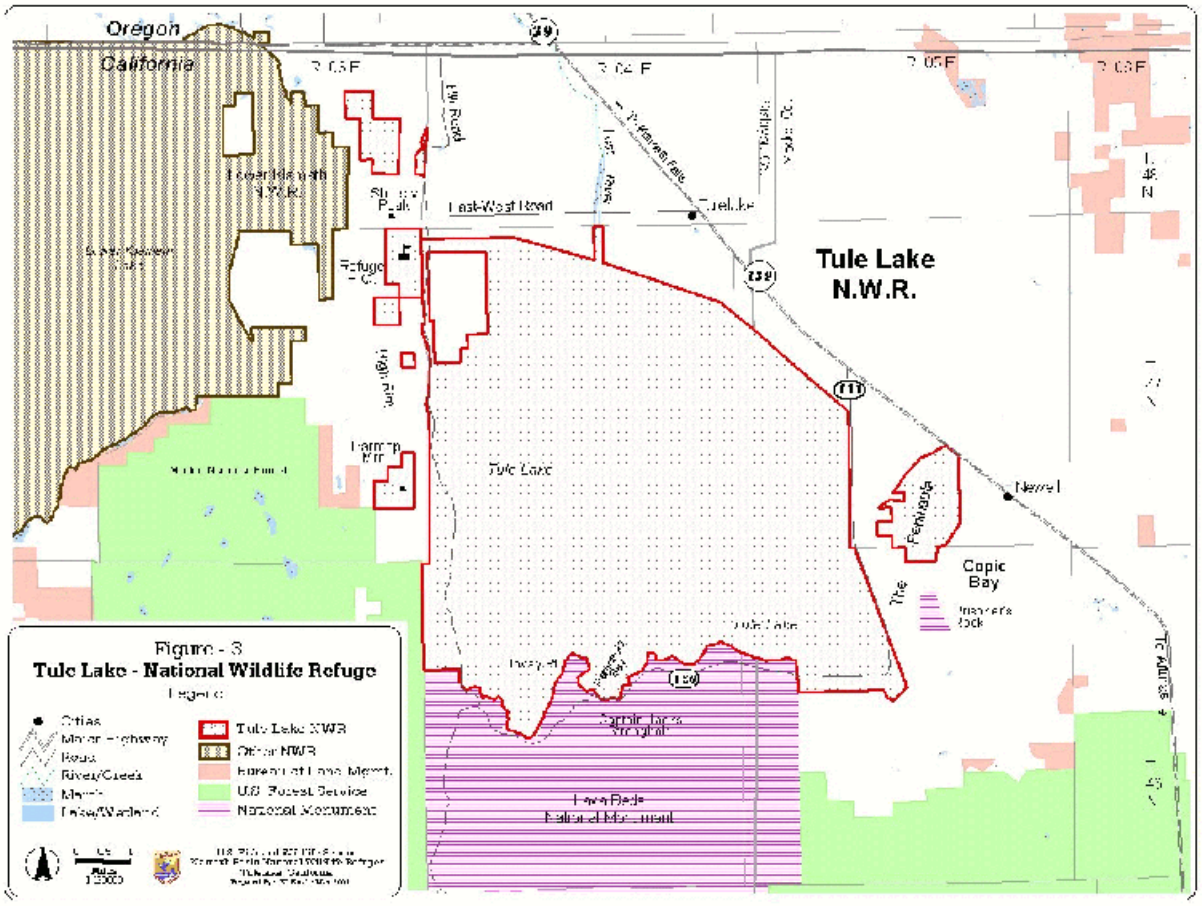
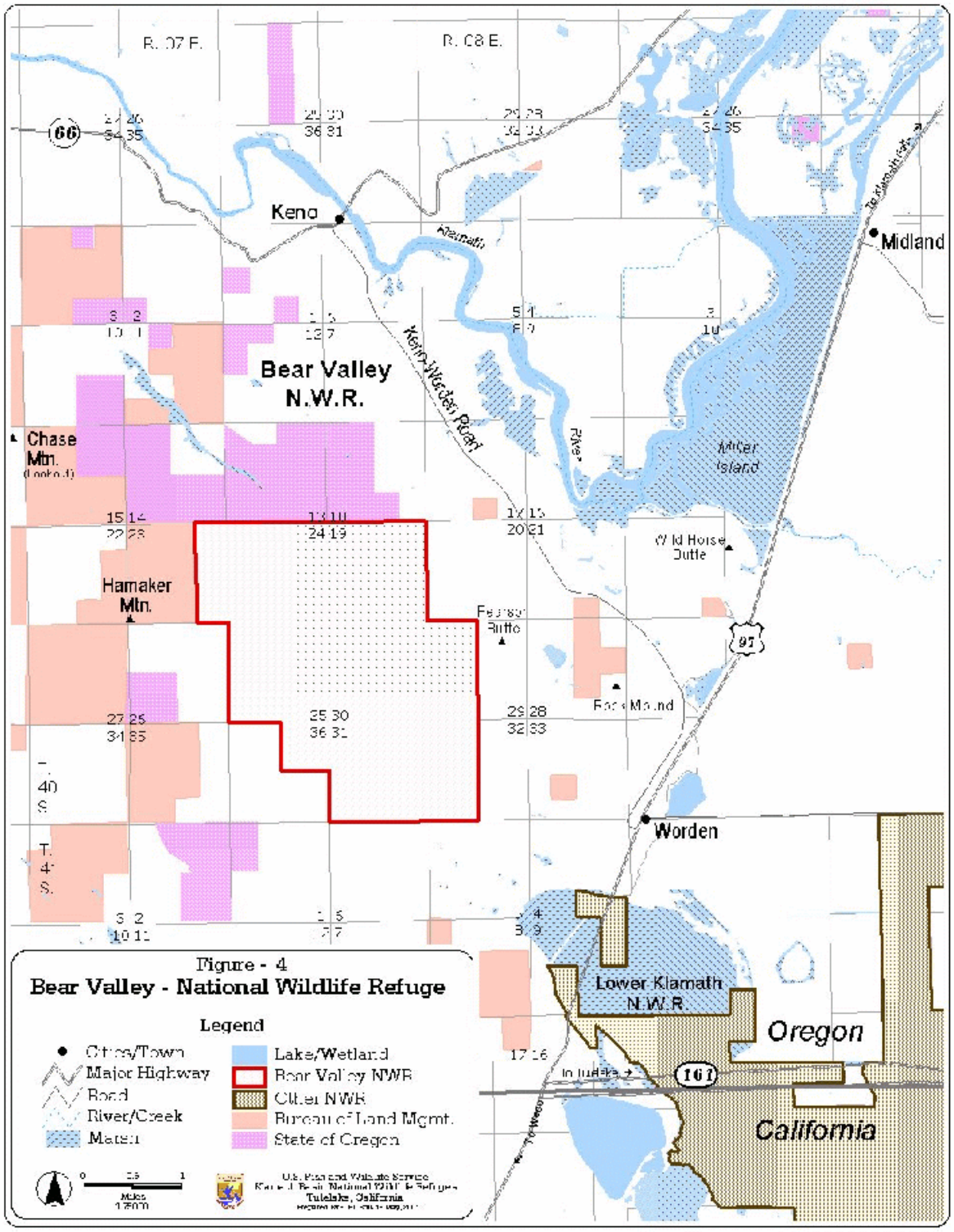


Figure 4: Bear Valley NWR



The Refuge was established in 1978 to provide roosting habitat for wintering bald eagles. The Upper Klamath Basin hosts the largest wintering population of bald eagle in the contiguous United States, with numbers some years approaching 1,000 birds. These birds are attracted to the area by the large number of wintering waterfowl. Waterfowl serve as their primary food source. Bear Valley Refuge is one of several night communal roost sites used by the bald eagles and other raptors, with 350 bald eagles observed there at one time. The refuge is especially attractive as a roosting site due to it's proximity to an abundant, dependable food supply, suitable roost trees, protection from inclement weather, and lack of human disturbance.

Bear Valley is 4,200 acres and ranges in elevation from 4,090 to 6595 feet. It consists primarily of heavily timbered hillsides and woodland area. The drier sites on the south-facing slopes and lower elevations support a community of western juniper with bitterbrush and bunchgrass. This gradually merges with a community dominated by ponderosa pine at about the 4,600 foot elevation. North-facing slopes and at higher elevations, ponderosa pine merges with incense cedar, Douglas fir and white fir. The forested vegetation is a valuable winter roost site for bald eagles.

The only public entry permitted into Bear Valley Refuge is walk-in deer hunting during a limited season in the fall. This closure is enforced to minimize disturbance to roosting and nesting bald eagles. A nearby road offers opportunities for visitors to observe bald eagles depart roost sites to feed throughout Upper Klamath Basin.

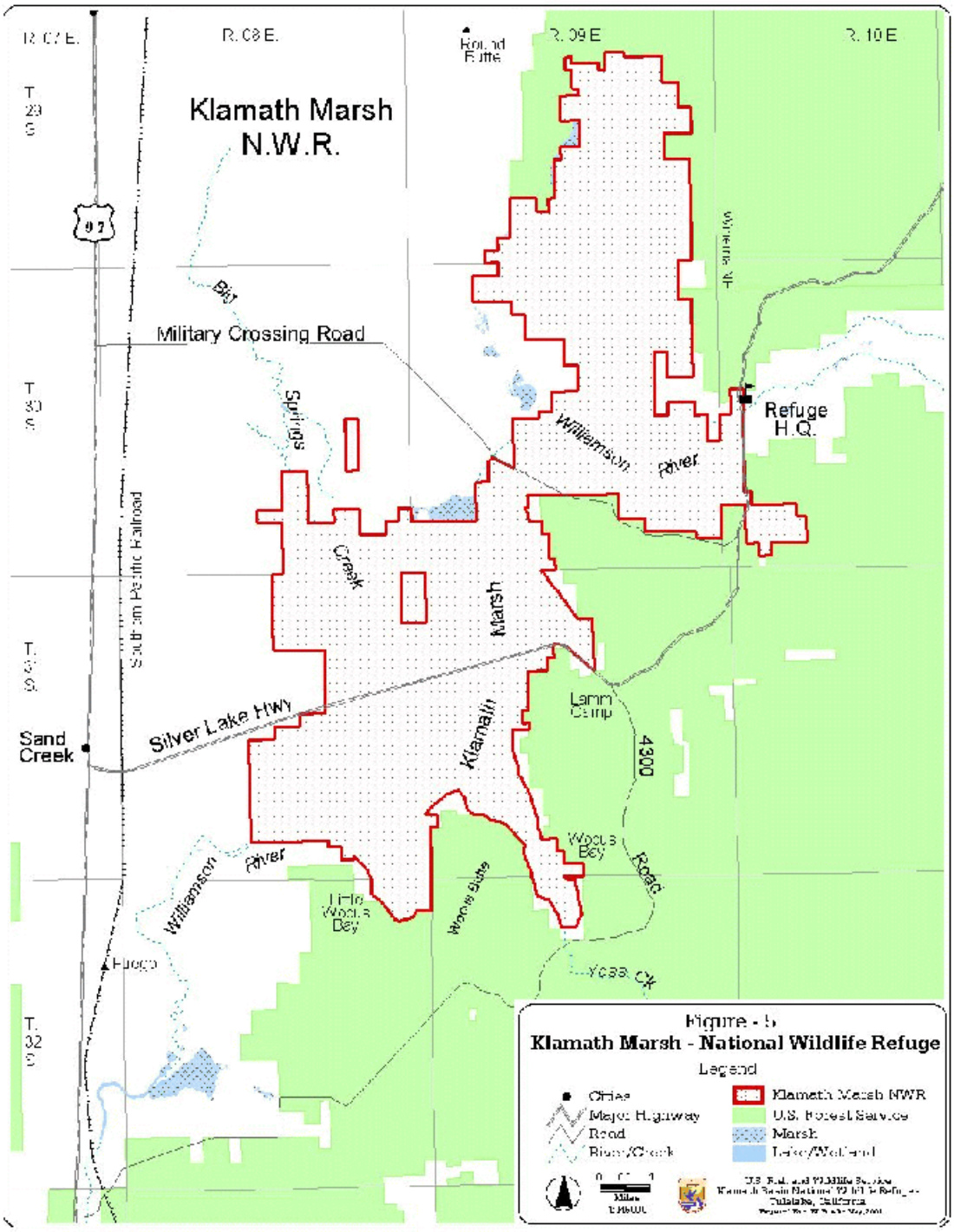
The refuge has a management plan, the "Bear Valley NWR Bald Eagle Habitat Improvement Project" (Appendix C). The purpose of the management plan is to maintain the mature eagle roosting habitat by commercial thinning of heavily stocked under-story trees. Post thinning prescribed fire to reduce hazard fuel accumulation. The commercial thinning operation would take place in five distinct zones over a period of 10 years. The project is administered through an agreement with the Klamath Falls office of the BLM.

**Klamath Marsh National Wildlife Refuge**

The Klamath Forest NWR was created on June 12, 1958 when 309 acres were purchased from private ownership. Additional tracts totaling 275 acres were bought later that year. The refuge was further expanded in September 1960, when land held in Indian trust status, totaling 14,641 acres of former Klamath Indian Reservation Land was purchased. Subsequent acquisitions using Land and Water Conservation Funds have brought the total refuge acreage to 40,776. The refuge's name was changed in 1998 to Klamath Marsh NWR. Figure 5 is a map of the refuge.

The Klamath Marsh National Wildlife Refuge is a marsh surrounded by meadow and timber land which occupies an elongated, shallow basin in the Williamson River drainage. The long axis of the marsh is north-south and is approximately 17 miles in length. The marsh is approximately seven miles in width at its widest point. The refuge is located approximately 65 miles north of Klamath Falls, Oregon. It is bisected from east to west by the Silver Lake Highway (Klamath County Rd. 676). The refuge contains approximately 16,908 acres of permanent marsh, 20,839 acres of seasonal marsh, 2,238 acres of coniferous forest and 651 acres of dry upland meadow.

Figure 5: Klamath Marsh NWR



The area was previously used primarily for summer grazing of livestock. Historical grazing levels were in excess of 60,000 animal use months (AUM). With the establishment of the area as part of a National Wildlife Refuge, grazing pressure was reduced, management units were established, and strategies for improving the area for wildlife were implemented.

Management techniques at the refuge consist of water manipulation, grazing, haying, or prescribed fire. Water management on the north end of the refuge during normal or above-average water years. On the south end of the refuge, there is no way to control water levels. Fall cattle grazing and haying is permitted on designated areas. Prescribed burning is accomplished as weather and habitat conditions permit.

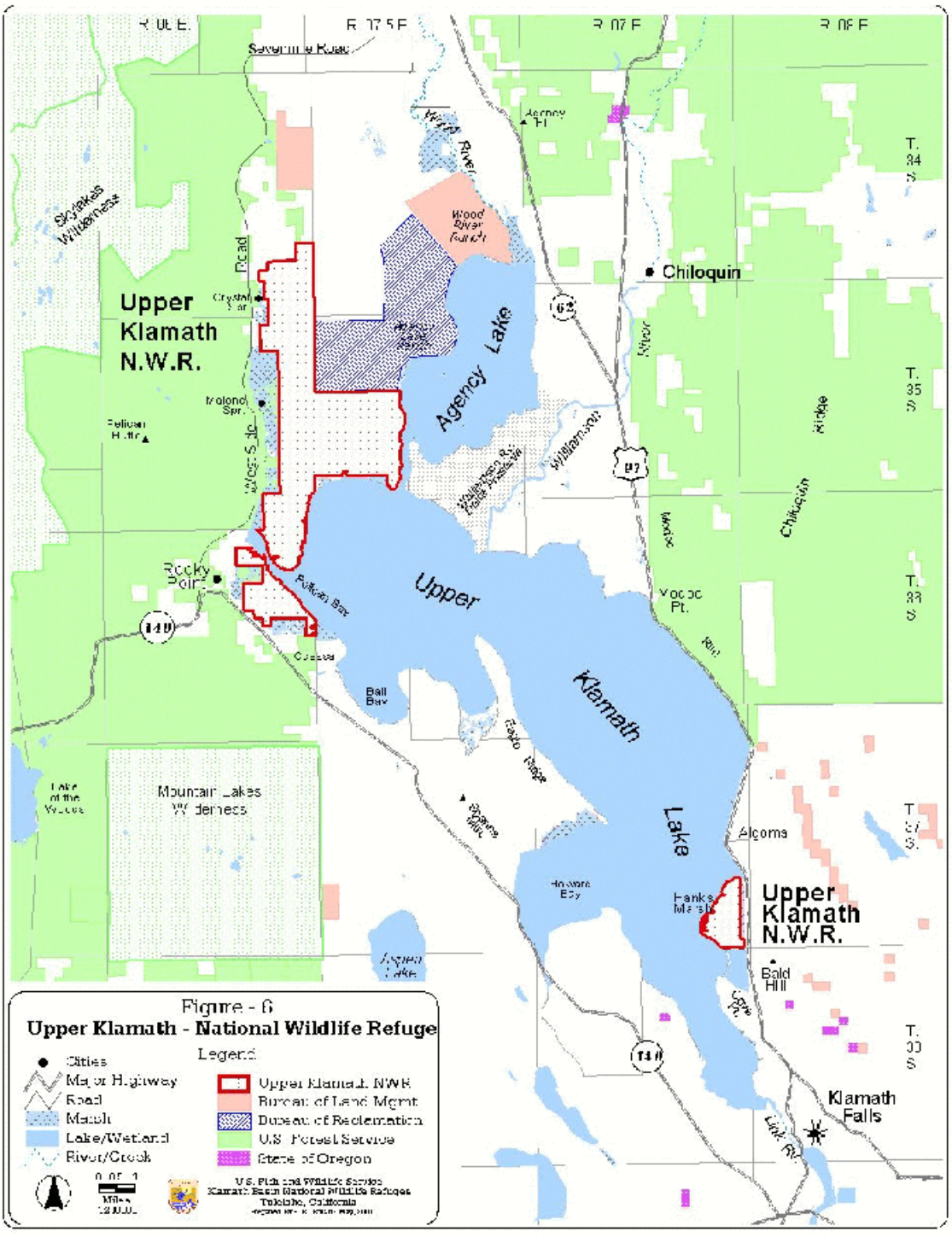
**Upper Klamath National Wildlife Refuge**

Upper Klamath National Wildlife Refuge is located in Klamath County, Oregon, approximately 20 miles northwest of Klamath Falls, Oregon. Adjacent public lands include the Winema National Forest directly west. The north and east boundaries are formed by private land. The Nature Conservancy, BOR and BLM have recently purchased those private lands on the east and are working to restore them as wetlands. Much of the remainder of the surrounding lands is in private ownership. The general area is characterized as rural, with scattered small ranches and farms, private vacation cabins, and several resort developments.

The Refuge was established by Executive Order in 1928. As a partial overlay on BOR lands withdrawn for "reclamation" purposes in connection with the Klamath Reclamation Project. The Executive Order stated the lands would be ".. reserved and set apart for the use .. as a refuge and breeding ground for birds and wild animals .. subject to the use thereof .. for irrigation and other incidental purposes, and to any other valid existing rights." The Kuchel Act of 1964 added 1,440 acres to the original area of the refuge. The Migratory Bird Conservation Act mandates that Upper Klamath Refuge be used "as an inviolate sanctuary, or for any other management purpose, for migratory birds."

The Refuge consists of 14,966 acres, and is divided into two geographic units, Hank's Marsh at the south end of Upper Klamath Lake, and Upper Klamath Marsh at the north end of the lake. The Refuge is comprised almost entirely of hardstem bulrush marsh. Approximately 30 acres in the Upper Klamath Marsh unit is forested. The refuge serves as important nesting areas for waterfowl and colonial waterbirds such as American white pelican and blue heron. It also provides foraging habitat for nearby nesting bald eagles and ospreys. The Refuge is an important resting area for migrating waterfowl. During the summer months, the endangered Short-nosed and Lost River suckers find important habitat near the lake interface with the Upper Klamath Marsh unit. Most of the refuge is accessible only by boat or from the air. Figure 6 is a map of the refuge.

Figure 6: Upper Klamath NWR



**Clear Lake National Wildlife Refuge**

Clear Lake National Wildlife Refuge was established by President William Howard Taft in 1911 by Executive Order. The refuge is located approximately 15 miles southeast of Tulelake. Clear Lake resevoir serves as a major irrigation water source for the Klamath Reclamation Project operated by the BOR. Clear Lake's water level is regulated by the BOR. The refuge serves as a waterfowl migration area and a nesting area for colonial birds, primarily pelicans and cormorants. The largest parcel is the "U', which is a 5,500 acres. The "U', is fenced and grazed seasonally during the fall. The refuge is 46,460 acres consists of 33,440 acres of open water at full pool and 13,020 acres of perennial grasses and forbs, low sage, and scattered juniper. Several islands created by the reservoir support breeding colonies of California and ring-billed gulls, Caspian terns, great blue herons, great and snowy egrets, double-crested cormorants, and the largest breeding colony of white pelicans in California. One of the last remaining sage grouse leks in the vicinity is located on the refuge. The refuge is also home to the healthiest populations of federally endangered Lost River and short-nosed suckers in the Upper Klamath Basin. Figure 7 is a map of the refuge.

Specific habitat management objective for the refuges uplands are:

1. Provide year around habitat for pronghorn antelope.
2. Provided suitable areas to perpetuate the resident sage grouse population.

**WATER RESOURCES**

All of the refuges in the Complex, except for Bear Valley, are associated with abundant water. The Upper Klamath Basin is the headwaters of the Klamath River. Only Tule Lake did not contribute to the Klamath River System during the pre-settlement era. Tule Lake was a closed basin. During the Klamath Reclamation Project, a tunnel was bored through the barrier ridge between Tule Lake and Lower Klamath Lake. Waters from the Klamath Reclamation Project now flow from Clear Lake and Upper Klamath Lake, through an intricate system of canals to the Tulelake NWR, through the tunnel and onto Lower Klamath NWR. Figure 8 is a map of the Klamath Reclamation Project. Tulelake, Upper Klamath, Clear Lake and Lower Klamath NWR's are dependent upon the BOR's Klamath Reclamation Project for their water supply. Tulelake and Lower Klamath NWR's are dependent on the BOR for water delivery.

Lower Klamath NWR receives water from 2 primary sources, the Ady canal and P canal systems. Ady canal water is delivered directly from the Klamath River and represents the best quality water currently available to the refuge. Except in periods of extreme drought (i.e., summer 1992 and 2001), water is generally available year round from this source. The Ady canal is capable of supplying approximately 150 cubic feet per second, which is used to maintain permanently flooded and open submergent habitats during the summer. The Ady canal is also used as a supplemental water source during fall flooding of seasonal wetlands.

P system water originates from Tule Lake via the tunnel through Sheepy Ridge and services most of the units of Lower Klamath NWR. This water is comprised largely of agricultural return flows and is of lesser quality than Ady canal water. Water generally becomes available from the P canal system during the fall when Tule Lake is lowered for flood storage. Thus, the majority of water used for fall flooding comes from the P canal system with lesser amounts from the Ady canal.

For both Lower Klamath and Tulelake, water is removed from wetland units using a number of drains and ditches. Estimated water use by year will vary depending on the specific habitat and water management plan.

Figure 7: Clear Lake NWR

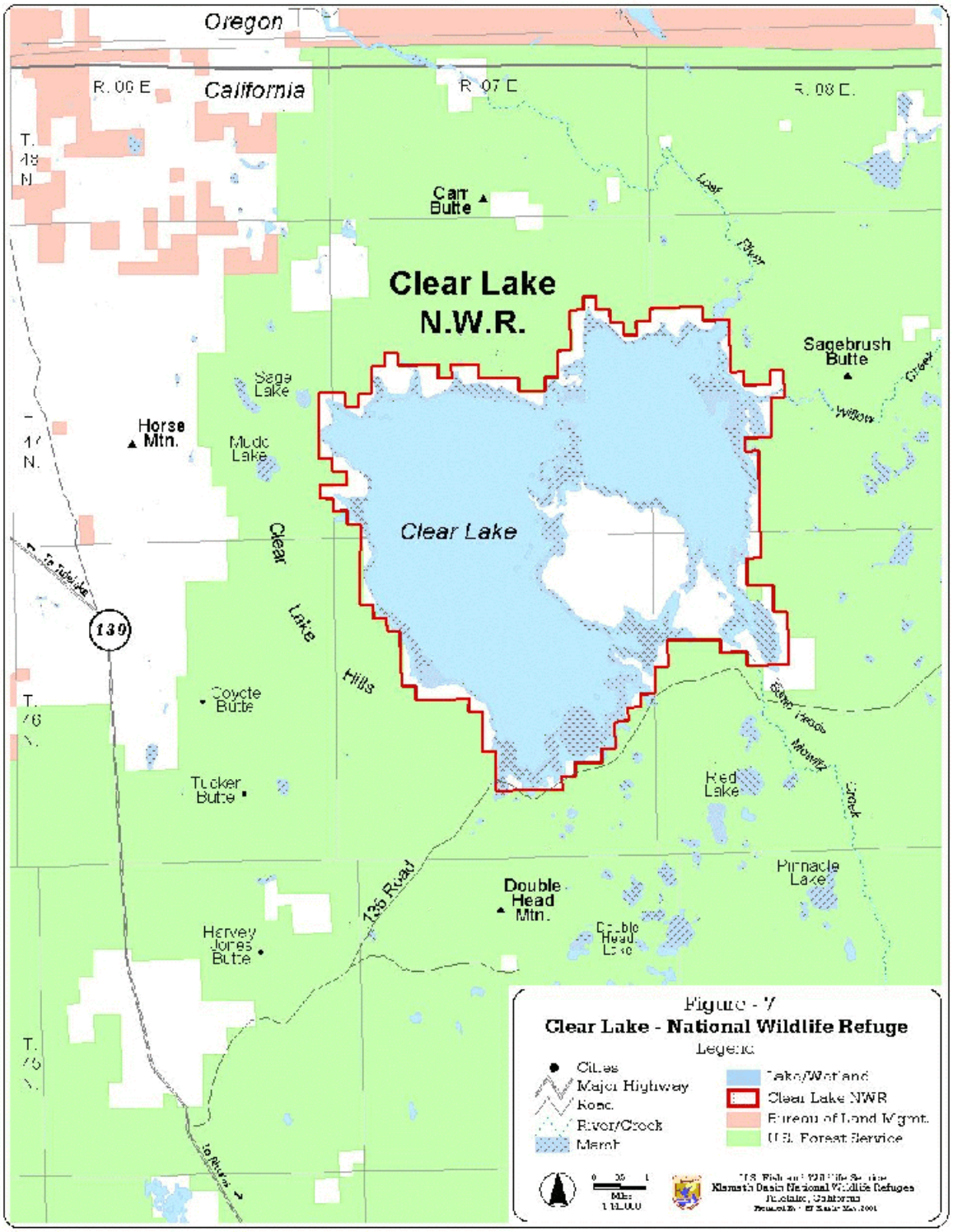
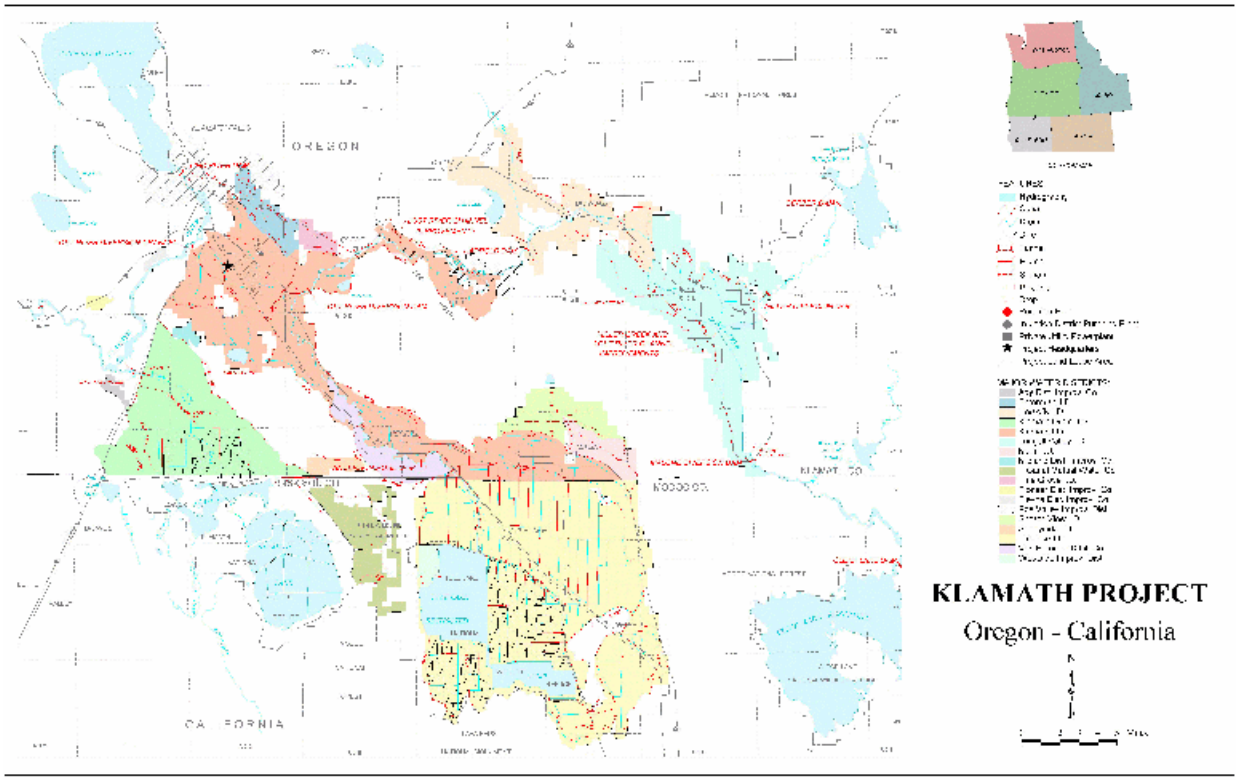


Figure 8: Klamath Reclamation Project



The primary sources of water for Klamath Marsh NWR are the Williamson River, Big Spring Creek, Kane Spring, and Sand Creek. The Williamson River enters the refuge via two natural channels. The main channel enters the refuge below the headquarters and ends at Rock Island, where it historically spread out toward the north and inundated wetlands on the north end. After exiting the refuge, the river flows south to where a lava flow forms a natural barrier known as Kirk Reef. This natural dam restricts the river flow enough to help create the wetlands which exist upstream. Ground water flows on the refuge and surrounding area are significant, resulting in small springs, open water potholes, and artesians. The refuge contains four developed artesian wells. Potholes near the Loosely area are so numerous that approximately 40 acres are surrounded by a fence to keep cattle out of the area.

Water levels in both marshes at Upper Klamath are under the control of the BOR, in agreement with Pacific Power and Light Company. With the listing of the Short-nosed and Lost River suckers, management of lake levels has changed. At this date, the BOR is operating under a biological opinion which mandates specific lake levels at various months of the year to protect all life stages of the endangered suckers.

**SOILS**

The soils of the Upper Klamath Basin is of volcanic origin. Cinder cones and lava flows of the Miocene era to recent age surround the basin. Most of the soils within the Complex have a large amount of diatomaceous material present. Most soils are silt loams, although individual series do vary.

The soils of Lower Klamath and Tulelake NWRs developed under the former Lower Klamath and Tule Lakes are a result of lacustrine deposits and volcanic ash. A distinguishing feature of the soils is the high amount of diatomaceous material present (U.S. Bureau of Reclamation 1987). Soils of the west side of Lower Klamath NWR have been classified by the U.S. Soil Conservation Service as Algoma silt loam, Tulana silt loam, and sandy substratum (U.S. Bureau of Reclamation 1987).

The principal soil type at Bear Valley is a stony loam, which is derived from weathered andesite, other felsites, basalt, and minor amounts of pyroclastic rocks and ash. This soil type is usually found in cooler sites with higher annual precipitation levels (18 to 25 inches) and typically supports forest tree species. Less prevalent soil types include Lober loam, Climus loam, Lorella very stony loam, Royst stony loam and Dehllinger very stony loam, usually on more xeric sites. These soils generally support western juniper , mountain mahogany an other woody shrubs, and grasses.

There are four hydromorphic soil types (Yamsay, Chinchallo, Mazama, and Kirk) underlying most of Klamath Marsh and Upper Klamath. These soils are generally submerged. Vegetation does vary by each of the four types. The Yamsay series is dominated by black to very dark brown diatomaceous muck or ooze and has a root mat of living and dead tule Roots. The Chinchallo Series is a modal silt soil of greatest importance for grazing, haying, and hay production. The Mazama Series is a silt soil and may drain in late summer or fall to permit limited grazing. The Kirk Series is a modal loam and the principal vegetation includes blue grasses, meadow sedge, Nebraska sedge, cheatgrass, and other perennial grasses, sedges, rushes, and reeds.

No formal soil survey of Clear Lake Refuge has been done. Soils occurring between the rockland outcrops have coarse pumice sand surface layers and subsoils. However, due to the volcanic nature of the area most soils are shallow over fractured basalt and contain compacted layers and hardpans. Low sagebrush, annual and perennial grasses are the dominant plants of this soil type. Adjacent to the shoreline of the impoundment, deeper soils of a sandy loam texture are present and big sagebrush, and Great Basin

wild rye, can be found on these sites.

**VEGETATION**

The Refuge Complex has nine vegetation types with burnable vegetation. Some of these vegetation types are unique to one refuge while other vegetation types occur on many of the refuges. The vegetation types are described by defining the elements of the vegetation that contribute to wildland fire spread and intensity. The vegetation types are permanent hardstem bulrush marsh, emergent seasonal marsh, uplands, agricultural crop lands, ponderosa pine forest, mixed conifer forest, western juniper woodland and lodgepole pine forest.

Much of the existing vegetation types at the refuges are a result of post-settlement modification of natural functioning ecosystems. The Wocus Bay area at the Klamath Marsh NWR, contains some of the only natural vegetation type that remains essentially unaltered by reclamation activities, agricultural development or logging. Lower Klamath and Tulelake NWRs are the most changed environments, both being drained lake beds. The Peninsula and Sheepy Ridge areas of Tulelake NWR were used for intensive livestock grazing at times during the last 50 years with a result of introduced annual grass species, but still have native vegetation components. Upper Klamath NWR in on a natural lake that has a dam. The water level of the lake is raised with subsequent flooding of marsh and uplands areas along the lake edge. The reef which controlled the natural level of Upper Klamath Lake was lowered three feet for construction of the dam and the lake can be lowered to levels less than natural levels. Bear Valley NWR has been extensively logged for over 100 years. Clear Lake NWR received very heavy year around livestock grazing from 1870 until the early 1950's, but still has some native vegetation components. The remaining area of Klamath Marsh NWR has been used for intensive haying, grazing and logging for approximately 50 years.

None of the refuges have been managed in natural fire regimes for well over 100 years. The existing biomass accumulations in the forested areas of the Complex are a result of wildland fire exclusion policies. Most of the forested areas had mean natural fire return intervals of less than 20 years. Some forested areas on the refuges, may have had mean fire return intervals significantly less than 20 years. Studies have shown the mean fire return interval to be 14 years at Bear Valley NWR (Goheen, 1999).

The existing vegetation at Tulelake and Lower Klamath NWR is the result of the draining Tule Lake and Lower Klamath Lake during reclamation activities. Lower Klamath Lake was once an area of vast hardstem bulrush marsh and open water. After the flow of water to Lower Klamath Lake was stopped, the lake and marsh land dried. Large areas of the former lake bottom had wildland peat fires which burned for approximately 20 years, destroying much of the lake bottom’s peat based soils. Water was applied to the former lake bed for the purpose of agriculture and wildlife management to create the mosaic of open water, marshes and agricultural lands that exist today.

Tule Lake was once a large shallow lake, with hardstem bulrush marsh along the edge of the lake. The exposed, drained lake bottom was converted into agricultural crop land. The current lake and hardstem bulrush marshes were created out of the drained lake bottom. The refuges obtain water from Upper Klamath Lake and Clear Lake through downstream flows of agricultural water through a complex canal and drain system. The current vegetation configuration at these refuges bears little or no resemblance to the pre-settlement condition. Except for the upland areas, vegetation types at Tulelake and Lower Klamath NWRs are transitory, being changed or replaced when refuge and agricultural management practices dictate change.

**Permanent Hardstem Bulrush Marsh**

This type exists where permanent lake areas are maintained at the refuges. Permanent marsh is scattered through out the refuge complex, except for Bear Valley NWR. The primary vegetation is hardstem bulrush, with cattail, sago pondweed and other aquatic vegetation. The bulrush and cat tail plants often grow to six feet or greater in height. This vegetation type does not burn unless the diked marsh unit is drained and the vegetation is allowed to cure or until winter freeze-up conditions occur with fuel curing. Permanent marsh areas are managed primarily for waterfowl and other water dependent wildlife.

**Emergent Seasonal Marsh**
This type exists where seasonal winter, spring and early summer flooding is applied to diked units or natural shallow water basin areas. Vegetation varies on the different units depending on location of the unit, the soil type, salt content of the soil, seasonal flooding schedule and whether the unit is rotated with agricultural crop land. Vegetation consists of either mono-culture stands of alkali bulrush, to highly diverse stands of moist soil vegetation, including aggregations of hardstem bulrush and cat tail. Seasonal marsh areas are managed primarily for waterfowl, sandhill cranes and other water dependent wildlife.

**Agricultural Crop Land**
A variety of agricultural crops are grown on three refuges. The majority of agricultural crops at Tulelake and Lower Klamath are planted to grain, with row crops and hay crops being secondary. Grain farming results in large areas of these refuges having pre and post harvest vegetation that is highly flammable. Generally, row and hay crops do not contain burnable vegetation. Row crops include potatoes and onions. The majority of agricultural crops at Klamath Marsh NWR is hay that is harvested from emergent seasonal marsh. Burnable vegetation is largely removed from hay producing agricultural crop lands by agricultural practices.

**Uplands**
This is one of the most diverse groups of vegetation on the refuges. Uplands vegetation generally occurs on areas adjacent to the former and current lake beds and on the network system of canal banks, berms and roads that occur throughout the refuges. This vegetation type varies from introduced annual grasses, such as cheatgrass, to a mix of native and introduced perennial grasses, forbs, noxious weeds, and native brush species. The uplands are generally the earliest vegetation to cure and will contain burnable vegetation from July until the next seasons green-up.

A series of sand and peat dunes border the western, southern and eastern edges of the Lower Klamath NWR wetlands. The dunes were probably formed during droughts by wind deposited materials. The dunes are vegetated with greasewood, introduced annual grasses, native perennial grasses and forbs. The dune areas cover approximately 1,500 acres of the refuge.

Dry, former lake bed areas receive only winter and spring precipitation and are seldom flooded as these areas are higher in elevation than the current flooded area. These dry areas have a mix of upland vegetation that varies from grasses less than 12 inches tall to perennial and annual vegetation up to six feet tall. Hardstem bulrush and cat tail aggregations occur in these areas. Vegetation on the canal and road berms varies from low growing grasses to noxious weed patches that grow to eight feet tall. Many of the berms have been planted with wheatgrass or have been invaded by quackgrass. Most of the berms near the wetland areas have very dense annual growths of vegetation.

**Ponderosa Pine Forest**
This type consists of several vegetation associations with ponderosa pine. The most common association is ponderosa pine forest with an understory of bitterbrush. This association is usually a result of logging and wildland fire suppression. Logging opened up the canopy of the pine stands and disturbed the soils. Fire return intervals in natural functioning ponderosa pine forests can be as close as every 2 to 3 years.

Bitterbrush is a volatile plant and prone to burning during surface fires. As a result of fire suppression policies by Tribal, state and federal governments, many ponderosa pine stands exist with extensive understory stands of bitterbrush. This vegetation association is highly volatile, with stand replacement wildland fire a hazard.

Ponderosa pine also has associations with montane brush, which is a snowbrush and manzanita shrub understory. This association usually exists on lower elevation north facing slopes or in higher elevation pine stands. Because of the increased precipitation regimes usually accompanying this vegetation association, also increased biomass accumulations of duff, litter and limbs exist.

**Mixed Conifer Forest**
This type occurs only at Bear Valley NWR. Mixed conifer vegetation consists of a mixed overstory of ponderosa pine, douglas fir, white fir and incense cedar. The percent of tree species in any one area varies throughout the refuge. Most of the refuge, except for the lower elevation areas, were originally mixed conifer forest. Subsequent logging, historical wildland fires and over 50 years of fire exclusion radically changed the vegetation composition of the forest to dense stands of second growth conifers or burned over areas of montane brush and western juniper.

Montane brush areas are a direct result of wildland fires. These areas consist of manzanita, snow brush, bitter cherry and other shrub species. Montane brush is an early seral stage of mixed conifer forest. The montane brush fields are being succeeded to mixed conifer forest, as white fir, douglas fir and ponderosa pine invade the brushfields.

**Western Juniper Woodland**
This type occurs only at Bear Valley NWR. This type is a result of fire suppression policies and past logging practices. Western juniper is not a fire resistant tree species and mortality is high from moderately intense wildland fires. Western juniper occurs in the dry areas along the east boundary of the refuge. The juniper stand has an understory of annual and perennial grasses, bitterbrush and other shrub species. Some of the juniper woodland areas are being succeeded to ponderosa pine forest.

**Lodgepole Pine Forest**
Lodgepole pine forest consists of nearly pure stands of lodgepole pine with an understory of either bitterbrush or grasses. This vegetation type is located only on the Klamath Marsh NWR. Most of the lodgepole pines stands on the refuge have a component of dead and down materials. Most of this fire dependent type has not been burned in over 100 years and in areas has accumulated heavy fuel loading from down logs. Wildland fire spread through this type is largely through grass or bitterbrush.

**WILDLIFE**
The Refuge Complex contains over 430 vertebrate species, most of which are dependent on wetlands, with waterfowl being the most conspicuous. During fall and spring migration, up to 1 million waterfowl rest and feed on Lower Klamath NWR alone. In recent years, over 140 million waterfowl use days per year have been recorded.
In addition to waterfowl, the Refuge Complex is important to a variety of vertebrate species which are of concern to federal and state wildlife agenceies. Bald eagles (*Haliaetus leucocephalus*) which originate in the Pacific Northwest and Western Canada winter at all of the Complex refuges. More than 500 bald eagles have wintered in the Klamath Basin, constituting one of the largest concentrations in the lower 48 states (Keister et al. 1987). In more recent years, wintering bald eagle population numbers have exceeded 1,000 eagles. Wintering bald eagles are usually present in the Upper Klamath Basin between mid-October and April (Keister 1981). The roost at Bear Valley typically has the highest concentration of eagles during

winter. As many as 64 percent of the entire wintering population in the Basin utilize this roost area (Dellasala et al. 1987). Extensive eagle use appears to be related not only to the availability of roost trees but also because of its proximity to major waterfowl concentration areas. The refuges topographic position which offers favorable thermal conditions for roosting eagles (Keister and Anthony 1983, Keister et al. 1985). Selection of habitat for communal roosting occurs on at least three spatial scales, including a macrohabitat scale (roost area, generally near food resources), at the roost stand (mature, multi-layered stands), and the individual tree (older, taller, dominant or co-dominant trees) (Dellasala et al. 1987).

Peregrine falcons (*Falco peregrinus*) are also present on Lower Klamath, Upper Klamath, Clear Lake, and Tulelake and prey on waterfowl and shorebirds.

Upper Klamath Lake, Tule Lake, Clear Lake, the Lost River and Lower Klamath Lake are home to short nosed and Lost River suckers. These two fish species are federally listed as endangered species. Klamath Marsh NWR has spotted frogs, a federally listed category one species.

The Refuge Complex is host to several species of colonial nesting water birds. American white pelicans (*Pelecanus erythrorhychos*) have only 2 colonies remaining in California, at Lower Klamath and Clear Lake. White Pelicans are also found at Klamath Marsh. Shallow water in these areas provide prime feeding areas for pelicans, as well as for other fish-eating species of birds such as great egrets. White-faced ibis (*Plegadis chihiz*) are also an important nesting species at Lower Klamath. Ibis numbers have grown over the past several years to the present nesting population of approximately 3,800 pairs located in 5 colonies (Taft et.al. 2000). Ibis nest in association with great egrets (*Casmerodius albus*), snowy egrets (*Egretta thula*), and black-crowned-night-herons (*Nycticorax nycticorax*).

The Refuge Complex is an important area to neotropical migratory birds especially those which are dependent on wetland habitats.

The Complex provides for the habitat needs of greater sandhill cranes, particularly at Klamath Marsh where approximately 65 pairs of cranes nest. As water levels recede during late summer and early fall, excellent crane feeding conditions are created in the marsh.

Tundra swans and white-fronted geese are numerous during the spring migration at Klamath Marsh. Close to 16,000 tundra swans have been observed on the refuge during this period. Most use occurs on the north end of the refuge. White-fronted geese utilize recently burned areas of the refuge and adjacent rangelands.

A wide variety of forest-dwelling wildlife species occur at on the Complex. Uplands vegetation support small, transient populations of pronghorn, mule deer, and Rocky Mountain elk. As adjacent forest lands become dry in late summer and early fall, elk utilize the marsh lands for feeding. There are two small herds of pronghorn on the Complex refuges. Small numbers of mule deer inhabit primarily the forested areas of the Complex. Sage Grouse are still found at Clear Lake. This population of sage grouse is thought to be in serious jeopardy.

**FACILITIES AND INFRASTRUCTURE**

There are a number of structures located at Tulelake, Lower Klamath and Klamath Marsh NWR's. Table 1 displays the structures by refuge. These structures include shops, vehicle storage, offices, residences, fueling stations, pump houses, hazardous material storage, visitor centers, and wildlife rehabilitation buildings. Most of the heavy equipment and other refuge equipment and vehicles are parked in common areas at Tulelake, Lower Klamath and Klamath Marsh NWR's. Routine maintenance activities of refuge

equipment occurs in these areas. Hazardous material storage buildings are located at each refuge facility. Herbicides, pesticides, cleaning chemicals, paint and petroleum products are the most common hazardous materials used on the refuges.

An intricate system of power lines exist on Lower Klamath and Tulelake NWR's. Most of the overhead power lines have been removed and placed underground over the past 10 years. However, a number of overhead lines still exist and a more detailed overview of these can be found in the aviation plan found in Appendix O. Klamath Marsh NWR also has overhead power lines.

Tulelake and Lower Klamath NWR's have many miles of roads. Most of the roads on these refuges were constructed to facilitate maintenance of the reclamation project and are part of the berm of canals. Vehicle access is good for these refuges. Most of the main roads have an aggregate surface. Secondary roads are native surface and are inaccessible when wet. There are many bridges on the refuges. All of these are being replaced with culverts.

Bear Valley NWR has a road system that was constructed prior to FWS acquiring the refuge. Some of the roads have been improved from native surface to aggregate surface. FWS does not have fee title access to the refuge. A bridge was constructed off of the south boundary of the refuge in 1999 to aid access to the refuge. Access to the refuge can be gained only through the south and north boundaries of the refuge.

Klamath Marsh NWR has a road system that was constructed when the refuge was privately owned. The exterior of the refuge is accessed throught the Winema National Forest road system. Interior roads consist of a major county highway (Silver Lake Highway), a major aggregate surface road (Military Crossing Road) and numerous native surface roads. Some of the interior roads parallel water delivery canals.

Tulelake, Lower Klamath and Klamath Marsh NWR's have canal systems built for reclamation and delivery of agricultural water. These canals are usually charged from April until October. A more detailed view of these can be seen on the map in Appendix F.

**CLIMATE**

The Refuge Complex has a semi-arid climate with dry, hot summers and cold winters. Summer temperatures can occasionally reach 100 degrees Fahrenheit, but generally cool rapidly during the evening and night time hours. Night time temperatures can, and often do dip below 32 degrees Fahrenheit during the summer months. January is the coldest month of the year, with temperatures occasionally dropping below -30 degrees Fahrenheit. Daytime temperatures during January often exceed 40 degrees Fahrenheit. Frost can, and usually does, occur in every month. Strong winds are common, especially during winter months

Precipitation generally occurs during the winter and spring months, with the lower elevation refuges receiving approximately 7-11 inches of rainfall annually. Temperature and precipitation vary with elevation, slope, and aspect. Bear Valley NWR can receive approximately 18-25 inches of rainfall annually. Klamath Marsh NWR averages approximately 27 inches of rainfall annually, which includes an average annual snowfall of 165 inches. The surrounding higher elevations receive more precipitation and this finds its way into the basin and the Klamath River through a series of rivers and creeks.

The Upper Klamath Basin climate includes periodic drought cycles. The droughts usually follow 10 year patterns. During the driest years, annual precipitation can be as low as 30 percent of average. During years with less than average precipitation, large woody fuels cure to their lowest fuel moisture equilibrium earlier in the fire season. Fire seasons tend to start earlier and last longer into the fall. During

years with very low annual precipitation, Lower Klamath NWR may not receive spring and fall flood-up water from the BOR. Without flood-up water marsh vegetation will cure earlier with large areas available for continuous spread of wildfire.

The primary season for lightning activity extends from mid-May through mid- September, with occasional activity as early as April and as late as November. From mid-June through August, lightning commonly occurs unaccompanied by precipitation. The intensity of such activity varies widely but, on a few occasions, more than 100 cloud-to-ground strikes have been recorded in a 5 minute period.

Relative humidity ranges from 10-20% in summer and averages 75% during the winter, contributing to high fire-risks in the area (U.S. Fish and Wildlife Service 1978 and DellaSala et al. 1987). Prevailing winds are usually from the south and west.

**CULTURAL RESOURCES**

The area is rich in this respect. Klamath Basin was a focal point of early human activities. Prehistorical human use is estimated to have existed up to 12,000 years ago. Most of what is now seasonal and permanent marsh was under water in pre-settlement times. Little evidence of prehistoric human activities is found in these areas. Upland areas, are generally rich in evidence of prehistoric human activities.

An Environmental Impact Assessment prepared for the original acquisition of Bear Valley identified no significant cultural resource sites with the proposed Refuge boundary (U.S. Fish and Wildlife Service 1978). An archaeological survey conducted in 1995 detected three historical sites within the proposed project area but no evidence of prehistoric activity was noted (US Fish and Wildlife Service 1995). Two of the sites are cabins and homestead sites. The Third is an old railroad grade used for logging which still has the ties in place although the rails have been removed. Documentary research revealed that it is very likely that a branch of the Oregon Trail, which later became known as the Applegate Trail, passed through Bear Valley. The route along Bear Creek was apparently not the original route pioneered in 1846 but was highly used by later groups from 1846 to 1869. Due to intensive use of all roads in the area for logging earlier in this century, the on-the-ground survey could not determine with certainty if any of the numerous roads that traverse the Refuge from southeast to northwest were once wagon roads. Therefore, although it is almost certain that the second edition of the Applegate Trail passed through the Refuge, no physical traces are extant. A cultural resource inventory of the project area encompassing approximately 1800 acres was undertaken by the regional office archaeological staff during the spring of 1995. SHPO clearance for the project was obtained in 1996.

Pre-historic human occupation of the Tulelake and Lower Klamath NWRs was largely along the shores of the former lakes. The Modoc Tribe inhabited this area. There are numerous pre-historic archaeology sites along the former lake shores and surrounding uplands.
The Clear Lake area has a very dense occurrence of pre-historic sites. The area that now lies at the bottom of Clear Lake was an important rendevous site where area tribes gathered to barter goods. This area was also formerly inhabited by the Modoc Tribe.

Upper Klamath and Klamath Marsh NWR's were part of the Klamath Tribe territory. These areas were very densely populated by the Klamath Tribe prior to settlement. There are many historic and pre-historic sites in these areas.

# WILDLAND FIRE MANAGEMENT SITUATION

## HISTORIC ROLE OF FIRE

Fire has played a major role in the shaping of vegetative communities in the Upper Klamath Basin. Prior to settlement, fires burned whenever there was an existing fuel bed and an ignition source. Lightning is a prevalent weather phenomena in the Upper Klamath Basin, and the area probably sustained hundreds of ignitions per year. The area was heavily populated in pre-settlement times. Pre-historic use of fire by humans is not well documented in the area, but must have played some role in shaping vegetative communities.

All of the Complex's refuges, except for Bear Valley NWR, lie at the lowest elevations of the sub-basins in which they are located. Most lightning ignitions occur at higher points than the bottom of basins. The FWS has recorded wildland fire ignitions at all of the Complex's refuges, except for Upper Klamath NWR. Lightning ignitions have occurred even in former lake bed areas.

Historically, wildland fire burned any time there was an ignition in an available fuel bed. Burning continued until the conditions that allowed the fire to burn were modified or no longer existed. Existing fuel bed and weather are the two main factors controlling the spread of a fire. Wildland fire will burn through an existing fuel bed until there are no fuels left to be burned.

Nearly all of the native plants and animals in the Upper Klamath Basin evolved under fire regimes with frequent wildland fire. Fire maintained plant communities in either a low seral stage or as a fire climax. Native grasslands probably burned frequently, with stand replacing fires maintaining a native grassland community. Ponderosa pine and mixed conifer forests were largely maintained in stands of large, older trees, with little under-story vegetation or build-up of debris on the forest floor. Marsh communities were probably the least frequently burned, as receptive fuel beds were dependent on drying out and fire spreading from adjacent plant communities.

### Pre-settlement Fires

During the pre-settlement era, in the dry months of July, August, September and October, wildland fires that were started by lightning burned until they were stopped by natural barriers, the weather or a lack of fuel bed. It is likely that in many years wildland fires in the Klamath River drainage reached sizes of several hundred thousand acres. Studies have shown that recorded mean annual fire return intervals can be as frequent as 2 to 3 years. Many trees are not scarred by low intensity wildland fire, so the dendrochronology studies only focus on evidence left by fire scarring.

The Complex has not completed any research on pre-settlement wildland fire history, except at Bear Valley NWR (Goheen, 1999). Goheen's study sampled fire rings and determined a 14 year mean fire return interval. It is not known how fire affected marsh habitats at Upper Klamath and Klamath Marsh NWR's. Tulelake and Lower Klamath NWR's were lakes, with the only fuel beds in upland areas and in adjacent shallow marshes. Clear Lake is a reservoir which when flooded covered extensive native grasslands and marshes.

### Post-settlement Fire History

The FWS has been recording wildland fire history at the Refuge Complex for approximately 20 years. During the period 1990-2000 there have been 174 wildland fires recorded on the refuges. An average of 14 fires per year were recorded, with 91 (52%) being human caused and 83 (48%) being lightning caused. The fires range in size from less than one acre to 1,500 acres. All of the fires occurred during the period

between the last week in March and the first week in November. Documented fire history prior to 1990 is incomplete and shows 28 fires occurring on the Complex from 1962 to 1988. Historic fires are both human and lightning caused.

August of 1998, an equipment fire on the Lower Klamath NWR, burned 1,500 acres of refuge property and spread onto neighboring private, BLM and National Forest lands. The resulting fire size was approximately 10,000 acres. A Type 2 incident management team was ordered and managed the Refuge Fire.

August of 1987, a lightning fire on Klamath Marsh NWR burned 1,500 acres of refuge property. Lower Klamath, Clear Lake, Tulelake and Klamath Marsh NWRs have all had Class D fires (greater than 100 acres).

The neighboring National Forests have recorded fire history that covers decades. The Modoc National Forest has fire history records dating to 1910. For the latest fire budget planning cycle, the Modoc NF recorded average fire cause data for the period 1980-1999. An average of 103 fires per year were recorded with 220 (11%) human caused and 1,848 (89%) lightning caused (Forero, 2000). During the same fire budget planning cycle, the Winema NF recorded average fire cause data for the period 1968-1997. An average of 78 fires per year with 840 (33%) human caused and 1,500 (67%) lightning caused (Rogers, 2000). These records of fire ignitions demonstrate that the adjacent National Forests contribute an average of 180 wildland fire ignitions per year in the Upper Klamath Basin area. Wildland fire occurrence records from State, other Federal and local sources will show that wildland fire occurrence levels in the Upper Klamath Basin average more than 200 per year.

**Prescribed Fire History**

The Complex has a long history of prescribed fire. Accurate records have only been kept since 1990. Anecdotal records report that prescribed fire has long played a role in managing habitats, maintenance activities and farming practices. Prescribed burning has been used at all of the Complex's refuges except Upper Klamath NWR. During the period 1990-2000, 160,000 acres (approximately 14,500 acres per year) have been prescribed burned. This figure includes only those acres burned by the FWS. An estimate of agricultural burning on Tulelake and Lower Klamath NWRs for the same period is 210,000 acres (approximately 19,000 acres per year). The FWS have had no escapes from their prescribed burns. Numerous escapes have occurred from prescribed burns conducted by private individuals. The escapes have resulted in damage to equipment, neighboring crops and wildlife habitat.

Prescribed fire has been used by FWS primarily for wildlife habitat enhancement. Most of the acres burned at the complex are in marsh or agricultural habitats. All of the marsh burns have been at Lower Klamath, Tulelake and Klamath Marsh NWRs.

Prescribed fire for hazard fuel reduction began at Bear Valley NWR in 1989. The Winema NF conducted the first prescribed burns. Torching and crown fire spread occurred in the earlier burns and the program was stopped in 1992. The FWS began prescribed burning for hazard reduction in 1999 after a mechanical thinning project. The burning has been successful.

**RESPONSIBILITIES**

The Complex has had a fire management staff since 1988. However, it was not until 1990 that a dedicated Fire Management Officer was placed at refuge headquarters. The primary responsibilities of the fire management staff are to provide initial attack fire suppression capability on the complex, conduct hazard fuels reduction projects, provide interagency support in fire suppression, and conduct prescribed burns in

support of refuge habitat and water management programs.

The Fire Management organization at the Complex is currently staffed with six permanent employees. The organization consists of a Fire Management Officer, Assistant Fire Management Officer, Prescribed Fire Specialist, Fire Crew Supervisor, Crew Leader and Experienced Firefighter. The Fire Management Officer works directly for the Refuge Complex Project Leader. The Project Leader and Deputy Project Leader are both directly involved in the fire management decision process, The permanent fire staff has been supported by four temporary seasonal firefighters during fire season. Fire season for the Complex has been 14 weeks. Additional help to augment the Refuges fire management staff is provided by several other Complex personnel who have firefighting qualifications.

The Complex will be adding an additional ten permanent fire management personnel beginning in 2001. These additional personnel are a result of increased fire management staffing outlined in the National Fire Plan as a result of the National Wildland Fire Policy Review. The Complex will add an additional Crew Leader, Experienced Firefighter to support wildland fire preparedness and an Experienced Firefighter to support prescribed fire. A Fire Management Officer trainee position will also be staffed. Temporary firefighters will be increased by two for a total of six for the Complex. The Pacific Region of the Fish and Wildlife Service will also staff a Prescribed Fire Crew at the Complex. The Prescribed Fire Crew will consist of a Fire Crew Supervisor, Crew Leader and four Experienced Firefighters. The Prescribed Fire Crew will conduct prescribed fire work activities at the Refuge Complex and other refuges in southern Oregon, California and Nevada. All of the crew positions will be permanent or permanent seasonal.

Suppression capability on the Complex consists of two ICS type 6 engines and one type 3 engine. All three engines are "Class A" foam equipped to increase effectiveness in all aspects of fire operations. One type 6 and one type 3 engine is staffed at Tulelake, CA, and the other type 6 engine is stationed at Klamath Marsh NWR, OR.

The Fire Management Officer, Refuge Biologist, Refuge Manager, Project Leader, Refuge Operations Specialist, and Integrated Pest Management Specialist serve on the Habitat Management Committee. This committee will review and update the FMP annually.

**Project Leader/Deputy Project Leader**

X Final responsibility for development and implementation of fire management program.

X Initiates formal, written limited delegation of authority to Incident Commanders (IC's) for suppression of project wildland fire (Appendix H).

X Approves Cooperative and Interagency agreements.

X Annually reviews fire management program prior to fire season.

X Approves all prescribed fire plans.

X Approves WFSA.

X Authorizes all purchases of fire equipment.

X Supervises the Fire Management Officer.

**Fire Management Officer (FMO)**

X Coordinates and implements the fire management program.

X Supervises the Assistant Fire Management Officer.

X Coordinates emergency fire operations - preparedness, detection, dispatch, and serves as Line Officer representative to Overhead Teams.

X Supervises emergency preparedness activities; makes initial in-refuge requests for

emergency preparedness expenditures.

X Develops and implement cooperative fire agreements with adjacent agencies and land owners.

X Coordinates fire management program and activities with adjacent agencies; maintains close contact with adjacent agency fire coordinator during fire season.

X Reviews burn plans developed by the Prescribed Fire Specialist or three ECS.

X Maintains appropriate fire and fire weather records.

X Serves as the Prescribed Fire Manager for the Refuge.

X Participates in on-site suppression activities.

X Attends meetings with national and regional FWS mangers. Presents issues, discusses problems, and discusses overall agency policies, procedures, and guidelines for wildland fire management and prescribed fires.

X Coordinate Regional Prescribed Fire Crew.

X Aviation management and radio coordinator.

X Supervise the Fire Management Officer Trainee.

**Assistant Fire Management Officer (AFMO)**

X Supervised by the FMO but has many of the same duties and responsibilities as the FMO.

X Prepares reports, prescribed burn plans, fire management plans, maintains quals/cert program, time and attendance reports.

X Assists with the budget needs analysis by work unit and prepares the final budget. Monitors expenditures and tracks all fire-related budget.

X Serves as the refuge subject matter expert on emergency fire administration procedures including fire timekeeping, cost analysis, procurement procedures, injury claims and compensation procedures.

X maintains Qualifications and Certification records and identifies employees for appropriate training.

X Responsible for training seasonal firefighters to agency standards; assists in interagency training as requested, may serve as lead instructor.

X RONS, MMS and RCAR inputs.

X Approve crew acquisition requests.

X Supervise Prescribed Fire Specialist and Engine Crew Supervisor.

**Prescribed Fire Specialist (PFS)**

X Supervised by the AFMO and is responsible for planning and implementing the prescribed burn program.

X Prepares burn plans, reports, time and attendance reports.

X Monitors first order fire effects.

X Coordinates prescribed fire assistance with neighboring agencies and other refuges.

X Maintains prescribed fire and weather records.

X Prepares prescribed fire input to FIREBASE.

X Coordinates planning and implementation of fire hazard reduction projects.

X Coordinates fire mapping GIS and GPS.

X Maintains unit weather stations.

X Coordinates smoke management activities with state and county agencies.

X Reports burns and burned acres to dispatch centers.

X Fuel moisture sampling.

X Prescribe fire budget requests and cost tracking.
X Weather forecasts and Station maintenance.
X Monitoring first order fire effects

**Engine Crew Supervisor (ECS)**

X Serves as the day to day supervisor for seasonal fire crew and assures that project work is completed in timely and efficient manner.
X Collection and correction of time and attendance reports.
X Serves as initial attack incident commander on refuge and off-refuge fires.
X Assures that daily safety inspections are carried out.
X Assures the fire cache is maintained to standards and that supplies needed are ordered, all fire equipment is in a state of readiness.
X Assures that seasonal firefighters are familiar with the refuges within the complex; assures that seasonal firefighters are familiar with dispatch operations and the area expected to respond in cases of mutual aide actions.
X Assures the seasonal firefighters are familiar in operating all refuge fire equipment.
X Assists in training seasonal firefighters to agency standards; assists in interagency training.
X Responsible for completing all fire reports; maintaining a log of project work completed and time spent.
X Crew safety.
X Tulelake barracks check in/out for seasonals.
X Seasonal hiring and notify AO of EOD and Termination dates.
X Task books for all crew personnel.

**Engine Captain (Tulelake and Klamath Marsh NWRs)**

X Lead Tulelake Engine Crew.
X Assign and accomplish tasks.
X Crew safety.
X Project work implementation.
X Prescribed fire prep and implementation.
X Completion of crew time and attendance.
X Initiate fire reports, turn in to the ECS for completion.
X Oversee barracks and yard maintenance.
X Fire Equipment service and maintenance log for all vehicles.
X Crew work log.
X Coordinate fire replacement with ECS.
X Maintain and inventory refuge fire cache.
X Assumes duties of ECS when absent.
X Coordinate project work with Project Leader or Refuge Manager and staff.
X Coordinate fuels reduction projects with Prescribe Fire Specialist.
X Coordinate with irrigation specialist on spot maintenance burns.
X Review, preparation, and implementation of refuge safety plans.

**Incident Commander**

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

X Reports directly to Project Leader or Refuge Manager on Type 1 and 2 incidents.

X Responsible for planning, operations, logistics, finance and General Staff functions on assigned incidents.

X Responsible for incident fire report.

X Maintains regular and prompt communications with Refuge Line Officer and Fire Staff.

X Immediately reports incident injuries and critical incidents to Project Leader and Fire Staff.

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

X Assure aviation safety is maintained to the highest standards.

X Brief subordinates, direct their actions and provide work tools.

X Ensure that safety standards identified in the Fire Orders, the Watch Out Situations, and agency policies are followed at all times.

X Personally scout and communicate with others to be knowledgeable of fire conditions, fire weather, tactical progress, safety concerns and hazards, condition of personnel, and needs for additional resources.

X Order resources to implement the management objectives for the fire.

X Inform appropriate dispatch of current situation and expected needs.

X Coordinate mobilization and demobilization with dispatch and the FMO.

X Perform administrative duties, i.e., approving work hours, completing fire reports for command period, maintaining property accountability, providing or obtaining medical treatment, and evaluating performance of subordinates.

**FIRE MANAGEMENT STRATEGIES**

The fire management strategies for the Complex Refuges are the appropriate management response. These strategies are determined from FWS fire management policy and the Complex's fire management objectives. The tactics used on wildland and prescribed fires will be developed based on the fire management strategies. The fire management strategies for the Complex are:

1. Protect life, property, and natural resources from unwanted fire.

X Provide for public and firefighter safety.

X Use prescribed fires to reduce fuel loadings, create horizontal and spatial diversity, to minimize the risk of large fires. Delineate fire management units within the refuge.

X Provide protection for important historic and cultural resources. Efforts will be made to suppress at least 90% of all wildland fire ignitions in these areas at size class A.

X Implement cooperative agreements and programs with adjacent agencies on a annual basis. Enter into cooperative agreements to better utilize the "closest forces" concept, maximize efficiency, increase training opportunities both in the classroom and on fire assignments, and support other agencies on initial attack and prescribed fires.

X Conduct a fire prevention program in cooperation with other agencies to reduce preventable fires by 10% over a five year period to provide for the safety of Refuge visitors and employees.

X Protect critical habitat from adverse effects of fire. Utilize fire to promote critical habitats which benefit from fire.

X Maintain a level of presuppresson readiness as identified by the Step-up Plan.

2. Utilize prescribed fires to accomplish habitat management objectives.

X Utilize prescribed fire to maintain community diversity and perpetuate the habitats of native wildlife species.

X Utilize prescribed fire to protect critical habitat.

X Reduce opportunities for disease and insect epidemics by maintaining a mosaic of climax and sub-climax vegetation.

X Restore pre-settlement vegetation communities by utilizing prescribed fire to standards indicated in the Habitat Management Plans.

3. Avoid unacceptable effects of fire and fire suppression.

X Suppress all wildland fires at the minimum acreage possible, commensurate with acceptable suppression impacts and safety standards.

X Use minimum impact suppression tactics in suppression activities, where feasible, and identify in Incident Action Plans and Prescribed Burn Plans all rehabilitation efforts necessary. Utilize appropriate accounts to accomplish rehabilitation efforts within two growing seasons.

4. Utilize refuge staff, in so far as possible, to achieve other fire management objectives.

X Establishing appropriate qualification and training standards by position for permanent and seasonal employees engaged in fire management. Such standards may include suppression, prescribed fire, air quality, and fire effects monitoring.

X Actively generate support and understanding for the fire management program through public education, utilizing the Refuge Public Use Staff to give talks and slide programs to visitors and to public and school groups in the surrounding area.

5. Monitor wildland and prescribed fires to assure habitat objectives are being met. Establish a process to ensure the collection, analysis and application of high quality fire management information needed for sound management decisions.

**INTERAGENCY OPERATIONS**

The Complex's refuges are located in two states, California and Oregon. Dispatching services for the refuges in California are served by the Modoc Interagency Command Center (MICC), located in Alturas, CA. Wildland fire resource orders for the refuges in California are processed by the California North Operations Geographic Area Coordination Center (North Ops GACC), in Redding, CA. Dispatching services for the refuges in Oregon are served by the Klamath Falls Interagency Fire Center (KFIFC), located in Klamath Falls, OR. Wildland fire resource orders for the refuges in Oregon are processed by the Pacific Northwest Geographic Area Coordination Center (PNW GACC), in Portland, OR.

The Refuge Complex has entered into cooperative agreements with Modoc National Forest, Winema National Forest, Oregon Department of Forestry, and Lava Beds National Monument. Copies of these agreements are in Appendix E. A reimbursable agreement with the Modoc National Forest is for fair share payments for the operation of the Interagency Dispatch Center in Alturas. Agreements are reviewed annually. Agreements are renegotiated every five years.

The Refuge Complex operates in Oregon under an interagency fire partnership agreement with the Oregon Department of Forestry, Winema National Forest, Lakeview District of BLM and the Crater Lake National Park. The purpose of the agreement is to maximize cost efficiency and effective use of resources, increase the use of fire to restore and maintain ecosystems, coordinate with local landowners and information and education. A similar agreement is used in California to work cooperatively with the Modoc National Forest and Lava Beds National Monument.

The Refuge Complex is also signatory to the Oregon-California (ORCA) Incident Management Teams.

This organization consists of 21 agencies that pool their resources for Type 2 Incident Management Teams that are used in Northern California and Southern Oregon. These Type 2 teams are also used throughout the western United States when needed.

The Complex's refuges also work under a network of National and State level agreements for wildland and prescribed fire. The FWS is accelerating involvement in wildland fire interagency cooperation in California. New agreements will increase the flexibility of the FWS to conduct and participate in interagency operations in that State.

The interagency agreement established between all federal agencies involved in wildland fire suppression activities provides for the cooperative use and assistance of fire equipment and personnel of the various agencies. The suppression of wildland fires may be of regional or national magnitude. Interagency requests for the assistance of Klamath Basin fire resources will be made through either MICC in Alturas or KFIFC in Klamath Falls. Requests from the Dispatch centers will be to the Fire Management Officer or designated person. Refuge Complex engines and crews respond not only to fires on the refuges, but also other agency lands within a specified area.

The Refuge Complex engines and crews also respond to move-up and cover operations for both Dispatch centers. When other area agencies have a critical draw down of local resources due to local area fires, refuge engines are called upon to cover key stations in other agencies jurisdictions. Move-up and cover operations are dependent upon refuge personnel availability.

The Tulelake NWR is adjacent to the Tulelake Volunteer Fire Department District. Although a formal agreement does not yet exist, the Refuge Complex will be adding an agreement with this Department for both wildland and structural fire protection.

**PROTECTION OF SENSITIVE RESOURCES**

Fire management strategies need to be identified for wildland fire suppression efforts and prescribed burn preparation and implementation. Four out of the 6 refuges support wetlands ecosystems. All of the refuges contain critical habitat. Mechanized equipment, such as dozers, are not effective in constructing control lines in wetland environments. Retardant drops by air tankers may have negative impacts on wetland ecosystems. The surrounding uplands need protection during suppression efforts as these areas contain cultural and historical sites.

The Fire Management Officer or his designee will be responsible for directing the type of suppression tactics that can be used in the refuges within the complex. The tactics used will be developed from the fire management strategies. In the absence of the FMO or AFMO a Resource Advisor will be designated by the Project Leader. A Resource Advisor, when assigned, will facilitate the development of the suppression tactics that can be used on an incident. Prescribed fire is a planned event and most of the tactics such as control lines, equipment uses, etc. will be defined in the planning process.

During extended attack of a wildland fire a Wildland Fire Situation Analysis (WFSA), will delineate the range the tactics that can be used. The WFSA will be developed by the FMO or AFMO and signed by the Project Leader. Suppression strategies and tactics should be applied so that the equipment and tools used to meet the desired objectives are those that inflict the least impacts upon the natural and cultural resources. Minimum impact suppression strategies will be employed to protect all resources. Natural and artificial barriers will be used as much as possible for containment. When necessary, fire line construction will be conducted in such a way as to minimize long-term impacts to resources.

# WILDLAND FIRE ACTIVITIES

## WILDLAND FIRE PROGRAM OBJECTIVES

Fire suppression strategies for the Refuge Complex will place primary emphasis on a fire suppression program that is capable of applying appropriate wildland fire management strategies and tactics, before significant resource damage can occur and to prevent the fire from escaping off the refuge. Due to the potential rapid rate of spread through the fuel types on the refuges, a wildland fire not only threatens refuge resources, but threatens landowners adjacent to a refuge. Resources such as critical habitat, agricultural crop lands, organic based peat soils, farm equipment on and off the refuge, refuge equipment and structures may be threatened by wildland fires.

The Department Manual states "Wildland fire losses will be held to the minimum through timely and effective suppression action consistent with the values to be protected. Wildland fires which threaten life, structures, or are determined to be a threat to natural resources or facilities..... will be considered emergencies and their suppression given priority over normal Departmental programs. However, no wildland fire situation, with the possible threat to human survival, requires the exposure of firefighters to life threatening situations."

Appropriate wildland fire management strategies and tactics will be used to manage wildland fires to the minimum area possible, commensurate with acceptable suppression impacts, safety standards, feasibility, and cost. Emergency suppression funds may be utilized for the initial reconnaissance and staffing of all wildland fire ignitions.

## PREPAREDNESS

Preparedness is the process of planning and implementing activities prior to wildand fire ignitions. This process includes actions which are completed on a routine basis prior to each fire season as well as incremental actions conducted in response to increasing fire danger. Fireline preparation and hazard fuel reduction operations for resource protection are examples of this type of routine action.

As fire danger increases, the level of preparedness must increase. Preparedness actions are preplanned and delineated by staffing classes in the step-up plan for the refuges. Preparedness includes a wide array of annual activities which include:

1. Reviewing cooperative agreements for fire related activities.
2. Coordination meetings with agencies and dispatch centers.
3. Pre-season risk and hazard analysis.
4. Fire equipment and cache maintenance.
5. Equipment acquisition and development.
6. Personnel qualifications review.
7. Developmental and refresher training for assigned personnel.
8. Physical fitness training and testing.
9. Maintenance of weather stations.
10. National Fire Danger Rating System operations.
11. Determination of fire season.
12. Budget planning.
13. Readiness inspections.

The preparedness objective is to have a well trained and equipped Refuge Complex fire management organization to manage all wildland fire ignitions at the refuges.

**Historical Weather Analysis**

There are two Forest Technology System (FTS) weather stations on the complex. One is located on Lower Klamath NWR and the other on Klamath Marsh NWR. These are operating stations and have the capability of maintaining National Fire Danger Rating System (NFDRS) indices (Deeming, 1977). However, data entry into the Weather Information Management System (WIMS) has not been consistent and records from these stations are not adequate to conduct NFDRS analyses. Two other stations are utilized to attain the $90^{th}$ and $97^{th}$ percentile breakpoints for Burning Index(BI) for the Refuge Complex. The Indian Wells Remote Automatic Weather Station (RAWS) located at the Lava Beds National Monument and the Hoyt RAWS located on the Winema National Forest. They are within close proximity of the refuges, representative of our fuel types and elevations. The Indian Wells RAWS is near Tulelake, Lower Klamath and Clear Lake NWR's. Hoyt RAWS is near Klamath Marsh NWR. A map of the location of these stations is in Figure 1. These stations have been operating for a considerable period of time and have a reliable data base.

Two NFDRS fuel models have been selected for analysis. These models are G and F. Fuel model G is representative of mature conifer forest with a heavy accumulation of dead tree debris. Model G represents resource management concerns at Bear Valley and Klamath Marsh NWRs. The Klamath Falls Interagency Fire Center also uses Model G to predict daily dispatch levels. Fuel model F is representative of vegetation where woody plants occupy less than two-thirds of the site. These types of fuels predominate the upland edges of the Tulelake, Lower Klamath and Clear Lake NWRs. The Modoc Interagency Command Center uses Model F to predict daily dispatch levels for Lava Beds National Monument. Fire Family Plus runs (Main, et. al., 1990) and historical weather data from these stations can be found in Figures 14 to 21. The graphs display weather data for fuel models G and F for both stations. These figures display the burning index statistics graph of average years curves and percentile curves.

The values represented by historical weather analysis displays the potential of fuels on the refuges to burn during the weather cycle in the Upper Klamath Basin. NFDRS fuel models F and G do not represent the majority of the fuels at the refuges. Grasses, sedges and hardstem bulrush are the most prevalent fuels. These lighter fuels react very rapidly to wetting and drying. Storm fronts approaching, precipitating and passing can cause very rapid swings in the burning index (BI). The heavier fuels models can be used to display seasonal trends that are more stable. The majority of the precipitation in the Upper Klamath Basin falls during December, January and February. All wildland fire fuels are significantly affected during the major precipitation period.

Burning index values represent a fire danger rating value. 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 mid-flame length of 4 feet. Wildland fires where the mid-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.

Part of the annual cycle of wildland fire fuels is green-up. Green-up is the life cycle period of the lighter fuels (grasses, sedges and herbaceous vegetation) when growth occurs. Green-up is defined as that period when rapid growth begins, until 90 percent of the total annual growth is achieved. The length of the green-up period varies. Annual grasses, perennial grasses, sedges and herbaceous vegetation all have different length green-up periods that vary from two to four weeks. The predicted green-up periods are reflected in the Fire Family Plus calculations for each fuel model. In the Upper Klamath Basin, burning index values usually drop during the period of early June until July, depending on the amount of precipitation, elevation and aspect. This drop in burning index values is due to green-up.

Fuel models F and G have different BI threshold values for potential to burn. Fuel model F represents the lighter fuels and brush type fuels, while fuel model G represents the heavier fuels. Fuel model F reacts rapidly to precipitation, relative humidity, temperature and wind. Fuel model G reacts far less rapidly to the aforementioned weather elements. Lower BI values for fuel model F represent greater potential for fire spread, than for fuel model G. In relative values, fire danger is far higher for fuel model F at a burning index level of 20 than for fuel model G. This is due to a higher proportion of lighter fuels in fuel model F. High BI values, greater than 40 in fuel model G, however, represent a higher severity of fire danger than in fuel model F because heavier fuels do not react rapidly to the effects of moisture, relative humidity and temperature. The higher BI values reach in fuel model G reflect higher fire danger severity. Fuel model F BI values predict the flamibility of wildland fire fuels. Fuel model G ERC values predict the severity wildland fire fuels fire danger.

Wildland fires will burn and spread in lighter grass fuels whenever the fuels are dry. Wind will increase the spread of wildland fires in lighter fuels. The average and maximum BI values for both fuel model F and G from the Hoyt and Indian Wells RAWS, display that wildland fires will burn and spread through one or more fuel types on the Complex's refuges during the period from approximately March 15 to November 1. An historical analysis of the occurrence of wildland fires for all of the refuges in the Complex for the period of 1990 to 2000, shows that the earliest fires occur in the last week of March and the latest fires occur in the first week of November. The $90^{th}$ percentile BI values (approximently a BI of 76) for fuel model G is relatively the same for both weather station locations. The $90^{th}$ percentile values for fuel model F is different between the two weather stations. Wildland fires will actively burn and spread in the lighter fuels at the refuges when BI values are above 20.

**Fire Prevention**

Approximately 52 percent of the refuges historical fires are human caused. The main causes of these fires are escaped burns, equipment and campfires. Human-caused fires are preventable. Fire prevention efforts will be concentrated on main visitor use areas and industrial operations. Fire prevention activities are grouped into three categories: in-refuge activities, programs presented to special audiences, and cooperative actions with other agencies.

Refuge fire prevention activities will receive a priority higher than normal refuge operations. Each employee is responsible for fire safety and fire prevention in their everyday duties. Fire prevention will be promoted in interpretive programs, messages on bulletin boards, and visitor contacts. Prevention of fires caused by equipment use will be emphasized in the program. The need for fire prevention will be emphasized in all programs designed to acquaint employees and visitors with the fire management plan. Periodic safety inspections throughout the refuge facilities and working areas also stress fire prevention.

All cooperators on the refuges, including lease farm operators and construction contractors are responsible for preventing wildland fires. Cooperators are responsible for ensuring that their equipment is fire-safe and is equipped with USDA Forest Service approved spark arresters. Cooperators and refuge personnel are also responsible for adhering to the State fire laws in California and Oregon.

Cooperating Federal, state, and local agencies (e.g., Bureau of Reclamation, Tulelake Irrigation District and Klamath Irrigation District) are responsible for informing their lessees, cooperators, and contractors of fire prevention responsibilities. Cooperating agencies are responsible to include fire prevention instructions in lease agreements and contracts. The BOR is responsible to ensure that lessee, cooperator, and contractor equipment is fire safe and equipped with USDA Forest Service approved spark arresters.

Out-of-refuge programs vary in their emphasis on fire prevention. While some presentations at local schools deal specifically with fire prevention, the subject is more often included for other groups as one part of a more general presentation. Fire prevention will be an integral part of public meetings and news releases dealing with prescribed fire.

Cooperative fire prevention activities have been mainly limited to joint closures during periods of extreme fire danger. Fire prevention will be emphasized in any future cooperative agreements.

Some of the additional fire prevention activities may include:

1. Pertinent signs, posters, and notices will be posted on bulletin boards, and at the visitor center, and neighboring resorts.
2. Pertinent messages will be included in informal contacts between employees and visitors, hunters, and neighbors.
3. Programs at local schools will emphasize fire's natural role in the refuge ecosystem and the prevention of human-caused wildland fires.
4. Any actions deemed necessary during periods of extreme fire danger will be publicized on radio, television, and local newspapers.
5. Formal annual fire and safety building inspections will be conducted by the refuge safety committee. Any hazards identified during such inspections will be mitigated as soon as possible.
6. Formal annual fire safety training for equipment operators and cooperators.

The Refuge Complex will prepare a Fire Prevention Plan for the complex. When the Fire Prevention Plan is completed, it will become an appendix to the FMP.

**Staffing Priority Levels**

Burning Index (BI) has been selected as the basis for Staffing Class. Staffing Class 4 and 5 are described by the 90th and 97th percentile of BI as establish by Fire Family Plus. The use of these indices is discussed further in the Step-up Plan located in Appendix F.

Two engine crews are staffed during the fire season. NFDRS indices are broadcast daily by both dispatch centers as well as any other pertinent information such as, fire weather advisories and warnings, predicted lightning activity and projected fire weather forecasts.

Industrial fire precaution levels are developed in Oregon by the Oregon Department of Forestry and are part of the morning broadcast by the Interagency Dispatch Center. The same process is in place in California and the Interagency Dispatch Center in Alturas broadcasts this information. All agencies have signed agreements that concur with this process. During periods when this is established, extra precautions are taken on the refuges to prevent human caused fires by employees. These may include no mowing of roadsides after 1300 hours or if it must be accomplished , engine crew will accompany the mower. All work with chain saws and all off road activities may be curtailed or the hours of operation limited only to the morning hours.

Additional actions are delineated in the Step-up Plan.

**Training**

Departmental and FWS policy requires that all personnel engaged in wildland fire suppression and prescribed fire duties meet the standards set by the National Wildfire Coordinating Group (NWCG). Klamath Basin refuges will conform strictly to the requirements of the wildland fire management

qualification and certification system outlined in the NWCG publication "Wildland and Prescribed Fire Qualification System", PMS 310-1. The refuges will also follow additional requirements and quidelines in the USFWS Fire Management Handbook.

Basic wildland fire training refreshers are offered annually for all qualified firefighters. 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. Fire qualification task books will be used to document fire experience of trainees. The AFMO will coordinate fire training needs with those of other nearby refuges and FWS units, cooperating agencies, and the Regional Office.

The refuge supports the development of individual Incident Command System overhead personnel from among qualified and experienced refuge fire staff. Assignment to overhead teams at the local, regional, and national level is also encouraged. Refuge Complex employees who are not part of dedicated fire staff are encouraged to develop fire qualifications for use on the refuges. Off refuge fire assignments for non-fire employees will be managed by their immediate supervisors.

The Departments Fire Management Information System (FMI) will be used by Klamath Basin Refuges to track fire qualifications. This system is based on standards set by the National Wildland fire Coordination Group. The standards set in Chapter 1, Fire Management Handbook for qualification, certification and physical fitness testing are adopted by the FWS for all interagency wildland fire responses. Employees of United States Government Agencies participating in any wildland or prescribed fire activities on FWS or cooperator's lands will meet qualifications and fitness requirements established in PMS 310-1, except where FWS specific fitness requirements apply.

**Supplies and Equipment**

Two permanent fire caches are maintained at the Complex. These are located at Tulelake NWR Headquarters and at Klamath Marsh NWR Headquarters. Replacement of supplies and equipment during the fire season will be coordinated through the AFMO. An inventory of the Refuge Complex's fire equipment caches will be conducted at the end of each fire season and replacement equipment ordered. The engine crew supervisors at each station are responsible for inventory, readiness, and notifying the AFMO of needed items. The main fire cache, located in Tulelake, is a 10 person fire cache conforming to Normal Unit Strength standards as outlined in the FWS Fire Management Handbook. A second fire cache, located at Klamath Marsh, is a similar to the Tulelake fire cache, and supports the type 6 engine stationed at Klamath Marsh. See Appendix G for a more detailed list of equipment.

Extended attack incidents may require amounts and types of supplies and equipment not in the inventory at the two refuge headquarters caches. There are several area caches available locally and interagency caches available in Redding, CA and Redmond, OR. These caches can supply most standard types of firefighting equipment in 2 to 4 hours.

**Detection**

All personnel assigned to or working in field locations have a responsibility for fire detection. Reporting wildland fires is one of the most important public and employee safety actions that employees can accomplish. Wildland fires need to be reported immediately. Wildland fires at Complex's refuges in California are to be reported to the Modoc Interagency Command Center in Alturas, CA. Wildland fires in Oregon are to be reported to the Klamath Falls Interagency Fire Center in Klamath Falls, OR.

Three programs are designed specifically for detection. These programs are fixed detection lookouts, the Automatic Lightning Detection System and aerial detection. The refuges in the Complex utilize all three wildland fire detection systems.

There is an extensive network of fire lookouts in the area. These lookouts are supported and staffed by the Forest Service, Bureau of Land Management, California Department of Forestry, and Oregon Department of Forestry. All fires detected are relayed to one of the Interagency Dispatch Centers. The responsible land management agency is then contacted and notified of the fire and approximate location. Both dispatch centers utilize closest forces in dispatching resources to the detected fire, regardless of land ownership. The Klamath Basin refuges assist Oregon Department of Forestry in staffing the Bryant Mountain Lookout by providing funds for State-hired personnel.

Locations of severe lightning storms, as determined by the Automatic Lightning Detection System, are relayed to Refuge headquarters by either the Interagency Dispatch Centers in Alturas or Klamath Falls. Reports are received by facsimile machine from either or both as often as significant lightning occurs.

The other program consists of aircraft overflights by the U.S. Forest Service. During periods of very high to extreme fire danger, the U.S. Forest Service makes daily fire detection flights over most of the forests which includes all six of the refuges within the system. Flights are keyed primarily to extreme fire danger and lightning activity level. Fire detection information is shared by the Forest Service (FS) to all agencies.

**Hazard Reduction for Structure Protection**

Hazard reduction is conducted to prevent wildland fires from spreading onto structures owned by the FWS. Some of the hazard reduction is conducted on an annual basis and other hazard reduction is on a permanent basis. Hazard reduction is conducted at three of the Refuge Complex's refuges. Grasses are removed either manually or by spraying on an annual basis at the Tulelake NWR headquarters buildings. Grasses are sprayed annually around the shop and office buildings on the Lower Klamath NWR. Klamath Marsh NWR headquarters is undergoing an extensive hazard modification project at the refuge headquarters, with brush removal and tree thinning being performed annually until wildland fire hazard is abated. Annual maintenance of hazard reduction at the Klamath Marsh NWR headquarters will be required.

**Dispatching**

Klamath Basin NWR Complex does not currently have a permanent dispatcher position. Day to day local dispatching functions for fire management are handled by the office personnel at the Tulelake Headquarters. Wildland fire responses are dispatched by either MICC or KFIFC. Mutual aide agreements are in place with both Dispatch Centers for response to wildland fires off of the refuges when requested. Under the terms of a cooperative fire agreement Modoc Interagency Command Center and Klamath Interagency Fire Center may request the assistance of refuge fire resources to suppress fires occurring within their jurisdictions. This includes FS, BLM, NPS, FWS and state protected lands. Upon receiving the request, engines respond according to the pre-determined response levels defined by NFDRS indices. These response levels are based upon fire weather conditions and predicted fire behavior.

The daily preparedness functions for the dispatch offices include:

1. Collecting fire weather data.
2. Inputting and recovering data from the WIMS system.

14. Maintaining an updated list of available personnel and equipment in the refuge.
15. Maintaining a locator file with names, addresses, phone numbers and capabilities of available resources.

The Fire Management Plan does not discriminate between human-caused and lightning caused wildland fire. All wildland fires will have an appropriate management response. Response shall include a determination of fire cause. Human-caused wildland fires will require an investigation and report by law enforcement personnel. Serious human-caused wildland fires, including those involving loss of life or property, require that a qualified arson investigator be requested.

**COMMUNICATIONS**

The two dispatch centers are responsible for dispatching of fire resources and handling requests for additional resources. The dispatch centers document and track all resources and coordinate with the duty officers for national dispatch requests. Trainee requests are made by the various agencies at the beginning of fire season and as opportunities become available during the fire season. The dispatch centers attempt to fill these trainee slots.

The current frequency use agreements and the common frequencies used at listed in Appendix E.

**FIRE MANAGEMENT UNITS**

Fire Management Units (FMUs) are areas on a refuge which have common wildland fire management objectives and strategies, are manageable units from a wildland fire standpoint, and can be based on natural or manmade fuel breaks. On smaller refuges the entire refuge may be treated as a single FMU. The refuges in the Klamath Basin Complex are divided into two or more FMUs, with the exception of Bear Valley NWR. Bear Valley NWR will be treated as a single FMU. Each FMU is described with those elements which make the FMU separate from others on the refuge.

The components of the FMUs that dictate the level of appropriate management response to wildland fires are the vegetation types, fuel types associated with the vegetation, special natural resource features of the refuge, location of and access to wildland fires, and the ability of a fire to spread into neighboring areas. All fire suppression activities in an FMU will follow the guidelines established in the Complex Fire Management Plan.

**Fire Effects**

Fire effects are the biological and physical effects that wildland and prescribed fire have on plants, animals, soils, watersheds and air. Fire effects are the result of burning of the fuels on the site. Nearly all of the fuels on a site are the dead and living parts of plants. Fuels can also include carbon based material that is incorporated into soils. The relative degree of severity of fire effects has a direct relationship to the reaction intensity of the fire, usually measured in rate of heat release per unit area of flaming fuels (BTUs per square foot per minute). Fire effects are determined by the amount of fuels being burned and the intensity with which those fuels are being burned.

Rates of intensity of a fire are determined not only by the amount of fuels present, but also by fuel moisture, live fuel moisture, relative humidity, air temperature, wind speed, slope and aspect of the site. Fires will burn with different intensity levels during different times of the year. As fire intensity increases fire effects will become more severe, especially in forested habitats. Severity of fire effects include unacceptable mortality to desired vegetation, undesired changes in vegetation components, reduction of productivity in soils, smoke incursion into populated areas, decreased water quality and increased costs for management.

*Permanent Hardstem Bulrush Marsh*

Wildland fire effects are that ninety percent or more of the existing vegetation will be removed. Areas that

have accumulated dead vegetation and duff, will burn with greater intensity. Mortality to roots of hardstem bulrush and cat tail may occur where heavier amounts of fuels occur. Post wildland fire vegetation response will be replacement of the existing vegetation type in the following growing season. Openings in dense marsh vegetation stands will exist for several years following the fire, with complete replacement expected in approximately three years. When soils are dry, then peat fires can occur. Peat fires will burn organic material from the soil.

*Emergent Seasonal Marsh*
Wildland fire effects are that ninety percent or more of the existing vegetation will be removed. Post wildand fire vegetation response will be replacement of the existing vegetation type in the following growing season. Dense stands may have temporary openings in the stands for several years following the burn. When soils are dry, then peat fires can occur. Peat fires will burn organic material from the soil.

*Agricultural Crop Land*
Wildland fire will effectively remove all agricultural debris. Wildland fires in standing, unharvested grain will destroy the grain crop. Farmed lands are subject to post burn wind erosion of the peat based soils.

*Uplands*
Wildland fire effects on uplands vegetation is the complete removal of all burnable vegetation. These areas lose all wildlife cover values until the next growing season when grasses and forbs grow. Native bunch grasses respond well after fire, but can be negatively affected by post fire livestock grazing for up to three years. Introduced annual grasses such as cheatgrass and medusa ead respond vigorously after fire. Native shrubs such as big sagebrush, low sage brush and bitter rush respond to wildland fire in a cycle that takes 20 to 30 years for replacement of a mature stand of brush. Brush species such as greasewood and currents sprout and grow rapidly in several years following fire. Areas with steep slopes are subject to small amounts of soil erosion.

*Ponderosa Pine Forest*
Wildland fire effects in the ponderosa pine-bitter brush association will be a stand replacing fire. Post burn vegetation will be grasses and forbs for approximately 10-15 years. Grasses and forbs will gradually by replaced by shrubs and then pondersosa pine forest. Wildland fire effects in the ponderosa pine-montane brush association will be similar to the bitterbrush association. Fuel loadings that are a result from past wildland fire suppression policy (an accumulation of surface fuels and duff ground fuels) will contribute to a higher severity of fire effects than produced by frequent low intensity fires. Nearly all ground and surface fuels will be consumed by wildland fires.

Wildland fire effects in ponderosa pine stands that have received prescribed fire or mechanical hazard treatments are very different from untreated stands. Where wildfire hazards contributing to crown fires are reduced, stand replacement events are limited to torching of small aggregations of trees. Residual ground fuels, such as duff and partially buried logs will contribute significantly to tree mortality during wildfires. Ponderosa pine stands that survive wildfire will become more resistant to wildfire effects, as long as fire continues to be a frequently used hazard management tool. Wildfire in these stands will effect ground vegetation by replacing brush and tree sapling under-stories with grasses, forbs and young brush plants.

*Mixed Conifer Forest*
Wildland fire effects in this type can be predicted to be stand replacing. Historical wildland fires on the refuge property and adjacent properties have been stand replacing fire. Wildland fires can be expected to spread rapidly, causing heavy mortality to the existing conifer stands. Most surface and ground fuels will

be burned, leaving exposed soil conditions. Post wildland fire replacement vegetation will be grasses, forbs and montane brush. Fuel loadings that are a result from past wildland fire suppression policy (an accumulation of surface fuels and duff ground fuels) will contribute to a higher severity of fire effects than produced by frequent low intensity fires.

Wildland fire effects in mixed conifer stands that have received prescribed fire or mechanical hazard treatments are different from untreated stands. As earlier discussed in the ponderosa pine fire effects, where wildfire hazards are abated through prescribed fire or mechanical methods, mortality to trees from a wildland fire is reduced. Ground fuels will still pose a threat to stand mortality, unless reduced through treatment. Post wildland fire vegetation will be grasses, forbs and brush under the surviving stand crowns.

*Western Juniper Woodland*
Wildland fire effects in this type will vary according to the amount of brush in the under-tory. Areas of juniper woodland that has a grass under-story, wildland fire will torch and cause mortality to most small junipers, litter, woody material and most shrubs. Juniper woodland that has a brush under-tory, wildland fire will torch and cause mortality to most of the juniper trees. Post wildland fire replacement vegetation will be annual and perennial grasses as well as shrubs.

*Lodgepole Pine Forest*
Wildland fire effects in lodgepole pine will be a stand replacing fire. Tree mortality will be greater than 90 percent. Surface and ground fuels will be consumed to at least 95 percent. Post burn replacement vegetation will be grasses, forbs and lodgepole pine tree seedlings. Fuel loadings that are a result from past wildland fire suppression policy(an accumulation of surface fuels and duff ground fuels) will contribute to a higher severity of fire effects than produced by frequent low intensity fires.

**Fuel Types**
The Complex has nine fuel types. The fuel modeling system used to describe the fuel types is the Northern Forest Fire Laboratory (NFFL) types (Anderson, 1982). Fuel models are determined from photo series guides that provide a means for field identification of NFFL fuel models (Blonski, et. al., 1981; Fischer, 1981; Maxwell, et. al., 1979; Maxwell, et. al., 1976) Fuel loading values are used to estimate fire behavior (Brown, et. al., 1985). Duff fuel loading usually does not contribute to fire behavior, but can significantly contribute to fire effects on vegetation. Duff fuel loading is calculated using 11 tons per acre per inch of duff in ponderosa pine, and 15 tons per acre per inch of duff in short needled conifers (Leenhouts, 1998).
Table 2 displays fuel model types in each Fire Management Unit.

*NFFL Fuel Model 1*
This type consists of agricultural crop standing grain and stubble and shorter annual and perennial grasses mixed with forbs. Fuels in this type are fine, very porous, continuous, open and exposed. The fuels in this model cure earliest of all fuels in the Complex. Because refuge soils are very productive, annually heavy crops of these fine textured fuels are produced. Fuel loading can vary from two to four tons per acre. These fuels remain available to burn during any dry period from curing to the following growing season green up period.

Wildland fire spread is very rapid. These fuels are subject to very short drying period, one hour or less, and are rapidly effected by temperatures greater than 80 degrees Fahrenheit, relative humidity less than 20 percent and wind at any temperature.

*NFFL Fuel Model 2*

Fire spread is primarily through the fine herbaceous fuels, either curing or dead. Surface fires burn where the herbaceous material, in addition to litter and dead-down stemwood from the open shrub or timber over-story, contribute to the fire intensity. Open shrub lands and conifer tree stands that cover one-third to two-thirds of the area, with fine herbaceous fuels in the under-story fit this model. Clumps of heavier vegetation in this model may generate higher intensities that may produce fire brands. Fuel loading is approximately eight tons per acre. Wildland fire spread is rapid, but half of NFFL Fuel Model 1, and more intense than NFFL Fuel Model 1.

*NFFL Fuel Model 3*
This type consists of hardstem bulrush and cat tails, seasonal emergent marsh, or a mix of tall perennial grasses, hemlock and stinging nettle, or alkali bulrush. Fuels are open and exposed. Fires in this fuel are the most intense of the grass group and display high rates of spread under the influence of wind. Wind may drive fire into the upper heights of the grass and across standing water. Stands are tall, up to six feet. Approximately one-third or more of the stand is considered dead or cured and maintains the fire. Fires that occur in the winter, during freeze up, are especially intense. Fuel loading is approximately nine tons per acre. Wildland fire spread is very rapid at 1 ½ times that of NFFL Fuel Model 1 and four times as intense.

*NFFL Fuel Model 4*
This type consists of ponderosa pine forest with an understory of bitterbrush. Fire intensity and fast spreading fires involve the foliage and live and dead fine woody material in the crowns of a nearly continuous secondary overstory of pine needle draped bitterbrush. Besides the flammable foliage ove the bitterbrush, dead woody material of the shrub and pine needle drape significantly contibues to the fire intensity. Fire brands are actively produced by this type resulting in high rates of spread. Fuel loading can approach 30 tons per acre. Wildland fire spread is the same as NFFL Fuel Model 3 and more intense.

*NFFL Fuel Model 6*
This type consists of montane shrubs where fire carries through the shrub layer where the foliage is flammable. The shrubs are older, but not as flammable as the shrubs in fuel model 4. Fire spread is dependent on moderate winds greater than eight miles per hour at mid-flame height. Fuel loading is approximately 10 tons per acre.

*NFFL Fuel Model 8*
This type occurs in closed canopy stands of short needle conifers. The fuel layer is mainly needles and occasionally twigs. Little undergrowth is present in the stand. Slow burning ground fires with low flame lengths are generally the case. Occasional “jackpots” of heavy fuel concentrations occur in this type. During periods of severe fire weather conditions involving high temperatures, low humidity, and high winds these fuels pose a hazard. Fuel loading is approximately 7 tons per acre. Duff fuel loading can be up to 12 tons per acre.

*NFFL Fuel Model 9*
This type represents fire spread through surface litter in ponderosa pine stands. Fire spread is faster and flame lengths are longer that fuel model 8. Concentrations of dead and down woody material will contribute to possible torch out of trees, spotting and crowning. Accumulated duff will contribute to tree mortality. Fuel loading is approximately 7 to 12 tons per acre. Duff fuel loading can be up to 12 tons per acre or more.

*NFFL Fuel Model 10*
Fires burn in the surface and ground fuels with greater fire intensity that the other timber litter models.

Dead and down fuels include greater quantities of 3 inch or larger limbwood, that accumulates as a result from stand maturity or natural events that create a large load of dead material on the forest floor. Small to medium height conifers in the stand understory contribute to a ladder fuel situation. Crowning, spotting and torching of individual trees are more frequent in this fuel situation. Any forest vegetation type may be considered if heavy down material is present. Insect or disease ridden stands, wind thrown stands or material from natural thinning of stands contribute to this fuel type. Fuel loading is approximately 18 tons per acre. Duff fuel loading can be up to 15 tons per acre or more.

*NFFL Fuel Model 11*
This type occurs in the logged areas of the refuges. This fuel model is a result of light partial harvests or thinning operations. The spacing of the rather light fuel load, shading from overstory or the aging of the fine fuels can contribute to limiting the fire potential. Herbaceous material mixed with the slash contributes to fire spread. Fuel loading is approximately 15 tons per acre. Duff fuel loading can be up to 20 tons per acre.

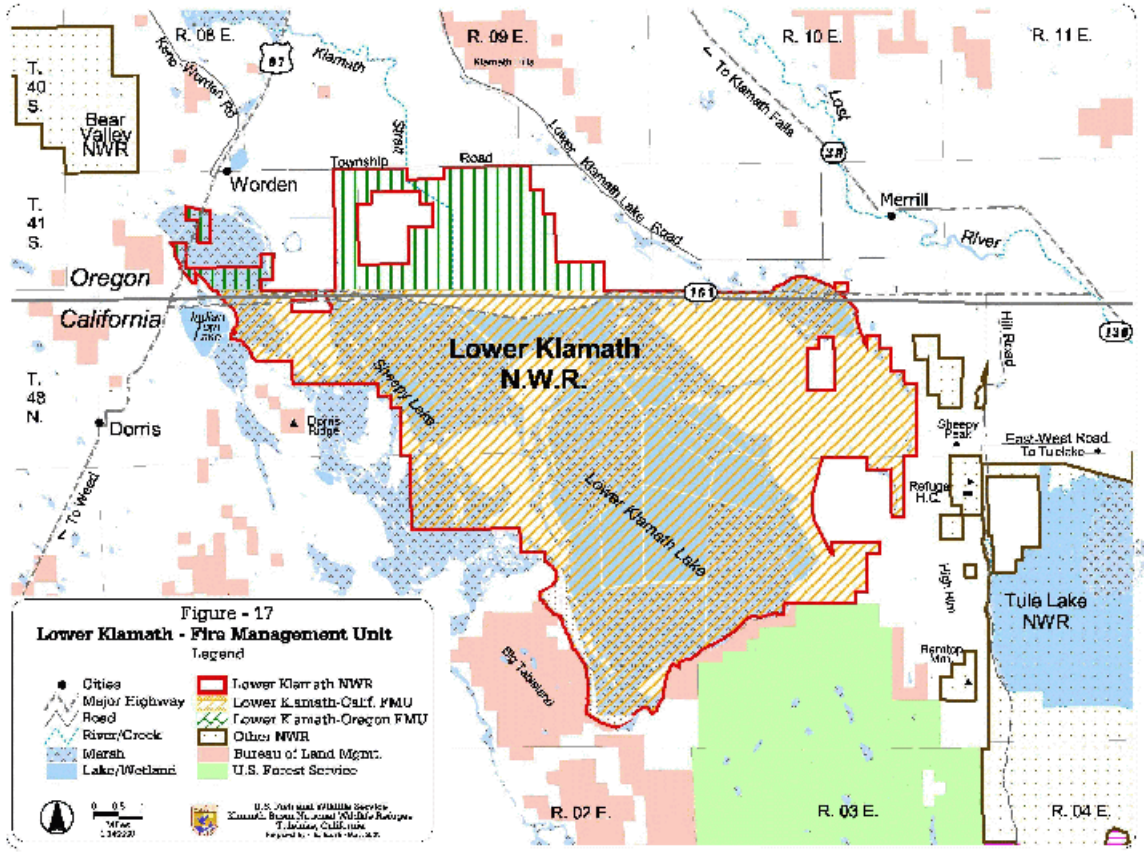
**Klamath Basin NWR Complex Fire Management Units**
Figures 9 to 13 display the locations of the Fire Management Units on each refuge except for the Bear Valley NWR. Bear Valley NWR is one FMU.

*Lower Klamath California FMU*
The FMU is located on the Lower Klamath NWR and consists of the refuge properties that lie in the state of California. The FMU has two fuel models, NFFL Fuel Models 1 and 3. Vegetation on the FMU consists of uplands, seasonal marsh, permanent marsh and agricultural crop lands. The FMU is broken into units that are mostly surrounded by canals or roads. Unit size varies from several hundred acres to 3,000 acres. The upland edges of the FMU largely do not have effective fuel breaks between the refuge and adjacent properties. The lower lying marsh and crop land areas of the FMU are considered sensitive to the use of chemical wildland fire suppression tools due to the hydrology of the unit. The upland areas of the FMU bordering adjacent properties are less sensitive to use of chemical wildland fire suppression tools, but are sensitive to physical disturbance of the ground due to archaeological resources. The roads, canals, berms and former lake bottom areas all contain peat soils and are subject to burning as a result of wildland fire.

This FMU contains two shop facilities, fueling stuctures, hazardous materials storage, vehicle storage garages and office buildings.

*Lower Klamath Oregon FMU*
The FMU is located on the Lower Klamath NWR and consists of the refuge properties that lie in the state of Oregon. The FMU has one fuel model, NFFL Fuel Model 1. Vegetation on the FMU consists 95 percent of agricultural crop land and the remaining area is uplands along canals and roads. The FMU is broken into units with surrounded by canals and roads. The entire FMU is surrounded by man made fuel breaks. The entire FMU is considered sensitive to chemical wildland fire suppression tools due to the hydrology of the unit. The roads, canals, berms and former lake bottom areas all contain peat soils and are subject to burning as a result of wildland fire.

Figure 9: Lower Klamath Fire Management Units



*Tulelake FMU*
The FMU is located on the Tulelake NWR and in the state of California. The unit consists of the main body of the refuge. The FMU has two fuel models, NFFL Fuel Models 1 and 3. Vegetation in the FMU consists of agricultural crop land, permanent marsh and uplands. The FMU is broken into units that are surrounded by canals and roads. The southern boundary of the FMU has uplands vegetation contiguous with Lava Beds National Monument and does not have an effective fuel break. The entire FMU is sensitive to chemical wildland fire suppression tools due to the hydrology of the unit.

*Peninsula FMU*
The FMU is located on the Tulelake NWR and in the state of California. The unit consists of an isolated island of upland vegetation. The FMU has one fuel model, NFFL Fuel Model 1. The unit is surrounded by roads or shear vertical cliffs. The unit is not sensitive to chemical wildland fire suppression tools, but is sensitive to ground disturbance due to archaeological resources and steep slopes.

*Sheepy Ridge FMU*
The FMU is located on the Tulelake NWR and in the state of California. The unit consists of isolated parcels of NWR property located on Sheepy Ridge. The FMU consists of upland vegetation. The unit has one fuel model, NFFL Fuel Model 1. The FWS parcels do not have fuel breaks. Sheepy Ridge is a steep fault block ridge with continuous fuels on the entire slope. The NWR properties lie within the direct protection area of the Modoc National Forest and are largely contiguous with private property. Vehicle access is limited in the FMU. The unit is not sensitive to chemical wildland fire suppression tools.

The headquarters for the refuge is in this FMU. The headquarters consists of office buildings, a residence, shops, fire cache, parking garages and a fueling facility.

*The "U" FMU*
The FMU is located on the Clear Lake NWR and in the state of California. The unit consists of a large peninsula of land nearly surrounded by Clear Lake, and the south shores of Clear Lake. The vegetation on the unit is uplands. The unit has one fuel model, NFFL Fuel Model 1. The southern boundary of the FMU is contiguous to Modoc National Forest. The area next to the lake edge of Clear Lake is sensitive to chemical wildland fire suppression tools. The entire FMU is a sensitive archaeological area.

*Clear Lake West FMU*
The FMU is located on the Clear Lake NWR and in the state of California. The FMU consists of a narrow strip of NWR property beginning at the rock dike on the Clear Lake Road and bordering the west and north shores of Clear Lake. Vehicle access to the FMU is limited on the west and north shores of Clear Lake. The vegetation on the unit is uplands. The unit has one fuel model, NFFL Fuel Model 1. The FMU boundary is contiguous to the Modoc National Forest. The area next to the lake edge of Clear Lake is sensitive to chemical wildland fire suppression tools and the entire FMU is a sensitive archaeological area.

Figure 10: Tulelake Fire Management Units

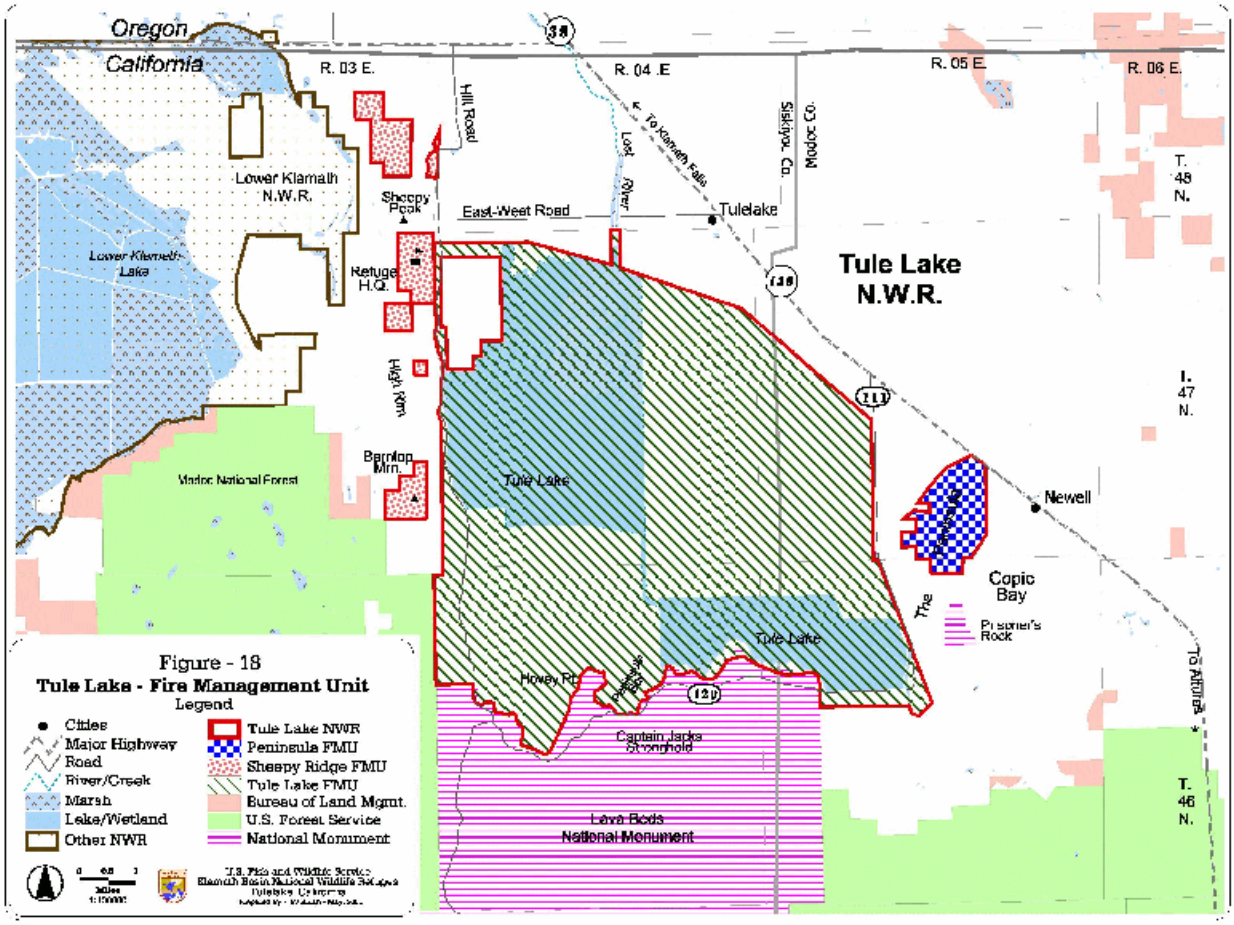
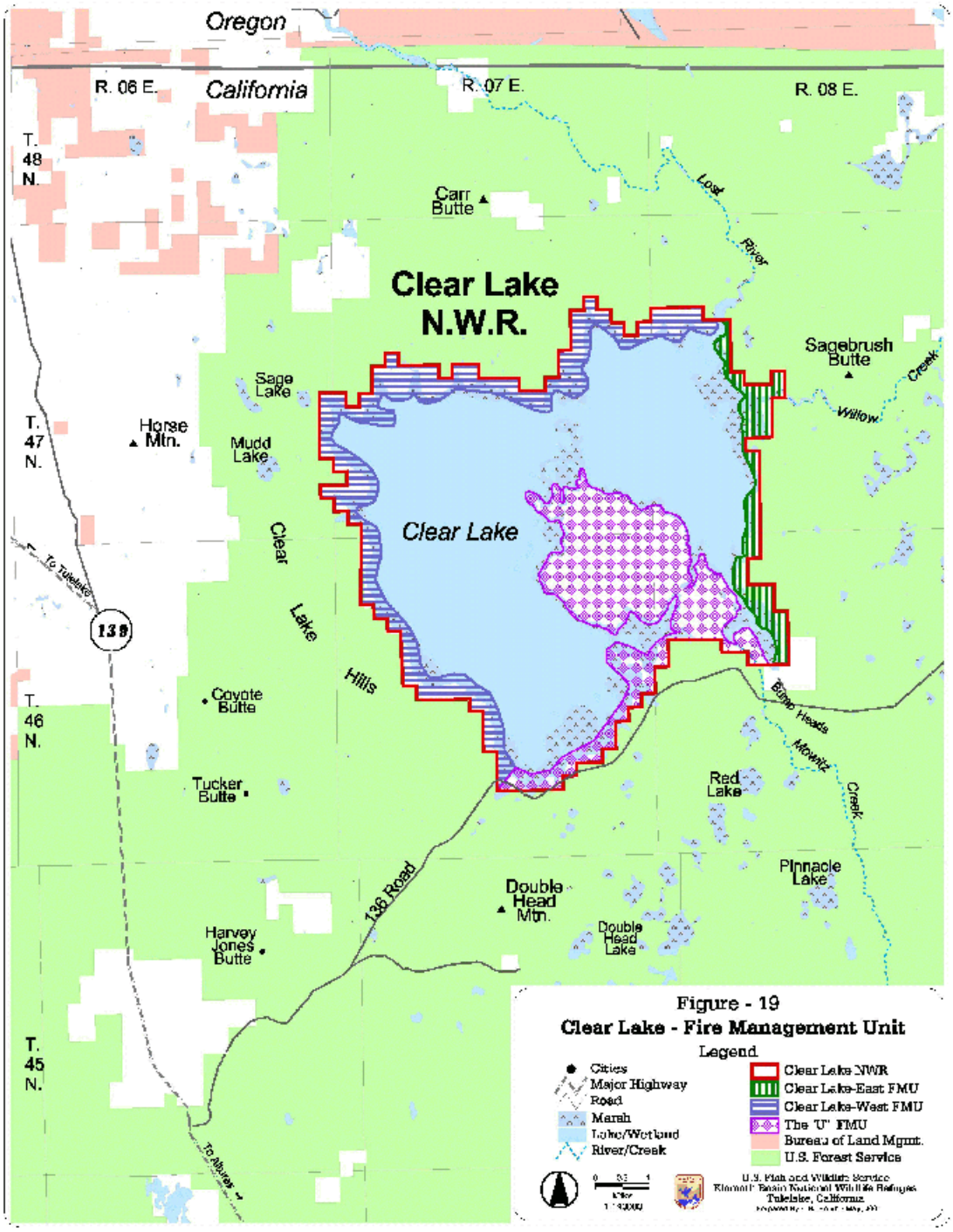


Figure 11: Clear Lake Fire Management Units



*Clear Lake East FMU*
The FMU is located on the Clear Lake NWR and in the state of California. The FMU consists of a narrow strip of NWR property beginning at the Clear Lake Dam along the east boundary of the refuge to the "U". Vehicle access is limited in the FMU. The vegetation on the unit is uplands. The unit has one fuel model, NFFL Fuel Model 1. The FMU boundary is contiguous to the Modoc National Forest. The area next to the lake edge of Clear Lake is sensitive to chemical wildland fire suppression tools and the entire FMU is a sensitive archaeological area.

*Bear Valley FMU*
The FMU consists of the entire Bear Valley NWR and in the state of Oregon. The vegetation in the unit consists of various seral and elevations stages of mixed conifer forest. Lower elevations are dominated by ponderosa pine and upper elevations are dominated by white fir, with mixed conifer forest occupying most of the refuge. Vegetation density is dependent on past management practices or vegetation as a result of wildland fire. Vegetation is less dense on south and west facing slopes. The unit has six fuel models. These are NFFL Fuel Model 2, 6, 8, 9, 10 and 11. The FMU has no natural or manmade fuel breaks to prevent wildland fire from spreading onto or off of the refuge. The unit is contiguous to BLM, State of Oregon and private properties. The unit is not sensitive to chemical or ground disturbing wildland fire suppression tools. Bald eagle nest and roost trees are a sensitive resource and cutting trees or construction of fireline may require consultation from the FWS Endangered Species division.

This FMU has the highest wildland fire risk in the Refuge Complex. The FMU has wildland urban interface risk on three sides. A rapidly developing subdivision is along the east boundary of the refuge. Another subdivision lies 1 mile to the north of the refuge and is separated from the refuge by a dense ponderosa pine plantation on Oregon State lands. Farms and ranchettes lie along the south boundary of the refuge. All of the refuge's area except several hundred acres of treated forest stands, is classed as high wildland fire hazard. The FMU is at risk of stand replacing wildland fire. The refuge is also classed as critical habitat for the federally listed threatened bald eagle.

*Uplands FMU*
The FMU is located on the Upper Klamath NWR and in the state of Oregon. The unit is located at the far north end of the refuge. It is bounded on the north, east and west sides by the refuge boundary, and on the south side by a branch of Recreation Creek. The vegetation in the FMU consists of permanent marsh. The unit has one fuel type, NFFL Fuel Model 3. The boundary of the unit is contiguous to private land, Winema National Forest and BOR properties. The unit is sensitive to chemical wildland fire suppression tools.

*Recreation Creek FMU*
The FMU is located on the Upper Klamath NWR and in the state of Oregon. The unit is located at the north end of Upper Klamath Lake. The north boundary is along Recreation Creek, the west boundary is the refuge boundary and Crystal Creek, the east boundary is formed by Upper Klamath Lake, Thomason Creek and the refuge boundary. The vegetation in the FMU is permanent wetlands. The unit has one fuel type, NFFL Fuel Model 3. Access to the unit is poor and by aircraft or watercraft. The unit is sensitive to chemical wildland fire suppression tools.

*Thomason Creek FMU*
This FMU is located on the Upper Klamath NWR and in the state of Oregon. The unit is bounded on the east by Agency Lake, south by Upper Klamath Lake, north by a canal along the Agency Lake Ranch which is owned by BOR and the west by Thomason Creek. Access to the unit is poor. The unit has one fuel type, NFFL Fuel Model 3. The unit is sensitive to chemical wildland fire suppression tools.

*Pelican Bay FMU*
The FMU is located on the Upper Klamath NWR and in the state of Oregon. The unit is located at the southwest corner of the refuge and consists of two geographically separate areas. Pelican Bay on Upper Klamath Lake separates the two areas of the unit. The western and southern boundaries are along private land. The eastern boundary of the unit is Upper Klamath Lake. The unit has one fuel type, NFFL Fuel Model 3. The unit is sensitive to chemical wildland fire suppression tools.

*Hanks Marsh FMU*
The FMU is located on the Upper Klamath NWR and in the state of Oregon. The unit is surrounded on all sides by wide canals or the Lake. Although the unit is near U.S. Highway 97, access is poor and by boat only. The unit consists of open water and patches of hardstem bulrush. The unit has one fuel type, NFFL Fuel Model 3. The unit is sensitive to chemical wildland fire suppression tools.

*Wocus Bay FMU*
The FMU is located on the Klamath Marsh NWR and in the state of Oregon. The unit's north boundary is the Silver Lake Highway and the east boundary is common with the Winema National Forest. The unit also lies adjacent to private land. The unit consists of open water and hardstem bulrush. The unit has two main fuel types, NFFL Fuel Model 3 and 4. Forested fuel models occur around the edge of the marsh areas. The unit is sensitive to chemical wildland fire suppression tools and is a sensitive archaeological area.

*Military Crossing FMU*
The FMU is located on the Klamath Marsh NWR and in the state of Oregon. The unit's south boundary is the Silver Lake Highway and the north boundary is the Military Crossing Road. The north and west boundary of the FMU is with private land. The east boundary is common with the Winema National Forest. The unit has six fuel types, NFFL fuel models 2, 3, 4, 8, 10 and 11. The unit is sensitive to chemical wildland fire suppression tools and is a sensitive archaeological area.

*North Marsh FMU*
The FMU is located on the Klamath Marsh NWR and in the state of Oregon. The units south boundary is the Military Crossing Road and also common with the Winema National Forest. The east, north and northwest boundaries are also common with the Winema National Forest. The west boundary lies adjacent to private land. The unit has six main fuel types, NFFL Fuel Models 2, 3, 4, 8, 10 and 11. The unit is sensitive to chemical wildland fire suppression tools and is a sensitive archaeological area.

The refuge headquarters is located in this FMU. Buildings include residences, an office building, vehicle storage garage, a fueling structure and hazardous materials storage.

Figure 12: Upper Klamath Fire Management Units

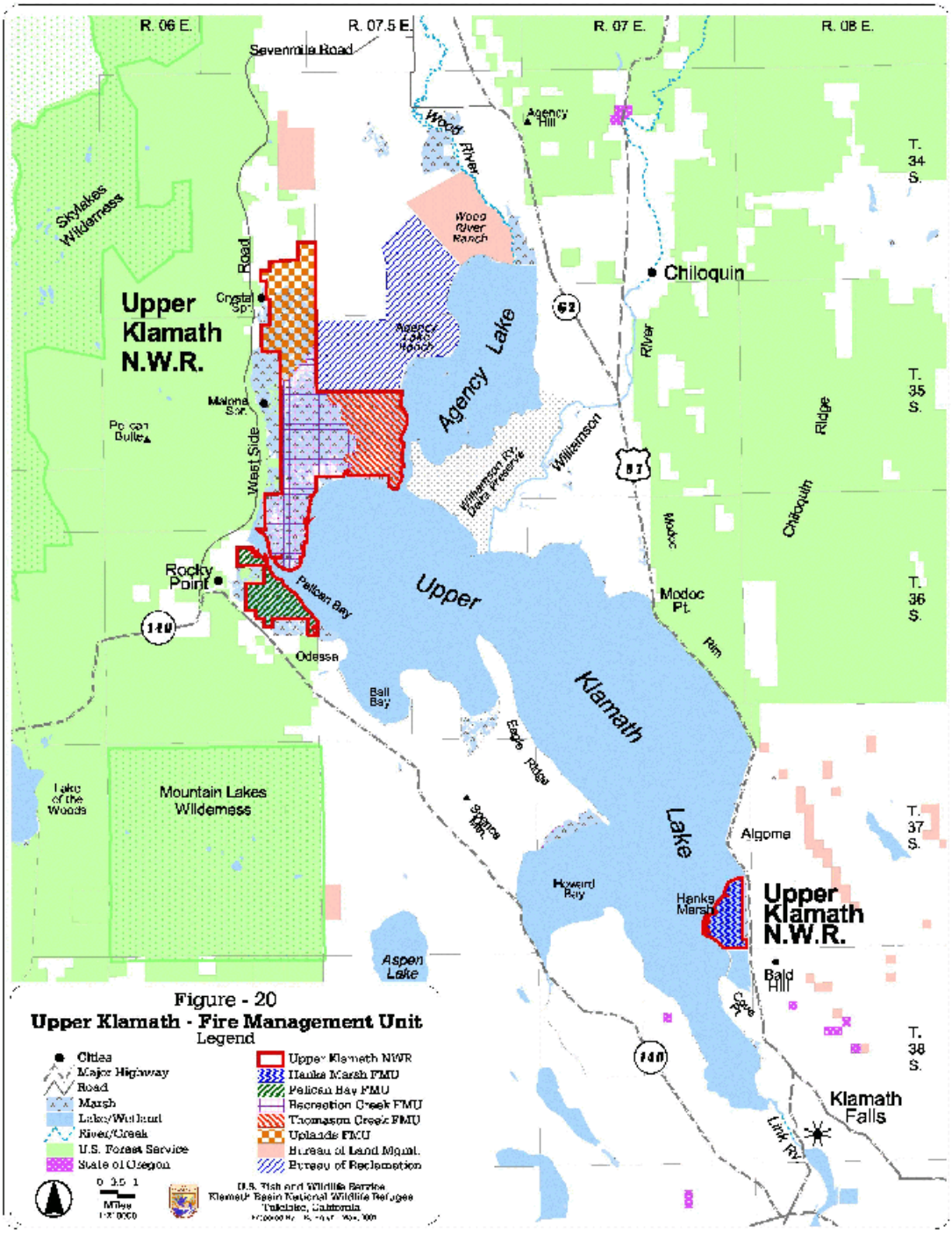
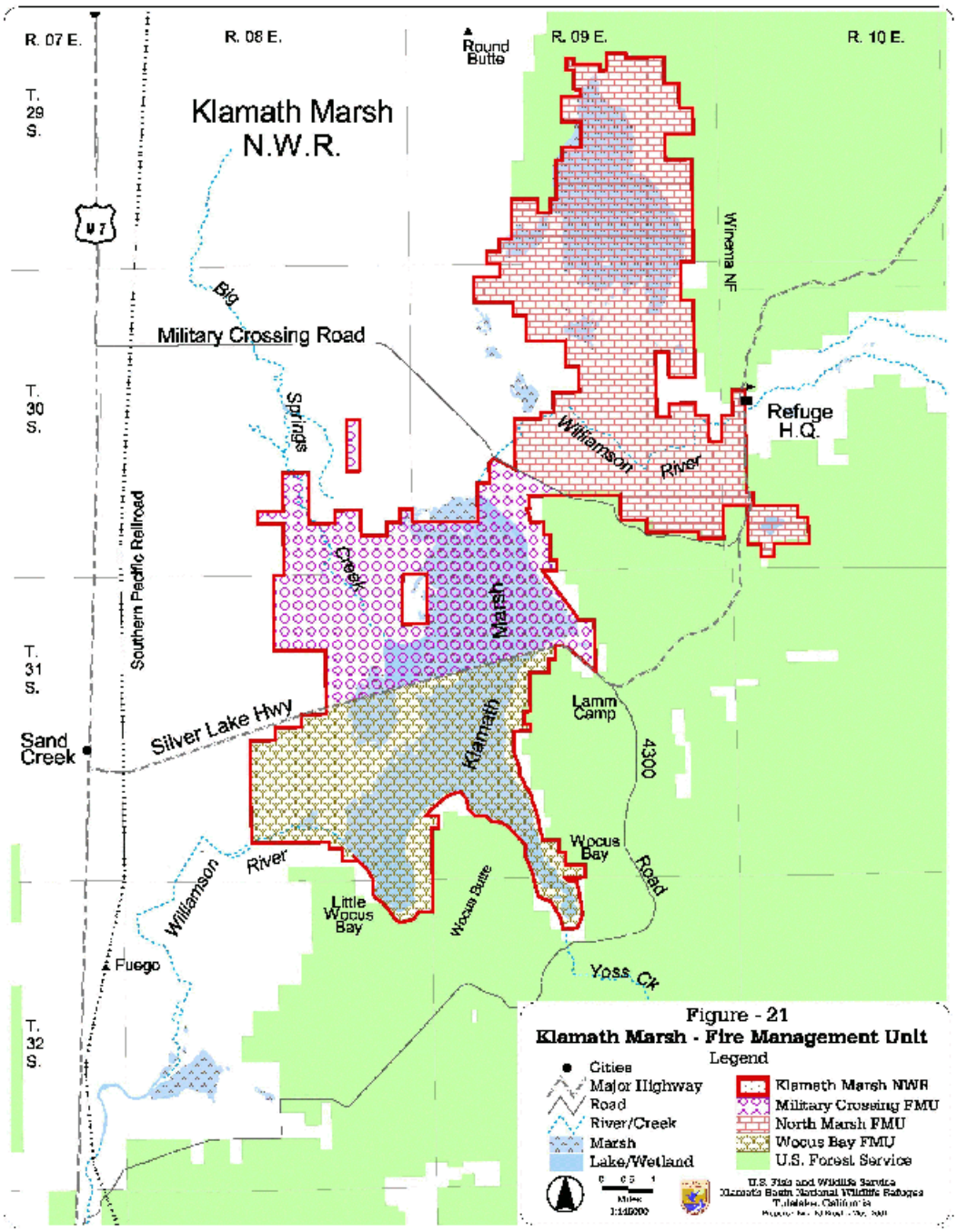


Figure 13: Klamath Marsh Fire Management Units



**Fire Management Unit Pre-Attack Plan**

The FWS has direct protection authority on all of the Complex's refuges. Closest forces initial attack is used on all of the refuges. FWS personnel respond or monitor wildland fire suppression for actions taken on National Wildlife Refuge lands. When FWS personnel or resources are not available, other agency personnel and resources respond to wildland fires on the refuges as per agreement.

A Pre-attack plan exists with each Dispatch Center. Each refuge has a separate pre-attack plan, based on NFDRS weather analysis conducted by the Dispatch Center (Deeming, 1978; Burgen, 1988; Burgen, 1979; Bradshaw, 1983; Cohen, 1985). The only portion of a refuge that does not have a pre-attack plan at a Dispatch Center is the Lower Klamath Oregon FMU and the Upper Klamath NWR. Nearly all of the Upper Klamath NWR is submerged during fire season. The pre-attack plans consist of "run cards" that dictate different levels of response to a wildland fire. The Dispatch Centers use similar, but different methods of determining dispatch levels.

The MICC uses Burning Index (BI) to determine three levels of dispatch. The dispatch levels are low, moderate and high. Dispatch levels are broadcast daily for two NFDRS fuel models (Deeming, 1978), Fuel Model K for the Modoc National Forest and Fuel model F for the Lava Beds National Monument. NFDRS fuel model K is equivalent to NFFL Fuel Model 11. NFDRS Fuel Model F is equivalent to NFFL Fuel Model 6. The dispatch levels for the Fire Management Units in California are:

| Fuel Model K BI | Fuel Model F BI | Dispatch Level |
|---|---|---|
| 0-34 | 0-20 | Low |
| 35-60 | 21-40 | Moderate |
| 61+ | 41+ | High |

The KFIFC uses Energy Release Component (ERC) to determine four levels of dispatch. The dispatch levels are low, moderate, high and extreme. Dispatch levels are broadcast daily for two NFDRS Fuel Models, G and C. NFDRS Fuel Model G is equivalent to NFFL Fuel Model 10. NFDRS Fuel Model C is equivalent to NFFL Fuel Model 2. The dispatch levels for the Fire Management Units in Oregon are:

| Fuel Model G and C ERC | Dispatch Level |
|---|---|
| 0-30 | Low |
| 30-45 | Moderate |
| 45-60 | High |
| 60+ | Extreme |

The dispatch plans for the FMU's on the Complex's refuges are displayed in Appendix H, the Dispatch Plan. When available, FWS resources are dispatched to wildland fires on the Complex's refuges when available. When FWS resources are committed to other incidents, then cooperator resources are dispatched to the fires. The dispatch centers notify the FWS Duty Officer when resources are dispatched to fires on the refuges.

Upon discovery of a wildland fire, all subsequent actions will be based on the following:

1. The Incident Commander (IC) will locate, size-up, and coordinate appropriate management response. The IC will complete the pre-attack planning checklist.
2. Provide for public safety.

3. Consider the current and predicted fire conditions. The IC will assess the need for additional suppression resources and estimate the final size of the fire. The potential for spread outside of the refuge will be predicted, as well as the total suppression force required to initiate appropriate management response at the beginning of each burning period.
4. The IC will assess the need for law enforcement personnel for traffic control, investigations, evacuations, etc. and make the request to the FMO.
5. Document decisions and complete the fire report (DI-1202).
6. Should a wildland fire move into an extended attack a Delegation of Authority and WFSA will be prepared. Once a Delegation of Authority has been signed by the Project Leader, the IC will make the final decisions on management of the fire. A copy of Delegation of Authority is in Appendix I.

**Suppression Tactics**

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

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

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

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

Equipment, fire crews and overhead personnel are available through cooperating agencies locally, local interagency fire caches and NIFC. Incident Commanders from off of the Complex will receive a copy of the "Limited Delegation of Authority".

The Tulelake and Lower Klamath NWR’s are divided into subunits of approximately 200 to 1500 acres by way of roads, ditches and canals. These manmade barriers suffice to effectively limit the spread of fire outside of the units, except in extreme cases. Indirect attack methods will be used to their fullest extent. This would include burn-out along canals, ditches or roads and in some instances backfiring utilizing these same lines. Direct attack will be avoided and used only to protect life and possibly equipment. Direct tactics can include a mobile attack with engine crews or in extreme cases the use of aerial retardant. Rotary wing bucket water drops may be used in areas inaccessible to firefighters. Due to the sensitive nature of this aquatic ecosystem retardant drops or the use of foaming agents will only be used to protect life. Where private land is adjacent to FWS boundaries, ignitions within a 0.5 miles of the boundary will be actively suppressed using the most aggressive means available, providing for firefighter safety first.

At any time suppression activities occur on FMUs within the complex minimum impact suppression

tactics should be used. FMUs that are identified as being sensitive to chemical firefighting tools (retardant and foam), having known archaeological sites, critical habitat, peat soils, erodible soils or other sensitive natural resources, tactics will include some of these activities:

1. Use water or fugitive dye retardant instead of fire retardant chemicals in air tankers. The use of aerial retardant should be restricted to emergency use only.
2. Use water without wildland fire whetting agents (foam).
3. Cold trail the fire edge when practical.
4. Use wet lines whenever possible and waterbars constructed on handlines on steep slopes.
5. Utilize soak hoses or foggers in mop-up. Avoid hydraulic "boring" action on shallow soils.
6. Firelines will be kept to the minimum width and follow natural contours as necessary to allow backfiring or safe blackline to be created and utilize natural barriers whenever possible.
7. Construct waterbars when line is on steep slopes.
8. Archeological sites, when possible, will be identified prior to a fire and protected.
9. Scatter or remove debris, utilizing fire suppression crews prior to demobilization.
10. After the fire emergency is over transport of personnel, equipment, and trash out of the refuge will be consistent with objectives and policy.
11. All fire lines, spike camps, base camps, and other disturbed areas will be rehabilitated as much as possible by crews before demobilization. Any follow-up work necessary will be accomplished in a timely manner.
12. Assign a Cultural Resource Advisor and Resource Advisor to all extended attack wildland fires.

Guidelines for Aerial Delivery of Retardant or Foam near Waterways:

1. Avoid aerial application of retardant or foam within 300 feet of waterways. These guidelines do not require the helicopter or airtanker pilot-in-command to fly in such a way as to endanger his or her aircraft, other aircraft, or structures or compromise ground personnel safety.
2. Medium/Heavy Airtankers: When approaching a waterway visible to the pilot, the pilot shall terminate the application of retardant approximately 300 feet before reaching the waterway. When flying over a waterway, pilots shall wait one second after crossing the far bank or shore of a waterway before applying retardant. Pilots shall make adjustments for airspeed and ambient conditions such as wind to avoid the application of retardant within the 300-foot buffer zone.
3. Single Engine Airtankers: When approaching a waterway visible to the pilot, the pilot shall terminate application of retardant or foam approximately 300 feet before reaching the waterway. When flying over a waterway, the pilot shall not begin application of foam or retardant until 300 feet after crossing the far bank or shore. The pilot shall make adjustments for airspeed and ambient conditions such as wind to avoid the application of retardant within the 300-foot buffer zone.
4. Helicopters: When approaching a waterway visible to the pilot, the pilot shall terminate the application of retardant or foams 300 feet before reaching the waterway. When flying over a waterway, pilots shall wait five seconds after crossing the far bank or shore before applying the retardant or foam. Pilots shall make adjustments for airspeed and ambient conditions such as wind to avoid the application of retardant or foam within the 300-foot buffer zone.

Exceptions:

When alternative line construction tactics are not available due to terrain constraints, congested area, life and property concerns or lack of ground personnel, it is acceptable to anchor the foam or retardant application to the waterway. When anchoring a retardant or foam line to a waterway, use the most accurate method of delivery in order to minimize placement of retardant or foam in the waterway (e.g., a helicopter rather than a heavy airtanker).

Deviations from these guidelines are acceptable when life or property is threatened and the use of retardant or foam can be reasonably expected to alleviate the threat.

When potential damage to natural resources outweighs possible loss of aquatic life, the unit administrator may approve a deviation from these guidelines.

Threatened and Endangered (T&E) Species:

1. These provisions do not alter or diminish an action agency's responsibilities under the ESA. Where aquatic T&E species or their habitats are potentially affected by aerial application of retardant or foam, the following additional procedures apply:
1. As soon as practicable after the aerial application of retardant or foam near waterways, determine whether the aerial application has caused any adverse effects to a T&E species or their habitat. This can be accomplished by the following:
1. Aerial application of retardant or foam outside 300 ft of a waterway is presumed to avoid adverse effects to aquatic species and no further consultation for aquatic species is necessary.
1. Aerial application of retardant or foam within 300 ft of a waterway requires that the unit administrator determine whether there have been any adverse effects to T&E species within the waterway.
1. If there were no adverse effects to aquatic T&E species or their habitats, there is no additional requirement to consult on aquatic species with Fish and Wildlife Service (FWS) or National Marine Fisheries Service (NMFS).
1. If the action agency determines that there were adverse effects on T&E species or their habitats then the action agency must consult with FWS and NMFS, as required by 50 CFR 402.05 (Emergencies). Procedures for emergency consultation are described in the Interagency Consultation Handbook, Chapter 8 (March, 1998). In the case of a long duration incident, emergency consultation should be initiated as soon as practical during the event. Otherwise, post-event consultation is appropriate. The initiation of the consultation is the responsibility of the unit administrator.

**Structure Protection Trigger Points**

Structures owned by the FWS are located on three of the Refuge Complex's refuges; Tulelake, Lower Klamath and Klamath Marsh NWR's. Trigger points for structure protection and evacuation are different for each refuge due to different fuel types, potential for spread and the potential for ignition of the structures. Trigger points are identical for initial and extended attack fires. Trigger points for structure protection and evacuation require immediate notification of the Project Leader or Refuge Manager. Structure protection tactics will be determined by the IC or operations personnel assigned to the task. Evacuation is the responsibility of the County Sheriff, but refuge personnel are not restricted from evacuating prior to a Sheriff's order.

Klamath Marsh NWR structures are all located in the North Marsh FMU. These structures have the most potential to be destroyed by wildand fire within the Refuge Complex. Buildings at the refuge headquarters are constructed of flammable materials and exit within a high hazard fuel type. The greatest potential for

these buildings to be threatened by wildland fire is for the fire to spread from the neighboring Winema National Forest onto the headquarters area. The trigger point for initiating structure protection is any wildland fire actively spreading in the direction of or parallel to the headquarters within three miles. The trigger point of initiating evacuation of the headquarters is any wildland fire actively spreading in the direction of or parallel to the headquarters within three miles.

Tulelake NWR structures are all located in the Sheepy Ridge FMU. Most of the headquarters structures are constructed of non-flammable materials. However, the fueling structure and residence could be ignited by a wildland fire. The trigger point of initiating structure protection is any wildland fire actively spreading in the direction of or parallel to the headquarters within one mile. The trigger point for evacuation will be on a case by case basis.

Lower Klamath NWR structures are all located in the Lower Klamath California FMU. These structures are the least likely to be threatened by wildland fire in the Refuge Complex. Most of the structures are constructed with non-flammable materials. Adjacent stockpiles of flammable materials and the fueling structure could generate enough heat to cause damage to building structures. The trigger point for structure protection is any wildland fire within the near proximity of the shop facilities. The trigger point for evacuation will be on a case by case basis.

**Suppression Conditions**

Wildland fires at the Complex refuges result from either lightning, equipment, escaped prescribed burns or other human causes. During the early part of fire season, fires do not usually spread rapidly because of large amounts of green vegetation. The upland areas with NFFL Fuel Model 1 are the areas where fuel cures early in the season, from late June to mid-July. Wildland fires from adjacent properties can spread onto the upland areas of the refuge. Because the refuge is divided into units and fields by roads and canals, most fires spreading onto the refuge from other properties, can be effectively controlled at these man-made fuel breaks except under extreme fire weather conditions (low relative humidity, high temperatures, winds above 10 miles per hour and weather events such as high Haines Index) . Fires spreading onto the refuge can be controlled by engine crews and have a short duration, usually one to two active control shifts, followed by patrol.

Wildland fires that start in the FBPS Fuel Model 3, usually occur in late August through October. This fuel model produces very high energy releases, which can lead to rapid fire growth. If a wildland fire occurs inside of a unit or field surrounded by canals or roads, control can be achieved at the man-made fuel breaks by engines and light equipment, such as a small dozer or road grader. Fires that occur in this fuel model where spread to the upland areas can grow unchecked can result in a wildland fire spreading off of the refuge on to neighboring properties. The fuel continuity conditions on neighboring properties could result in very large fires, such as the 1998 Refuge Fire (10,000 acres). Air tankers, helicopters, hand crews and dozers can be effectively used in the upland areas to prevent wildland fire spread to neighboring properties. Air tankers using retardant cannot be used in any area of the refuge where waters can become contaminated from the retardant. Foam products cannot be used in any area of the refuge where waters can become contaminated from the foam.

Peat fires at Lower Klamath and Klamath Marsh NWR’s are a risk from any wildland or prescribed fire. The refuges contain large areas of peat soils. Peat fires can burn for many months and are dangerous to control. Holes burned in the peat can lie hidden at the ground surface and a firefighter or piece of equipment could fall into the burning hole. These type of fires are expensive to extinguish, tying up resources and personnel for weeks. Water is the only effective tool to mop up a peat fire. Water for flooding of peat fire areas is not always available and extensive pipe or hose lay delivery systems are

required.

The upland areas of the refuge contain many archaeological or historical sites. Use of heavy equipment or handline construction needs to be monitored. Damage to sites must be avoided. When fires occur in the upland areas, an Archaeologist from the Portland, OR Regional office should be notified.

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

**WILDLAND FIRE SITUATION ANALYSIS (WFSA)**

For fires that cannot be contained in one burning period, a WFSA must be prepared. In the case of an extended attack wildland fire, the Incident Commander, in conjunction with the FMO and refuge staff, will prepare the WFSA. Approval of the WFSA resides with the Refuge Manger.

The purpose of the WFSA is to allow for a consideration of alternatives by which a fire may be controlled. The alternatives developed in the WFSA determine the appropriate fire management strategies for the incident. Damages from the fires effects, suppression costs, safety, and the probable character of suppression actions are all important considerations.

**AIRCRAFT OPERATIONS**

All aircraft must be Office of Aircraft Services (OAS) or Forest Service approved. An OAS Aviation Policy Department Manual will be provided by OAS. An Aircraft Operations plan has been developed for the refuge and is in Appendix O.

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

As in all fire management activities, safety is a primary consideration. Qualified aviation personnel will be assigned to all flight operations.

**REHABILITATION AND RESTORATION**

When suppression action is taken, rehabilitation is appropriate. The most effective rehabilitation measure is prevention of impacts through careful planning and the use of minimum impact suppression techniques. Rehabilitation will be initiated by the Incident Commander, FMO, or Refuge Manager. Rehabilitation will be directed toward minimizing or eliminating the effects of the suppression effort and reducing the potential hazards caused by the fire. These actions may include:

1. Backfill control lines, scarify, and seed.
2. Install water bars and construct drain dips on control lines to prevent erosion.
3. Install check dams to reduce erosion potential in drainages.
4. Restore natural ground contours.
5. Remove all flagging, equipment and litter.
6. Completely restore camping areas and improved helispots.
7. Repair roads and/or fences.

8. Consider and plan more extensive rehabilitation or re-vegetation to restore sensitive impacted areas.

When rehabilitation is needed to reduce the effects of a wildland fire then the refuge can request appropriate funding through the Burned Area Emergency Rehabilitation (BAER) process. Rehabilitation will conform to policy as stated in the Fire Management Handbook. In so far as practical, seed sources from near Klamath Basin Refuges will be selected.

**REQUIRED REPORTING**

The primary responsibility for completing and maintaining fire-related reports and records is assigned to the Fire Management Officer. Most reports and records are held permanently in the Fire Management Office. Copies of reports will be forwarded promptly to appropriate RO and WASO offices. Listed below are most of the types of records and reports compiled, together with the person/s responsible for their completion and their filing location.

| Report/Record | Responsible Person | Filing |
|---|---|---|
| Individual Fire Report, DI-1202 | IC or FMO/AFMO | FMO office |
| Narratives or other suppression reports | IC or FMO/AFMO | FMO office |
| Fire Atlas | FMO/PFS | FMO office |
| Weather records | PFS | FMO office |
| Prescribed Burn Plans | FMO?AFMO | FMO office |
| Burning Permits | PFS | FMO office |
| Historic Reports | FMO/AFMO | FMO office |
| Other Maps, Records | FMO/AFMO | FMO office |

**FIRE INVESTIGATION**

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

Prompt and efficient investigation of all suspicious fires will be carried out. However, fire management personnel should not question suspects or pursue the fire investigation unless they are currently law enforcement commission qualified.

Personnel and services of other agencies may be utilized to investigate wildland fire arson or fire incidents involving structures. Any needed resources will be ordered through dispatch.

# PRESCRIBED FIRE ACTIVITIES

## PRESCRIBED FIRE PROGRAM OBJECTIVES

Fire is an integral component of refuge ecosystems in the Complex. Fire is used as a tool to accomplish resource management objectives. These objectives include, but are not limited to: enhance and maintain wildlife habitat, enhance public use opportunities, reducing hazardous fuels, managing exotic and noxious plant species, promoting biological diversity and desired seral stages, preserving endangered species and critical habitat, and to accomplish basic maintenance needs such as disposal of vegetative waste and debris. Fire is a vital ecosystem process as well as protecting and maintaining refuge infrastructure.

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

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

The goals of the Fish and Wildlife Service prescribed fire program on the Complex's refuges are to:

1. Conduct a vigorous prescribed fire program with the highest professional and technological standards.
2. Identify the type of prescribed fire that is most appropriate to most situations and areas.
3. Efficiently accomplish resource management objectives through the application of prescribed fire.
4. Continually evaluate the prescribed fire program to better meet program goals by refining prescription treatments and monitoring methods, and by integrating applicable technical and scientific treatments.
5. Not allow prescribed fire to escape.

## FIRE MANAGEMENT STRATEGIES

### Hazard Reduction

Protection of forested areas on the Bear Valley and Klamath Marsh NWRs is the main strategy of hazard reduction. The pre-settlement forested areas on both refuges were short return interval, fire dependent vegetation types. Some of the forested areas on the refuges have not had a fire for up to 100 years. Forest vegetation on the refuges are in a condition that would result in stand replacement from moderate wildland fire conditions. Surface and ground fuel accumulations, along with shrubs and small trees as ladder fuels, would lead to severe fire effects after a wildland fire. The protection strategy is to thin forest stands and use prescribed fire on a recurring basis to reduce the hazard of stand replacement fires and severe wildland fire effects. Forested vegetation serves as habitat for the bald eagle, a federally listed threatened species.

### Wildlife Habitat Improvement

Use of prescribed fire to improve and maintain habitat for migratory birds is a primary role of fire management at the Complex. All of the refuges in the Complex were established to provide habitat for migratory birds. The vegetation and associated habitats at the refuges provide transitory or permanent habitats for over 430 vertebrate wildlife species. Threatened and endangered migratory avian predators, such as the bald eagle, depend on the resident or migratory birds for food. The strategy of the use of

prescribed fire for wildlife habitat improvements is to maintain habitats at an optimum level for plant diversity and forage production.

**Maintenance of Refuge Infrastructure**
The strategy for refuge infrastructure maintenance is to remove debris along roadsides, in water delivery structures, around water control structures, around electrical structures and around buildings. Mechanical manipulation of debris and prescribed fire will be used. The BOR and Tulelake Irrigation District will direct the maintenance activities associated with the irrigation system on the refuges.

**Debris Removal**
The strategy for debris removal is the continued safe use of prescribed fire, where applicable. The current rate of debris removal is 15,000 to 22,000 acres per year on the Tulelake and Lower Klamath NWRs. Most of the current debris removal is the burning of grain stubble.

The strategy for Tulelake and Lower Klamath NWR's is to eliminate burning of grain stubble, except for the purpose of wildlife management. This strategy will be accomplished in a step-wise process. All new leases and cooperative farm agreements will eliminate grain stubble burning by lease holders or cooperators.

**Noxious Weed Management**
The strategy is to continue the use of prescribed fire in conjunction with other tools to assist in the control of noxious weeds. Prescribed fire use for noxious weed control will be coordinated with the Integrated Pest Management Specialist and Refuge Biologist.

**Ecosystem Role of Fire**
Increasing the natural role of fire in the vegetation communities on the Complex's refuges is a strategy and goal of management. Because of the fragmentation of the land ownerships in the Upper Klamath River Basin and the relatively small size of the refuges, prescribed fire will be the only way that fire can safely be returned to the ecosystem on a regular basis. Using prescribed fire to manage the refuge's vegetation is highly favored over the impacts of wildland fire and it's associated severity of effects, safety issues,potential damage to adjacent properties and the unplanned nature of wildland fire.

**PRESCRIBED FIRE PLANNING**
All prescribed fires, prior to implementation must have a written plan which is reviewed and approved by the Project Leader. Habitat management burns, hazard fuels reduction, debris removal, roadside and ditch burning must have a written plan. The BOR and irrigation districts are responsible for completing the planning for all burns associated with the farm lease program and maintenance of the project water delivery system. The Department of Interior, Departmental Manual, chapter on Wildland Fire Suppression and Management (910 DM 1), section b (2) states: "No prescribed fire may be allowed to burn without suppression action unless a current and valid prescription has been approved by the responsible line officer. All prescriptions must address:

1. The land use objectives for the area.
2. Historical fire occurrence.
3. Expected fire behavior.
4. Natural role of fire.
5. Buffer and safety zones.
6. Energy release component (ERC).
7. Constraints which may be required due to regional and national fire activity.
8. Predetermined limit on the number of fires burning in the planning area at one time.

9. Perimeter and acreage burned limit.
10. Analysis of the cumulative effects of weather and drought on fire behavior.
11. Potential impacts upon visitors, users, and local communities, both on and off site.
12. Considerations of environmental, economic, and social effects, both on and off site.

Prescribed burns in California require a smoke management plan for each burn. Burn permits are required for and issued by Siskiyou and Modoc Counties. Fees will be assessed to each permit. In Oregon, all applicable state regulations on smoke will be followed.

**Annual Activities**

Refuge management staff will develop annual prescribed fire objectives and target specific burn units prior to the prescribed burn season. The planning for the Refuge Complex refuges is normally accomplished in late winter when the farming and water management programs are being developed for the year. The Refuge Biologist submits an annual habitat management proposal for Lower Klamath and Tulelake NWR's. These proposals are reviewed by the habitat management team. Prescribed fire projects at Bear Valley NWR are developed by the habitat management team. The Refuge Manager at Klamath Marsh NWR develops and submits prescribed fire projects to the habitat management team. All projects are approved by the Project Leader.

The BOR and irrigation districts submit proposed prescribed fire burns for irrigation infrastructure management at least four months in advance. These requests are reviewed by the Refuge Biologist and approved by the Project Leader.

Debris removal burns that are permitted on leased agricultural lands, are identified by November 1st. A refuge specific prescribed burn plan will be prepared for both Tulelake and Lower Klamath NWR's.

Burns may be conducted during any season of the year depending on the specific management objectives of the burn. However, due to the normal life cycle of this area, burns are bimodal, meaning that spring burning is done prior to green-up and fall burning is accomplished after maturation. Little or no burning is accomplished during the summer period as the vegetation is green.

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

Prescribed Fire activities will be reviewed annually by the Fire Management Officer, Assistant Fire Management Officer and Prescribed Fire Specialist. Necessary updates or changes to the Prescribed Burn Plan will be accomplished prior to the next fire season. Any additions, deletions, or changes will be reviewed by the Refuge Manager to determine if such alterations warrant a further approval of the plan.

**Management Unit Objectives**

Management unit objectives for prescribed fire are developed through environmental analysis and the subsequent habitat management plans for each refuge. A refuge may have several decision documents reflecting the land management actions occurring at the refuge. Plans for management of threatened and endangered species, waterfowl, other migratory birds and uses such as agriculture, may be reflected in different documents. The initiation of comprehensive conservation planning (CCP) in the Complex is planned for approximately 2005.

Several refuges share the same prescribed fire management objectives for similar vegetation types. Management of unique applications of prescribed fire is described for each refuge. Common management

techniques using prescribed fire will be described by vegetation type.

*Permanent Hardstem Bulrush Marsh*
The objective for burning this vegetation type is to remove accumulated plant biomass to facilitate increasing plant diversity, provide nesting habitat, restore vigor and palatability of forage, and create a mosaic of vegetative stages. Removal of biomass also facilitates discing or plowing of marsh habitat to create vegetation mosaics. The vegetation is cured either by draining the marsh area or when the dead plants cure during winter freeze conditions. Prescribed burning reduces accumulated materials, creating a diversity of submergent or emergent vegetation in the usually mono-culture stands of hardstem bulrush. Roots of bulrush can be temporarily killed in small aggregations, leaving more open water in continuous expanses of marsh. Permanent marsh areas are usually burned approximately every four years. Prescribed fire is being used to manage permanent marshes at Lower Klamath, Tulelake and Klamath Marsh NWRs, with the potential to manage permanent marshes at Upper Klamath NWR.

*Agricultural Crop Land*
Prescribed burning of grain crop stubble is the current practice for preparing farmed areas of the Tulelake and Lower Klamath NWRs for planting grain crops. Burning of grain stubble is also used as a pre-flood technique for waterfowl management to enhance hunting opportunities, stubble management and expose grain for waterfowl. The objective for burning agricultural crop land is site preparation.

The Refuge Complex will eliminate grain stubble burning by lease land growers for agricultural site preparation by 2006. Cooperatively farmed areas will eliminate grain stubble burning by cooperators by 2002. New leases will prohibit grain stubble burning by lease holders as a condition of the lease.

*Emergent Seasonal Marsh*
The objective for burning this vegetation type is to remove accumulated plant biomass and reduce opportunities for disease and insect epidemics by maintaining a mosaic of climax and sub-climax vegetation. This vegetation type cures in the late summer or early fall. Areas of seasonal marsh are burned to increase plant diversity, to create openings and provide improved forage. Migratory bird forages are improved by burning this type. Burning is also used to encourage use of these area by wading shorebirds, herons, sandhill cranes and egrets. Burning can also be used as site preparation for rotation of seasonal marshes to agricultural crop land.

*Uplands*
The objective of burning upland areas is to increase plant diversity and create lower successional stage vegetation. Sage brush and grease wood stands have been burned at Lower Klamath and Clear Lake NWRs to remove older shrub and grass plants and to reduce the age composition of the vegetation.

*Noxious Weeds*
The objective of burning this type of vegetation is site preparation. Prescribed burning this type is usually conducted over small areas in preparation of biological or chemical control of noxious weeds and maintaining grass plantings that control noxious weeds. This type of burning is conducted at Tulelake and Lower Klamath NWRs.
*Refuge Infrastructure*
The objective of burning this type is site preparation for construction or maintenance of the facility. Roadside vegetation is burned to facilitate road maintenance and construction. Irrigation ditch and canal vegetation is burned to facilitate mechanical cleaning of the structure or to facilitate movement of water and provide access to water control structures. This type of burning is conducted at Tulelake and Lower Klamath NWRs.

*Lower Klamath NWR*
The prescribed fire objectives are to annually burn 3,000 to 10,000 acres of uplands, permanent and seasonal marshes and 100 to 200 acres of ditch berms and roadway edges. Prescribed fire on agricultural crop land will decline from 5,000 to 7,000 acres annually to a case by case basis.

*Tulelake NWR*
The prescribed fire objectives are to annually burn 1,000 to 5,000 acres of uplands, permanent and seasonal marshes and 100 to 200 acres of ditch berms and roadway edges. Prescribed fire on agricultural crop land will decline from 11,000 to 13,000 acres annually to a case by case basis.

*Bear Valley NWR*
The objectives of prescribed burning at this refuge is hazard fuels reduction to protect bald eagle roosting and nest trees. Either natural or prepared fuel beds are broadcast burned. Removal of logging slash, shrubs, small trees, logs and duff are targeted to protect critical winter roost and nesting habitat. Burning under the canopy of forest stands constitutes most of the prescribed burn workload. Burning hand and machine piles are also used to reduce hazard fuels.

The prescribed fire objectives are to annually burn 200 to 400 acres of forest understory and 50 to 100 acres of piled woody residues.

The thinning objectives are to commercially or pre-commercially thin all of the forest stands in the refuge over a 15 year period.

*Klamath Marsh NWR*
The objectives of prescribed fire in forested vegetation at this refuge is hazard fuels reduction and establishing fire as a natural process. Either natural or prepared fuel beds are broadcast burned. Removal of logging slash, bitter brush shrubs, logs and duff are targeted to protect the refuge Headquarters, other refuge facilities, forest resources and lands adjacent to the refuge. Burning under the canopy of forest stands constitutes most of the prescribed burn workload. Burning hand and machine piles are also used to reduce hazard fuels.

The prescribed fire objectives are to annually burn 2,000 to 10,000 acres of uplands, forest understory, permanent and seasonal marshes, and 50 to 100 acres of piled woody residues.

Thinning objectives are to commercially or pre-commercially thin most of the forest stands in the refuge over a 15 year period.

*Upper Klamath NWR*
Prescribed fire objectives have not been developed for the refuge. Large areas of permanent marsh are available for burning, but wildlife and fisheries habitat resource management objectives have not been developed. The refuge is currently under a wildland fire management regime.

*Clear Lake NWR*
Prescribed fire objectives have not been developed for the refuge. The refuge is currently under a wildland fire management regime.

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

All prescribed fires will have prescribed burn plans. The prescribed burn plan is a site specific action plan describing the purpose, objectives, prescription, and operational procedures needed to prepare and safely conduct the burn. The treatment area, objectives, constraints, and alternatives will be clearly outlined. Specific units are delineated for prescribed burns and upon completion of the written Prescribed Burn Plan, it is submitted to the Project Leader for review and approval. The Assistant Fire Management Officer or Prescribed Fire Specialist is also responsible for assisting other units within their respective zones in preparing and reviewing Prescribed Burn Plans. However, final authority for approval of individual burn plans lies with the Project Leader.

After plan approval and appropriate signatures, the plan is returned to the originating unit. Prescribed burn unit preparation, if any, is initiated when applicable. In cases where construction of control lines for prescribed fire is involved, archeological clearances must be obtained prior to commencement of the work.

**Strategies and Personnel**

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

Prescribed fires conducted for FWS programs, i.e.; habitat management, hazard fuels reduction, cooperative farming and infrastructure maintenance, will be conducted by FWS personnel.

Prescribed fire activities conducted by farm lease holders, BOR or the Tulelake Irrigation District must follow FWS policy. FWS agency manual 621 FW 3-3.6 directs that local fire departments, qualified contractors or other cooperators can conduct prescribed fire operations on National Wildlife Refuge system lands. An agreement or contract clearly stating the conditions under which these individuals may conduct prescribed fire operations, liability waivers, qualifications and PPE requirements or other items important to the burning operation needs to be completed with the cooperators. Adequate fire lines will be established on all cooperator burns and the responsible individual will be present until the burn is declared controlled.

Weather and fuel moisture conditions must be monitored closely in planned burn units to determine when the prescription criteria are met. A belt weather kit may also be utilized to augment monitoring. Fuel moisture samples of 10, 100, and 1000-hour down, down logs (where applicable) and of live plants (where applicable) may be monitored each week and percent moisture contents figured to help determine when the prescription criteria are met.

Go/No-Go elements:

1. Prescription adequate for a safe burn
2. Plan includes a prediction of expected fire behavior
3. Plan provides for getting spot weather forecast or general weather forecast
4. Test fire is planned, if not explain
5. Qualifications of personnel reviewed and found adequate
6. Proposed organization structure reviewed and found adequate
7. Fuels adjacent to burn identified and problem areas highlighted
8. Plan includes instructors for overhead
9. Maps adequate
10. Escape Contingency Plan adequate

11. Safety Plan adequate
12. Post-burn plan included for both short and long term effects
13. Recommended for approval

When all prescription criteria are within the acceptable range, the Prescribed Burn Boss will select an ignition date based on current and predicted weather forecasts. A thorough briefing will be given by the Prescribed Burn Boss and specific assignments and placement of personnel will be discussed. An updated spot weather forecast will be obtained on the day of ignition and all prescription elements will be rechecked to determine if all elements are still within the approved ranges. If all prescription elements are met, a test fire will be ignited to determine on-site fire behavior conditions as affected by current weather. If conditions are not satisfactory, the test fire will be suppressed and the burn will be rescheduled. If conditions are satisfactory the burn will continue as planned.

A qualified Incident Commander Type III will be available within a four hour response in the event of an escaped prescribed burn. 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 pre-burn briefing. The FMO will be notified immediately of any control actions on a prescribed burn. A WFSA will be completed as necessary and additional personnel and resources ordered as determined by the Incident Commander. If the fire continues to burn out of control, additional resources will be called from the local cooperating agencies via the servicing dispatch. A management overhead team may be requested to assume command of the fire.

Prior to implementation of the burn, all refuge suppression equipment will be checked to insure readiness for the prescribed burn. Specialized equipment for the burn such as portable pumps and porta-tanks will be checked and put in place on the burn site along with any required hose lines and laterals. After completion of the burn the same dispatch center is notified that the burn is completed and any additional information is passed on at this time. In addition the appropriate county air quality control office is notified prior to implementation to secure a permit for the burn.

Smoke management is a concern for the Klamath Falls area. Klamath Falls, OR is classed as a non-attainment area for PM 10 smoke particles. There are three Class I airsheds near the Klamath Basin. These Class I airsheds are Lava Beds National Monument, Crater Lake National Park and Mountain Lakes Wilderness (Winema NF).

Additional resources for more complex burns can be acquired from U.S. Forest Service, Bureau of Land Management, and National Park Service. Cooperative agreements with Lava Beds National Monument, Modoc National Forest, and Klamath Falls Bureau of Land Management which allow us to assist them in implementing prescribed burns and allow those agencies to assist FWS in implementing prescribed burns.

**Monitoring and Evaluation**

Monitoring of prescribed fires is intended to provide information for quantifying and predicting fire behavior and its ecological effects on refuge resources while building a historical record. Monitoring measures the parameters common to all fires: fuels, topography, weather and fire behavior. Information gathered from monitoring will be used in fine-tuning the prescribed burn program.

Monitoring is performed on prescribed burns on the Klamath Basin Complex refuges to ensure that burn plan prescriptions are met, to see if first order fire effects fall within the intent of the burn plan objectives, and to make sure that smoke drift and dispersal is as predicted.

During prescribed burning, monitoring should include mapping, weather, site and fuel measurements and direct observation of fire characteristics such as flame length, rate of spread and fire intensity. Burn plan prescription parameters are monitored utilizing belt weather kits and fire behavior field reference guides. 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. Live herbaceous fuel moisture is monitored by oven drying field samples. Results of monitoring are recorded on fire behavior forms and stored with the individual burn records maintained by the PFS. Live herbaceous fuel moisture is sampled every two weeks on the refuge. Results of this sampling are on file in Fire Management.

First order fire effects are monitored mainly through the use of pre and post burn digital photos taken at established photo points. Photos are stored on disks and are kept by the PFS. Ocular estimate of percentage of area burned on larger units is provided by individuals conducting aerial bird census counts. Fuel reduction and duff consumption in forested vegetation are measured utilizing Brown's planar intersect method (Brown et.al. 1985).

Smoke drift direction and dispersal are monitored on burns exceeding 250 acres. At Bear Valley smoke is monitored on all burns. This is usually done on site and involves writing a simple description of what the smoke is doing. If available, photo documentation is attached to this description. All records are kept by the PFS.

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

**Required Reports**
All prescribed burn forms will be completed as outlined 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 fire records 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, map of the burn area, photographs of the burn, number of work hours, and final cost of the burn.

The 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, personnel utilized, and fire effects. Prescribed Fire activities will be reviewed annually by the FMO, AMFO, PFS Refuge Biologist, and Project Leader. 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 Refuge Manger to determine if such alterations warrant a re-approval of the plan.

An annual report on prescribed fire activities will be submitted to the Klamath Falls Fish and Wildlife Office requesting a determination as to whether Section 7 consultation will be extended or need to be modified.

**Prescribed Burn Critique**
The participants will critique each prescribed burn. A report detailing the actual burn will accompany any recommendations or changes deemed necessary in the program. This report will be submitted to the Refuge Project Leader and FMO. A post-season critique of the fire management program, including the

prescribed burn program, will be held each year by the Fire Management Officer, Assistant Fire Management Officer, Project Leader, Resource Specialists and Prescribed Fire Specialist at the conclusion of the fall fire season.

## AIR QUALITY

The fire management program at Klamath Basin Refuges will comply with the Air Quality Smoke Management Guidelines presented in the Fire Management Handbook.

The State of California requires the issuance of Open Burning Permits through the county Air Quality control offices. The State of Oregon in Klamath County does not require the issuance of a permit at this time. California requires the issuance of a permit prior to ignition of prescribed burns. NFFL Fuel Types 1, 2, 3 and 6 burn with short duration with little or no residual smoke. The Refuge Complex will comply with the local air quality offices and is cognizant of the restrictions and ramifications of affecting the air shed at Klamath Falls.

Smoke management in Oregon will comply with all applicable state air quality regulations.

As part of the prescribed burn plan the five step procedure outlined in the “Southern Forestry Smoke Management Guidebook” (Mobley et.al. 1976) will be utilized to predict the effect of smoke on any downwind receptors. Any adverse effect predicted on an identified downwind receptor would place an additional constraint within the burn plan and limit burning on only good to excellent dispersal days. This information will be obtained by the burn boss from the spot weather forecast.

Any time a prescribed burn is carried out in a visitor use area where smoke may impair vision, the burn boss will have people assigned to manage traffic flow. These people will also be aware of the prescribed burn objectives so that they can answer questions and generate a positive attitude toward the prescribed burn program.

## FIRE RESEARCH

The Klamath Basin NWR Complex has a need for fire ecology related research. Very little research has been conducted on pre-settlement fire history, fire ecology and early post-settlement fire history. Bear Valley NWR has had one dendro-chronology study conducted by Goheen. The refuge fire management personnel are currently continuing fire scar studies at Bear Valley. Further work is needed at some of the other Complex refuges. A partial list of the studies needed are;

1. Continued fire history and dendro-chronology studies at Bear Valley NWR.
2. Fire history and dendro-chronology studies at Klamath Marsh NWR.
3. Post settlement fire history of the Refuge Complex.

## PUBLIC SAFETY

Fire is hazardous and safety must be given first priority during all conditions. A qualified safety officer will be assigned to all large wildland fires. Employees responsible for any wildland fire management action will never subordinate human safety to other values. Assuring visitor safety will always take priority over fire suppression and monitoring activities. Consistent accurate monitoring and evaluation of fire behavior in the refuge will provide the basis for developing contingency plans, contacts, and briefings that ensure public and personnel safety.

Fires are a natural part of the ecosystem. As such, they are as much a part of the natural process as high wind, lightning storms and other natural phenomena. Ideally, through education and experience, people will better understand the element of risk associated with the process of fire.

The Fire Management Officer will inform other divisions, cooperators, adjacent agencies or landowners, commercial operators and grazing permittees of all potentially hazardous prescribed burns in the refuge. A public announcement may be done on some prescribed burns. The announcement will be prepared by the Outdoor Recreation Planner and the Refuge Manager will make the announcement to the proper people. The information actions to be considered are:

4. The initial attack IC or Burn Boss will determine the proximity of visitors, commercial operators, grazing permitees, and neighbors to the fire, inform them of potential hazards, and aid in their evacuation if necessary.

5. When a wildland fire is in progress, information listing location, behavior, expected dangers, areas to avoid, and precautions to be taken will be posted on refuge bulletin boards and at visitor centers and distributed. The Outdoor Recreation Planner will be utilized to inform the public of dangers and provide information on the objectives of fire.

6. The Prescribed Burn Boss will insure that closure and/or informational signs are properly posted for prescribed fires. Safety of refuge visitors and neighbors is an integral part of the planning process on all prescribed fires.

7. The Fire Management Officer will notify both Interagency Dispatch centers prior to ignition of any prescribed burns. Information will include location, size, and projected duration of the burn.

8. News articles will be prepared by the Outdoor Recreation Planner and released to local newspapers, radio, and television stations, when ongoing fires or prescribed fires are of local interest.

## PUBLIC INFORMATION AND EDUCATION

Educating the public on the value of fire as a natural process is important to increasing public understanding and support for the fire management program. The refuge will use the most appropriate and effective means to explain the overall fire and smoke management program. This may include supplemental handouts, signing, personal contacts, auto tour routes, or media releases. When deemed necessary, interpretive presentations will address the fire management program and explain the role of fire in the environment.

The public information program will be developed as follows:

1. Concepts of the prescribed burn program will be incorporated, as appropriate, in publications, brochures, and handouts.
2. During periods when prescribed burns are ignited, handouts will be prepared and distributed to all visitors entering areas of fire activity.
3. The fire management program may be incorporated into visitor contacts. Particular attention will be given when fires are conspicuous from roads or visitor use areas.
4. News releases will be distributed to the media as appropriate.
5. The public information outlets of neighboring and cooperating agencies and the regional office will be provided with all fire management information.
6. The fire management program will be discussed in informal talks with all employees , volunteers, residents, and neighbors.

Prior to the lighting of any planned ignition, information will be made available to visitors, local residents, and the press about what is scheduled to happen and why. On-site information will be provided to alleviate visitor concern about the apparent destruction of resources by fire or the impairment of views due to temporary smoke. 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

The Fire Management Plan has been reviewed by the management staff of the complex and appropriate comments were incorporated.

This Fire Management Plan will be reviewed annually and revised as necessary prior to the normal fire season. Substantive revisions will be approved by the Refuge Manager and Regional Fire Management Coordinator prior to implementation. Such revisions will be submitted with a new plan cover sheet for signatures and dates. Examples of revisions not requiring the Regional Director's approval include:

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

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

Individual fire critiques are completed on all prescribed burn plans and are kept on file. The format for this critique is a formal part of each individual burn plan. Critiques that are completed on wildland fires occurring on the complex will be file as part of the completion reports done on any wildland fire and will be kept as part of this permanent record.

## CONSULTATION AND COORDINATION

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

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# APPENDICES

## APPENDIX A: LITERATURE CITED


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## APPENDIX B: DEFINITIONS

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

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

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

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

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

Burning Index (BI). A rating value related to the contribution of fire behavior to the effort of containing a fire. Our staffing is based on the BI from fuel model C. fuel model G is used for IFPL calculations (this reduces major changes in indices due to RH and produces a smoother curve).

Energy release component (ERC). The ERC is derived from predictions of (1) the rate of heat release per unit area during flaming combustion and (2) the duration of flaming.

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

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

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

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

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

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

Fire prescription. A written direction for the use of fire to treat a specific piece of land, including limits and conditions of temperature, humidity, wind direction and speed, fuel moisture, soil moisture, etc.,

under which a fire will be allowed to burn, generally expressed as acceptable range of the various fire-related indices, and the limit of the area to be burned.

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

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

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

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

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

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

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

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

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

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

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

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

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

and other damages.

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

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

Waterway. Any body of water including lakes, rivers, streams and ponds whether or not they contain aquatic life. Note: Ecological Services includes springs, seeps, or intermittent streams within the definition of waterway.

Wildfire. An unwanted wildland fire.

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

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

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

## APPENDIX C: FIRE MANAGEMENT ENVIRONMENTAL ASSESSMENTS BY REFUGE

## APPENDIX D: KUCHEL ACT

## APPENDIX E: COOPERATIVE AGREEMENTS

## APPENDIX F: STEP-UP PLAN

This step-up plan uses weather data collected by the Modoc Interagency Command Center (MICC) and the Klamath Falls Interagency Fire Center (KFIFC). The weather data collected by MICC and KFIFC is collected and stored in WIMS. The step-up plan is based on Burning Index values (BI) reported by the two Dispatch Centers.

The analysis used NFDRS fuel models F and G. A cumulative frequency distribution on burning index yields staffing classes. The 97th percentile establishes staffing class 5, the 90th percentile establishes staffing class 4. Staffing classes 2 and 3 are based upon ¼ and ½ of the 90th percentile value, respectively. Staffing class 1 is the remaining days. The BI values used are for both fuel models. The established $90^{th}$ percentile BI is 76 (Indian Wells for G & F and Hoyt for G; 90% for FM F at Hoyt is 46). The established $97^{th}$ percentile BI is 88.

A staffing class 4 or 5 allows the duty officer to authorize fire staffing past normal hours. Following the afternoon fire weather forecast, an assessment of the potential for extended hours is forecasted through the Dispatch center. The Dispatch Centers, MICC and KFIFC, daily announce an actual BI and a predicted BI for the next day. The Dispatch Centers provide the actual BI values at approximately 1430 hours. The predicted BI values are announced at approximately 1630 hours.

If predicted of observed lightning activity level (LAL) is 4,5, or 6, automatically move up to SC-4. Daily tours of duty for regular initial attack personnel may be expanded, particularly when the observed LAL is 3-6, predicted LAL is 4-6 and /or human caused risk is exceptionally high. In these situations, the initial attack crew will consists of a minimum of 3 people, one of which should be qualified as Incident Commander Type 4, and will be held on duty through the burning period.

If a high visitation period is determined to pose exceptional human-caused risk of wildland fire, move to SC-4 (e.g. 3-day holiday weekend, opening days of hunting season).

If 1 HR fuel moisture are sufficiently low (e.g. < 6%), which will allow rapid rates of fire spread or high fire intensity in the presence of wind, step-up may be moved to SC-4. When relative humidity is low (e.g. <20%), step-up may be moved to SC-4.

The Dispatch Center may request that an extention of the tour of duties for mutual aide protection. IA crews may be held on standby in other areas if conditions warrant.

STAFFING CLASS TABLE

| Staffing class | Model F | Actions |
|---|---|---|
| 1 | BI $\leq$ 19 | Preparedness: ensure that an engine is fully equipped with suppression tools. Pump may need to be winterized after usage. Recruit firefighters by February 1 for upcoming fire season. Review cooperative agreements and annual operating plans by June 1. |
| 2 | 20 $\leq$ BI $\leq$ 37 | Preparedness: in addition to actions at level 1, perform weekly drills to assure that pump works to minimum specifications, if prior to May 15 or after October 1. Fire personnel complete annual fitness test. Prepare and issue red cards by June 1. Ensure that all complex fire vehicles for inclusion of serviceable fire suppression tools. Work schedule for fire personnel not altered (i.e. compressed schedule or standard tour of duty). |
| 3 | 38 $\leq$ BI $\leq$ 75 | Preparedness: in addition to actions at level 2, all units will be operational. Between May 15 and October 1, perform daily drills to assure that pump works to minimum specifications. Work schedule for field fire personnel between June 15 and September 30 is 0930-1800. When in Staffing Class 3, raise staffing class to level 4 for national holidays or during red flag warning days |
| 4 | 76 $\leq$ BI $\leq$ 87 | Preparedness: in addition to actions at level 3, request emergency preparedness support from Regional Office for additional staffing. Duty hours extended to 0930-2000 if between Memorial Day and Labor Day weekends. Days off may be canceled. When in Staffing class 4, raise staffing class to level 5 for national holidays or during red flag warning days. Request additional personnel, as needed, to avoid exceeding more than 16 hours on-duty for each 24 hour period. |
| 5 | 88 $\leq$ BI | In addition to actions at level 4. Non-fire staff personnel with red cards may be requested to be available for suppression support. Project Leader may consider closure of refuge roads, terminating construction work and restricting other activities that pose a wildfire risk. |

**APPENDIX G: EQUIPMENT INVENTORY/ NORMAL UNIT STRENGTH**

Normal Unit Strength (NUS) is the amount of non-capitalized fire fighting equipment needed by a refuge to meet 70 percent of suppression needs.

| Item | Year Purchased | percent of Fire Funding | Have | GVW | Need | GVW |
|---|---|---|---|---|---|---|
| Engine Modules<br>Heavy (500-1000 gallon)<br>Medium (200-400 gallon)<br>Light (50 - 150 gallon) | | | | | | |
| Slip-on Unit(s) | | | | | | |
| Water Tender(s) | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Portable Pump(s)<br>Standard<br>Flot-a-pump | | | | | | |
| Power saw(s) | | | | | | |
| Mower(s) | | | | | | |
| Tractor(s) | | | | | | |
| ATV(s) | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Grader(s) | | | | | | |
| Plow Unit/Disk | | | | | | |
| Other (List) | | | | | | |

| Other Equipment Available for Fire Suppression or Prescribed Fire operations<br>Not Fire Funded | Use the table to the left to list capital equipment used for preparedness and initial attack or for prescribed fire activities funded wholly or in part by fire. |
|---|---|
| | In the above table, Indicate the year purchased, if known, and the percent of fire funding (e.g.: The station purchased a tractor. Fire paid 25% and the station secured other funding for the remainder.<br><br>Radios are listed on a separate inventory |
| | |
| | |
| | |
| | |
| | |

U.S. FISH AND WILDLIFE SERVICE

# KLAMATH BASIN NATIONAL WILDLIFE REFUGE COMPLEX

Tulelake, CA

# DISPATCH PLAN

Prepared by: _____ Date:_____

Approved by: _____ Date:_____

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**PREFACE**

Fires occurring on lands under the jurisdiction of the Department of Interior will be classified as wildfires or prescribed fires (620 DM). Wildfire losses will be held to the minimum through timely and effective suppression action consistent with values at risk. Wildfires that threaten life, structures, or are determined to be a threat to natural resources or facilities will be considered emergencies, and their suppression given priority over normal Department programs. No wildfire situation, with the possible exception of a threat to human survival, requires the exposure of firefighters to life-threatening situations. A full range of suppression actions are available for controlling a fire. These range from aggressive, direct, high intensity efforts to indirect or low intensity efforts, such as holding at roads or ridge lines (620 DM).

All wildfires will be suppressed. If a wildfire escapes initial suppression actions, we will determine further actions through a Wildland Fire Situation Analysis (WFSA). Wildfires may not be used to accomplish land use and resource management objectives (620 DM). Prescribed fire are used to accomplish management objectives (620 DM).

**A. Initial Attack.**

It is Departmental and service policy to use only qualified personnel who meet standards established for wildland fire management. Refuge Managers will not dispatch unqualified personnel to wildland or prescribed fire duty.

There may be occasions when unqualified personnel discover a wildland fire. When this occurs, the employee should report the fire and request assistance before taking action to suppress or slow the spread of the fire. If the fire poses an imminent threat to human life, the employee may act accordingly to protect that life before requesting assistance. We will relieve unqualified personnel from direct on-line suppression duty or reassign them to non-fireline duty when qualified initial attack forces arrive.

**B. Extended attack.**

It may occur that fire exceeds the capabilities of available resources or extends beyond the initial burning period. In this event, additional resources will be requested through the District Fire Management Officer and/or the Interagency Coordination Center. Management of the fire may be transitioned to an Incident Management Team (IMT). The Refuge Manager will give the IMT an Incident Briefing and a Limited Delegation of Authority (Appendix H).

**1. Wildland fire situation analysis.**

The WFSA (Appendix M) is a document to aid in determination of the appropriate management response (strategy). Further, it documents actions needed to protect special resources (natural and cultural) and provides for public safety. The Refuge Manager has primary responsibility for development and daily revalidation of the WFSA.

**Klamath Basin National Wildlife Refuge Complex**

# FIRE DISPATCH PLAN

**1.** When report of smoke, or fire, is received get as much information as possible from the caller.

**2.** Check map location and ownership status.

**3**. Maintain a Radio Station Log of all radio and telephone communications, and resource status reports.

**4.** If a fire is not on or threatening the refuge, contact the Project Leader so they are aware of fire activity on adjoining properties.

**5.** If fire is on or threatening the refuge:

**A.** Call the appropriate interagency dispatch center MICC or KFIFC.

**B.** Notify Project Leader of the incident situation.

**C.** Notify Sheriff's Department, and/or adjoining landowners regarding active wildfire suppression actions.

**D.** If fire danger is very high or extreme: It may occur that fire exceeds the capabilities of available resources or extends beyond the initial burning period. In this event, additional resources will be requested through the Interagency Coordination Center. Management of the fire will be transitioned to an Incident Management Team (IMT). The Refuge Manager will give the IMT an Incident Briefing, a Limited Delegation of Authority (Appendix H), and a WFSA (Appendix M).

**6.** Request a weather forecast for the next 24 hours from the appropriate weather forecasting agency. Forecast should include any predicted changes in temperature, humidity, wind direction, wind speed, precipitation, and lightning activity.

**7.** Maintain communications with fire resources.

**8.** Initiate Incident Status Summary (ICS-209) for IC or Project Leader.

**9.** Remain on duty and dispatch further assistance until you completely brief your replacement or are released by the IC.

DISPATCH PLANS BY FIRE MANAGEMENT UNIT

Klamath Falls Interagency Fire Center - State of Oregon

Bear Valley FMU

Bear Valley FMU is part of the KFIFC Hamaker Dispatch Block

Low Dispatch Level (ERC value < 30)
1 engine or case by case basis
Notify FWS Duty Officer

Moderate Dispatch Level (ERC value 30-45), dispatch action:
4 engines (3 ODF, 1 FWS)
1 dozer
1 Duty Officer
Notify FWS Duty Officer, will respond
1 engine move-up/cover

High Dispatch Level (ERC value 45-60), dispatch action:
4 engines (3 ODF, 1 FWS)
1 dozer
1 helicopter
1 Duty Officer
Notify FWS Duty Officer, will repond
2 engines move-up/cover

Extreme Dispatch Level (ERC value > 60), dispatch action:
4 engines (3 ODF, 1 FWS)
1 dozer
1 helicopter
Notify FWS Duty Officer, will respond
6 engines move-up/cover

Klamath Marsh NWR, all FMU's are part of the KFIFC Klamath Marsh Dispatch Block

Low Dispatch Level (ERC values < 30), dispatch action:
1 engine case by case basis
Notify FWS Duty Officer, DO or Resource Advisor will respond

Moderate Dispatch Level (ERC values 30-45), dispatch action:
5 engines (2 FS, 2 ODF, 1 FWS)
1 dozer
Notify FWS Duty Officer, DO or Resource Advisor will respond
4 engines move-up and cover
1 dozer move-up and cover

High Dispatch Level (ERC values 45-60), dispatch action:
8 engines (5 FS, 2 ODF, 1 FWS)
1 dozer
1 helicopter
1 Duty Officer
Notify FWS Duty Officer, DO or Resource Advisor will respond
1 engine move-up and cover
1 dozer move-up and cover

Extreme Dispatch Level (ERC value > 60), dispatch action:
9 engines (5 FS, 3 ODF, 1 FWS)
1 dozer
1 helicopter
Notify FWS Duty Officer, DO or Resource Advisor will respond
1 engine move up and cover
1 dozer move up and cover

Lower Klamath Oregon FMU

Dispatch action on a case by case basis by FWS Duty Officer

Modoc Interagency Command Center - State of California
All dispatch actions are closest forces.

Clear Lake NWR, all FMUs are part of Dispatch Area 60 (NFDRS fuel model K is used)

Low Dispatch Level (BI 0-34), dispatch action:
2 engines
1 Duty Officer

Moderate Dispatch Level (BI 35-60), dispatch action:
6 engines
1 helicopter
1 Duty Officer

High Dispatch Level (BI > 61), dispatch action:
- 8 engines
- 1 helicopter
- 2 airtankers
- 2 dozers
- 1 Duty Officer
- 1 additional overhead

Tulelake FMU is Dispatch Area 71

Low Dispatch Level (BI 0-34), dispatch action:
- 1 engine
- 1 Duty Officer

Moderate Dispatch Level (BI 35-60), dispatch action:
- 2 engines
- 1 Duty Officer

High Dispatch Level (BI > 61), dispatch action:
- 2 engines
- 1 Duty Officer

Sheepy Ridge FMU is part of Dispatch Area 67

Low Dispatch Level (BI 0-34), dispatch action:
- 2 engines
- 1 Duty Officer

Moderate Dispatch Level (BI 35-60), dispatch action:
- 6 engines
- 1 helicopter
- 1 airtanker
- 1 lead plane
- 1 handcrew
- 1 dozer
- 1 Duty Offer
- 1 additional overhead

High Dispatch Level (BI > 60), dispatch action:
- 7 engines
- 1 helicopter
- 1 airtanker
- 1 lead plane
- 1 hand crew

1 dozer
1 water tender
1 Duty Officer
1 additional overhead

Lower Klamath California FMU is Dispatch area 70

Low Dispatch Level (BI 0-34), dispatch action:
1 engine
1 Duty Officer

Moderate Dispatch Level (BI 35-60), dispatch action:
2 engines
1 Duty Officer

High Dispatch Level (BI > 61), dispatch action:
2 engines
1 Duty Officer

# REPORT OF FIRE LOG

**DATE: _____ TIME: _____**

**WE WILL SEND A CREW AS SOON AS POSSIBLE. MAY I ASK YOU FOR MORE INFORMATION?**

**1. WHAT IS THE LOCATION OF THE SMOKE OR FIRE? _____**
**_____**

**2. ARE LIVES OR PROPERTY THREATENED? YES_____ NO_____**

**3. WHAT IS BURNING? TIMBER_____ GRASS_____ BRUSH_____**
**OTHER_____**

**4. WHAT IS THE COLOR OF THE SMOKE? _____**

**5. HOW WAS THE FIRE ACTING WHEN YOU SAW IT? _____**
**_____**

**6. DO YOU KNOW THE SIZE OF THE FIRE? _____**

**7. DO YOU KNOW OF AN ACCESS ROUTE TO THE FIRE? _____**
**_____**

**8. CAN YOU OR ANYONE ELSE DIRECT A CREW TO THE FIRE?**
**_____**

**9. IS THERE SOMEONE FIGHTING THE FIRE? YES_____ NO_____**
**IF YES, WHO? _____**

**10. DID YOU SEE ANYONE IN THE VICINITY, OR VEHICLES LEAVING THE AREA?_____**

**11. WHAT IS YOUR NAME? _____**

**12. WHAT IS YOUR PHONE NUMBER? _____**

**13. WHAT IS YOUR ADDRESS? _____**

**14. ACTION TAKEN: _____**

**_____**

**Klamath National Wildlife Refuge Complex**

# MEDICAL DISPATCH PLAN

**1.** Keep calm, think clearly, act decisively.

**2.** When a report of accident or injury is received, get as much information as possible and complete a Report of Accident, Incident, or Injury Log.

**3.** Dispatch trained staff, with shortest response time, to administer first aid to the extent of their skill/training and to assist rescuers as needed.

**4.** Maintain a Radio Station Log of all radio and telephone communications, and resource status reports.

**5. Call "911"** and request ambulance and medical assistance. Provide "911" dispatcher with needed information (Report of Accident, Incident, or Injury Log and Radio Station Log should be helpful).

**6. If the victim's injury(s) includes severe burns, contact closest burn center**
**(Oregon - Oregon Burn Center in Portland (530) 413-4232. California - U.C. Davis Regional Burn Center in Sacramento (916) 734-3636).**

**7.** Refuge staff will relinquish responsibility to higher qualified medical personnel as they arrive.

**8.** Provide responding medical personnel with needed information, and status of resources ordered and en route. Additional medical services may be ordered, or services may be released, as deemed necessary.

**9.** Maintain communications with resources.

**10.** Initiate CA-1, CA-16, and DI-134 with available information.

**11.** If **burns** resulted from **wildland fire**, initiate Wildland Fire Entrapment/Fatality Initial Report for completion by Incident Commander (IC) or Project Leader.

**12.** Remain on duty and dispatch further assistance until released by the IC or Project Leader.

## REPORT OF ACCIDENT, INCIDENT, OR INJURY LOG

**Record as much initial information as possible:**

**Name: _____**

**Location:_____**

**Access to victim:_____**

**_____**

**_____**

**Status of victim/type of injuries:_____**

**_____**

**Part(s) of body effected:_____**

**What has been done, contacted, etc.:_____**

**_____**

**Equipment involved? _____**

**Cause of incident:_____**

**_____**

**Witness(s): _____**

**Person receiving call:_____**

**Station:_____ Date:_____**
**Time:_____**

*After completing this page, return to the Radio Station Log and record all dispatch actions.*

# PERSONNEL DIRECTORY
## Klamath Basin National Wildlife Refuge Complex

**ADDRESS: 4009 Hill Road**
**Tulelake, CA 96134**
**PHONE: (530) 667-2231**
**FAX: (530) 667-3299**

| NAME/TITLE | OFFICE PHONE | HOME PHONE |
|---|---|---|
| **Phil Norton**<br>***Project Leader*** | **530-667-2231** | **541-273-2918**<br>**541-891-5980(C)** |
| **Fran Maiss**<br>***Deputy Project Leader*** | **530-667-2231** | **541-883-8992** |
| **Walter Ford**<br>***Refuge Mgr***<br>***(Klamath Marsh*)** | **541-783-3380** | **541-783-7768** |
| **Jim Hainline**<br>***Biologist*** | **530-667-2231** | **541-883-3282** |
| **Dave Mauser**<br>***Biologist*** | **530-667-2231** | **541-884-5011** |
| **Mike Johnson**<br>***Refuge Operations Spec.*** | **530-667-2231** | **541-273-7403** |
| **Sam Johnson**<br>***IPM Spec./Lease Lands*** | **530-667-2231** | **530-667-4030** |
| **Dave Menke**<br>***Info/Law Enforcement*** | **530-667-2231** | **541-882-5473** |
| **Bob Bollenbaugh** | **530-667-2231** | **541-885-7153** |

*Law Enforcement*

| | | |
|---|---|---|
| **Larry Bigoni** | **530-667-2231** | **541-723-5271** |
| ***Maint Crew Leader*** | | |
| **Mark Willard** | **541-783-3380** | **541-783-2370** |
| ***Equip Oper*** | **541-891-5850(C)** | |
| ***(Klamath Marsh)*** | | |

## WILDLAND FIRE DIRECTORY
### KLAMATH BASIN NATIONAL WILDLIFE REFUGE COMPLEX

**ADDRESS: 4009 Hill Road**
**Tulelake, CA 96134**
**FAX: (530) 667-4159**

| NAME/TITLE | OFFICE PHONE | HOME PHONE |
|---|---|---|
| **Mike Glass** | **530-667-4168** | **541-883-7418** |
| ***FMO*** | **541-891-3790(C)** | |
| **Dave Sinclear** | **530-667-2309** | **541-884-5739** |
| ***AFMO*** | **541-891-5435(C)** | |
| **Dave Goheen** | **530-667-2473** | **541-850-8002** |
| ***PFS*** | **541-891-5129(C)** | |
| **Greg Zoppetti** | **530-667-4820** | **541-883-7106** |
| ***ECS*** | **541-891-3791(C)** | |
| **John Wood** | | |
| ***RX Module Leader*** | | |
| **Troy Portnoff** | **530-667-4820** | **530-667-4744** |
| ***Eng Capt - 81*** | | |
| **Greg Hagedorn** | **530-667-4820** | **541-851-0407** |
| ***Eng Oper*** | | |

**(C) - Cellular Phone**

**KLAMATH BASIN NATIONAL WILDLIFE REFUGE COMPLEX**
**U.S FISH & WILDLIFE SERVICE**
**WILDLAND AND PRESCRIBED FIRE QUALIFICATIONS**
**2001**

4/30/2001

**MICHAEL GLASS** **Fire Management Officer**

| | | |
|---|---|---|
| QUALIFIED | Incident Commander Type 3 | ICT3 |
| | Incident Commander Type 4 | ICT4 |
| | Operations Section Chief Type 2 | OSC2 |
| | Division/Group Supervisor | DIVS |
| | Strike Team Leader Crews | STCR |
| | Task Force Leader | TFLD |
| | Prescribed Fire Burn Boss Type 1 | RXB1 |
| | Ignition Specialist Type 2 | RXI2 |
| TRAINEE JOBS | Incident Commander Type 2 | ICT2 |

**DAVE SINCLEAR** **Assistant Fire Management Officer**

| | | |
|---|---|---|
| QUALIFIED | Incident Commander Type 2 | ICT2 |
| | Incident Commander Type 3 | ICT3 |
| | Incident Commander Type 4 | ICT4 |
| | Division/Group Supervisor | DIVS |
| | Strike Team Leader Crews | STCR |
| | Task Force Leader | TFLD |
| | Planning Section Chief Type 2 | PSC2 |
| | Situations Unit Leader | SITL |
| | Field Observer | FOBS |
| | Human Resource Specialist | HRSP |
| | Fire Investigator | FINV |
| | Security Specialist Type 2 | SEC2 |
| | Prescribed Fire Manager Type 2 | RXM2 |

| | | |
|---|---|---|
| | Prescribed Fire Burn Boss Type 2 | RXB2 |
| TRAINEE JOBS | Safety Officer Type 2 | SOF2 |
| | Prescribed Fire Burn Boss Type 1 | RXB1 |

**DAVE GOHEEN** **Prescribed Fire Specialist**

| | | |
|---|---|---|
| QUALIFIED | Incident Commander Type 3 | ICT3 |
| | Incident Commander Type 4 | ICT4 |
| | Division/ Group Supervisor | DIVS |
| | Strike Team Leader Crews | STCR |
| | Strike Team Leader Engines | STEN |
| | Task Force Leader | TFLD |
| | Engine Boss | ENGB |
| | Faller Class B | FALB |
| | Prescribed Fire Manager Type 2 | RXM2 |
| | Prescribed Fire Burn Boss Type 2 | RXB2 |
| TRAINEE JOBS | Prescribed Fire Burn Boss Type 1 | RXB1 |
| | Field Observer | FOBS |
| | Fire Investigator | FINV |
| | Situation Unit Leader | SITL |

**GREGORY ZOPPETTI** **Fire Suppression Supervisor**

| | | |
|---|---|---|
| QUALIFIED | Incident Commander Type 4 | ICT4 |
| | Strike Team Leader Engines | STEN |
| | Engine Boss | ENGB |
| | Crew Boss (Single Resource) | CRWB |
| | Faller Class B | FALB |
| | Firing Boss ( Single Resource ) | FIRB |
| | Helicopter Manager | HEMG |
| | Helispot Manager | HESM |
| | Plastic Sphere Dispenser Operator | PLDO |
| | Prescribed Fire Burn Boss Type 2 | RXB2 |
| | Ignition Specialist Type 2 | RXI2 |
| TRAINEE JOBS | Division/Group Supervisor | DIVS |
| | Field Observer | FOBS |
| | Incident Commander Type 3 | ICT3 |
| | Task Force Leader | TFLD |

**JOHN WOOD** **Prescribed Fire Crew Supervisor**

| | | |
|---|---|---|
| QUALIFIED | Incident Commander Type 4 | ICT4 |
| | Engine Boss | ENGB |
| | Helicopter Crewmember | HECM |
| TRAINEE JOBS | Firing Boss (Single Resource) | FIRB |
| | Strike Team Leader Engine | STEN |
| | Task Force Leader | TFLD |

**MARK CARLSON** **Refuge Operations - Irrigator**

| | | |
|---|---|---|
| QUALIFIED | Incident Commander Type 4 | ICT4 |
| | Engine Boss | ENGB |
| | Faller Class B | FALB |
| | Firing Boss ( Single Resource ) | FIRB |
| | Helicopter Crewmember | HECM |
| | Firefighter Type 1 | FFT1 |
| | Plastic Sphere Dispenser Operator | PLDO |
| | Ignition Specialist Type 2 | RXI2 |
| | Prescribed Burn Boss Type 3 | RXB3 |
| TRAINEE JOBS | Prescribed Burn Boss Type 2 | RXB2 |
| | Strike Team Leader | STEN |
| | Crew Boss (Single Resource) | CRWB |

TROY PORTNOFF Fire Engine Supervisor

| | | |
|---|---|---|
| QUALIFIED | Incident Commander Type 4 | ICT4 |
| | Engine Boss | ENGB |
| | Faller Class B | FALB |
| | Plastic Sphere Dispenser | PLDO |
| | Ignition Specialist Type 2 | RXI2 |
| | Firefighter Type 1 | FFT1 |
| | Helicopter Crew Member | HECM |
| TRAINEE JOBS | Prescribed Burn Boss Type 2 | RXB2 |
| | Helicopter Manager | HEMG |
| | Crew Boss | CRWB |

**GREG HAGEDORN** **Fire Engine Operator**

| | | |
|---|---|---|
| QUALIFIED | Incident Commander Type 4 | ICT4 |
| | Engine Boss | ENGB |
| | Faller Class B | FALB |
| | Ignition Specialist Type 2 | RXI2 |
| | Prescribed Burn Boss Type 3 | RXB3 |
| | Firefighter Type 1 | FFT1 |
| TRAINEE JOBS | Prescribed Burn Boss Type 2 | RXB2 |
| | Helitack Crew Member | HECM |

**WALTER FORD** **Refuge Manager - Klamath Marsh NWR**

| | | |
|---|---|---|
| QUALIFIED | Engine Boss | ENGB |
| | Firefighter Type 1 | FFT1 |
| TRAINEE JOBS | Crew Boss (Single Resource) | CRWB |
| | Firing Boss | FIRB |
| | Prescribe Fire Burn Boss Type 3 | RXB3 |
| | Helicopter Crewmember | HECM |

**MARK WILLARD** **Refuge Operations - Equipment Operator**

| | | |
|---|---|---|
| QUALIFIED | Firefighter Type 1 | FFT1 |
| | Tractor/Plow Operator | |

**CARL MILLEGAN** **Refuge Operations Specialist**

| | | |
|---|---|---|
| QUALIFIED | Firefighter Type 2 | FFT2 |

**RAY McCLENATHAN** **Computer Systems Manager**
**Klamath Falls Office**

| | | |
|---|---|---|
| QUALIFIED | Computer Technical Specialist | CTSP |
| | Status Check-in Recorder | SCKN |
| | Computer/Hardware | CMHW |
| | GIS Specialist | GISP |

**DOUG LAYE** **Wildlife Biologist - Endangered Species**

**Division**
**Klamath Falls Office**

| | | |
|---|---|---|
| QUALIFIED | Firefighter Type 2 | FFT2 |

**ROSS WISE** **Firefighter**

| | | |
|---|---|---|
| QUALIFIED | Firefighter 2 | FFT2 |
| | Faller Class A | FALA |

**JESSE IRWIN** **Firefighter**

| | | |
|---|---|---|
| QUALIFIED | Firefighter 2 | FFT2 |

## EQUIPMENT

**FIRE ENGINES:**

| ENGINE # | TYPE | DESCRIPTION |
|---|---|---|
| **81** | **III** | **1999 FREIGHTLINER FL-60, 700 GAL.** |
| **82** | **VI** | **1997 DODGE 3500, 250 GAL.** |
| **84** | **VI** | **1993 FORD F-350, 250 GAL.** |

**SUPPORT VEHICLES & EQUIPMENT**

| VEHICLE # | PURPOSE | DESCRIPTION |
|---|---|---|
| **I257686** | **FMO Vehicle** | **1996 Jeep Cherokee** |
| **I265479** | **AFMO Vehicle** | **1999 Dodge 2500 PU** |
| **I265571** | **PFS Vehicle** | **1999 Dodge Durango** |
| **I265564** | **ECS Vehicle** | **1999 Dodge 2500 PU** |
| **?** | **RX Crew Vehicle** | **2001 Ford F-450 PU** |
| **I260901** | **Trailer for ATV's** | **Frontier Trailer** |
| | **ATV's (4)** | **Honda Fourtrax 300 (4)** |
| | **ATV** | **Polaris 500** |

## WEATHER:

Zone 5 (Modoc/Siskiyou County - California):

Redding Interagency Fire Weather Forecast & Warning Unit
6101 Airport Road
Redding, CA 96002
http://www.fs.fed.us/r5/fire/north/fwx/index.shtml
530-226-2743 (phone)
530-226-2808 (fax)

Zone 624 (Klamath County - Oregon):

National Weather Service, Medford, OR Office
4003 Cirrus Drive
Medford, OR 97504
http://www.wrh.noaa.gov/medford/
541-773-1067

**COOPERATORS:**

***Modoc National Forest:***
Elizabeth Cavasso, FMO.....530-233-8881
Modoc Interagency Command Center.....530-233-4581

***Winema National Forest:***
Doug Bright, FMO.....541-883-6792
Klamath Falls Interagency Dispatch Center.....541-883-6850

***Oregon Department of Forestry (Klamath):***
Business.....541-883-5681

***California Department of Forestry (Siskiyou):***
Business.....530-842-3515
530-842-3516

***Lava Beds National Mounment:***
Al Augustine, FMO.....530-667-2282 ext 238

**FIRE DEPARTMENTS:**

***All Fire Emergencies.....”911"***

***Tulelake Fire Department:***
Tulelake Fire Hall.....530-667-2997

***Keno Rural Fire Protection District:***
Business.....541-883-3062

***Klamath County Fire District No. 1:***
Business.....541-885-2056

***Klamath County Fire District No. 4:***
Business.....541-884-1670

***Chiloquin Agency Lake Fire District:***
Business.....541-783-2470

***Chemult Volunteer Fire Department:***
Business.....541-365-2255

**LAW ENFORCEMENT:**

***All Law Enforcement Emergencies.....”911"***

***Siskiyou County Sheriff Department:***
Emergency .....”911"
Dispatch (24 hours).....530-841-2900
Business (Yreka).....530-842-8300
Business (Tulelake).....530-667-5284

***Modoc County Sheriff Department:***
Emergency.....”911"
Office.....530-233-4416

***Klamath County Sheriff Department:***

Emergency.....”911"
Business.....541-883-5130

***California Highway Patrol:***
Business (Yreka).....530-841-6006

***Oregon State Police:***
Dispatch (Klamath Falls).....541-883-5711
Business (Klamath Falls).....541-883-5713

**MEDICAL:**

**Ambulance Services**

***All Medical Emergencies.....”911"***

***Basin Ambulance (Malin):***
Business.....541-798-5175

***Butte Valley Ambulance (Dorris):***
Business.....530-397-2105

***Keno Rural Fire Protection District***:
Business.....541-883-3062

***Klamath County Fire District No. 1:***
Business.....541-885-2056

***Klamath County Fire District No. 4:***
Business.....541-884-1670
***Chiloquin Agency Lake Fire District:***
Business.....541-783-2470

***Chemult Volunteer Fire Department:***
Business.....541-365-2255

## Hospitals

***Merle West Medical Center:***
2865 Daggett Ave. (Klamath Falls)
24-hour emergency.....541-883-6176
Main number.....541-883-6311

***Klamath Walk In Care Center:***
2655 Shasta Way Suite 7 (Klamath Falls).....541-882-2118

***Rogue Valley Medical Center:***
2825 Barnett Road (Medford).....541-608-4900

***Providence Medford Medical Center:***
1111 Crater Lake Ave (Medford).....541-732-5000

***Redding Medical Center:***
1100 Butte Street (Redding).....530-244-5400

***Oregon Burn Center:***
Legacy Emanuel Hospital & Health Center
2801 N. Gantenbein Ave (Portland).....503-413-4232
Toll Free.....888-598-4232

***U.C. Davis Regional Burn Center:***
U.C. Davis Medical Center
2315 Stockton Blvd (Sacramento).....916-734-3636

## COORDINATION CENTERS

***Modoc Interagency Command Center:***
Day.....530-233-4581
Night.....530-233-4416
Fax.....530-233-8889
Christi Forero (Center Manager).....530-233-8882

Joan Chandler (Disatcher).....530-233-8883
Steve Causemaker (Dispatcher).....530-233-8884

***Klamath Falls Interagency Fire Center:***
Day.....541-883-6850
Night..... 541-884-0516
Fax.....541-883-6860
Bill Hofstrand (Forest Dispatcher/Coordinator).....541-883-6850
Randall Baley (ODF Dispatcher/Coordinator).....541-883-5693
Kristi Culter (Asst. Forest Dispatcher).....541-883-6851
Darren Yazzie (Asst. Forest Dispatcher).....541-883-6852
Terry Bell (ODF Dispatcher).....541-883-5694
Dale Alter (Airtanker Base Manager)..... 541-883-6853

***Region 1 FWS Fire Management Coordinator:***
RFMC, Pam Ensley
Office.....503-231-6174
Fax.....503-231-2364
Home.....360-835-7004

RFMO, Andy Anderson
Office.....503-231-6175
Fax.....503-231-2364
Home.....360-666-5031

RPFS, Roddy Baumann
Office.....503-231-2075
Fax.....503-231-2364
Home.....360-573-9444

## RADIO FREQUENCIES

| Station | RX | TX | Tone |
|---|---|---|---|
| KBNWR Direct | 172.650 | 172.650 | — |
| KBNWR Hamaker Repeater | 172.650 | 171.650 | 131.8 |

| | | | |
|---|---|---|---|
| Modoc Natl Forest Direct | 168.750 | 168.750 | 11<br>0.9 |
| Winema Natl Forest Direct | 169.925 | 169.925 | 103.5 |
| Lava Beds Natl Monument | 171.750 | 172.450 | — |
| ODF Direct | 151.205 | 151.205 | 131.8 |
| NIFC Tactical Net I | 168.050 | 168.050 | — |
| NIFC Tactical Net II | 168.200 | 168.200 | — |
| NIFC Tactical Net III | 168.600 | 168.600 | — |

## APPENDIX I: DELEGATION OF AUTHORITY

## APPENDIX J: AIR OPERATIONS PLAN

Figure 14: Hoyt Raws Average Years BI Curve Fuel Model F

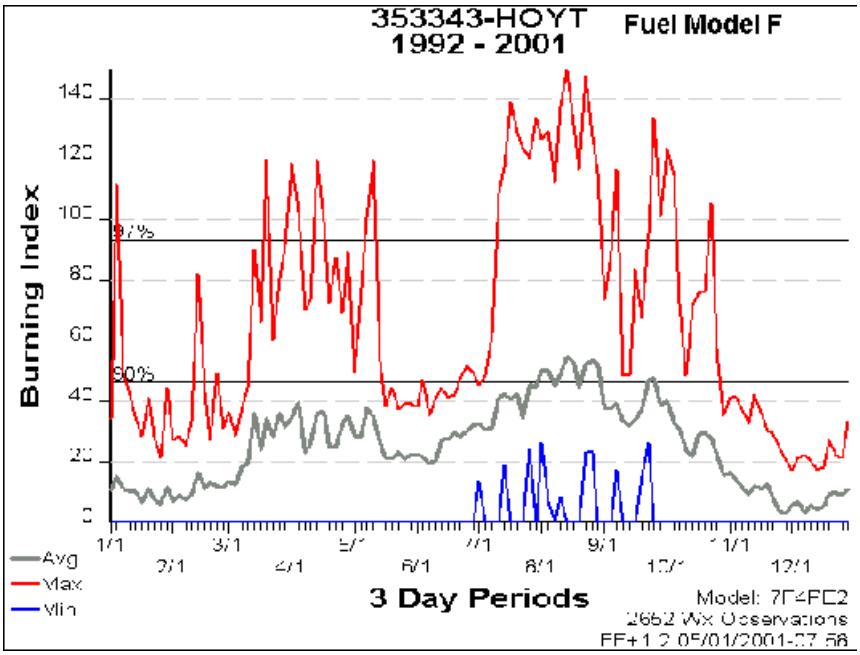



Figure 15: Hoyt Raws BI Percentile Curve Fuel Model F

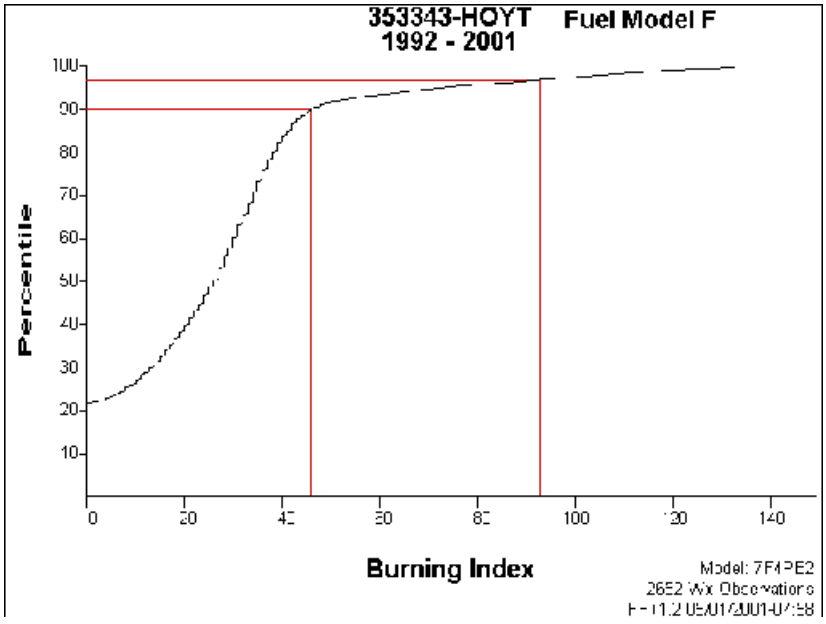



Figure 16: Hoyt Raws Average Years BI Curve Fuel Model G

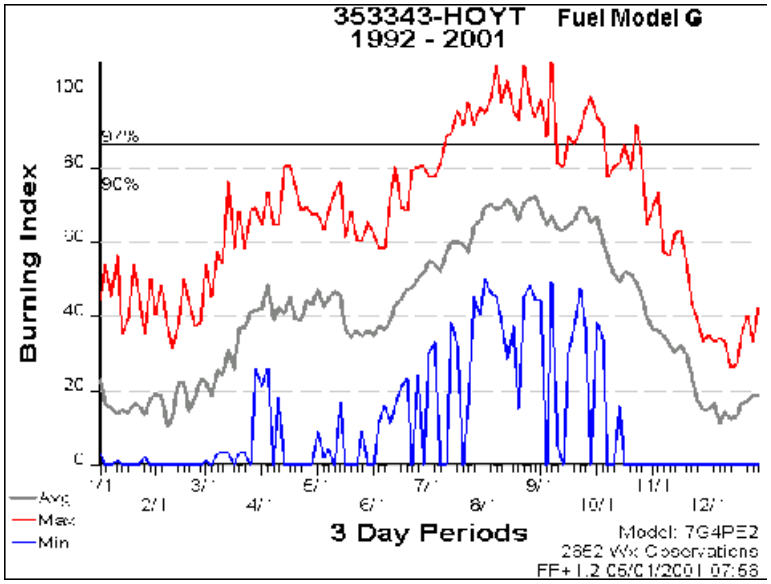



Figure 17: Hoyt Raws BI Percentile Curve Fuel Model G

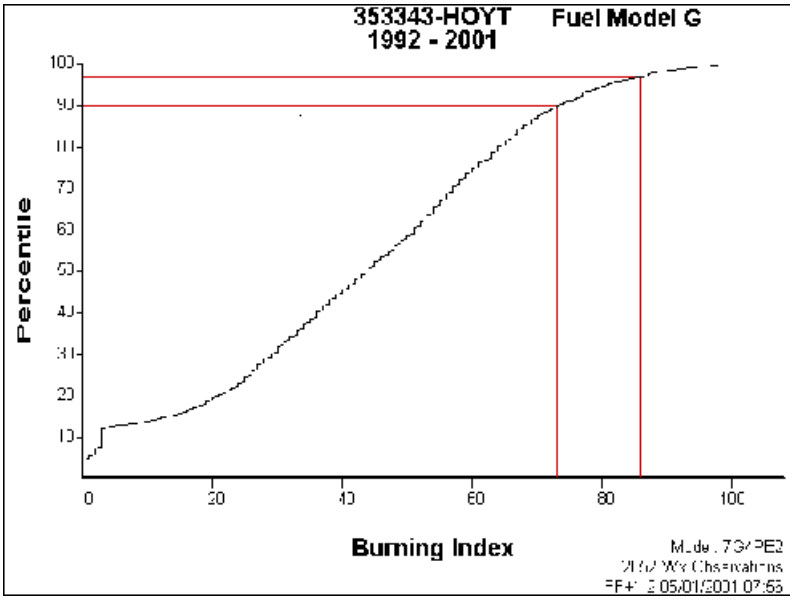


Figure 18: Indian Wells Raws Average Years BI Curve Fuel Model F

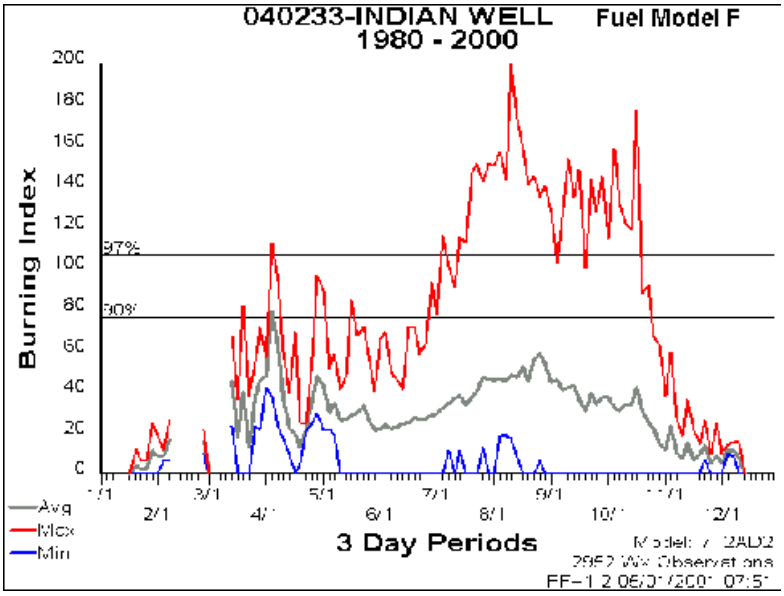



Figure 19: Indian Wells Raws BI Percentile Curve Fuel Model F

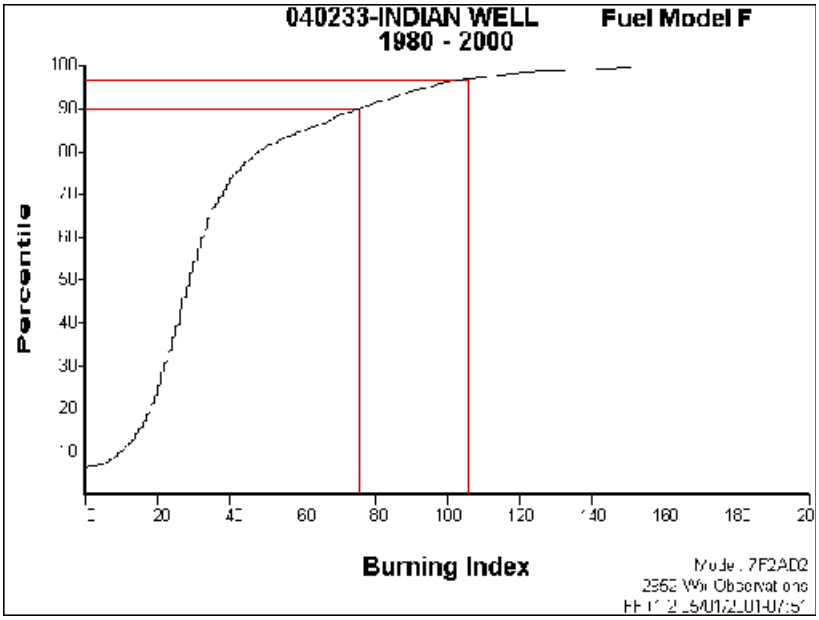


Figure 20: Indian Wells Raws Average Years BI Curve Fuel Model G

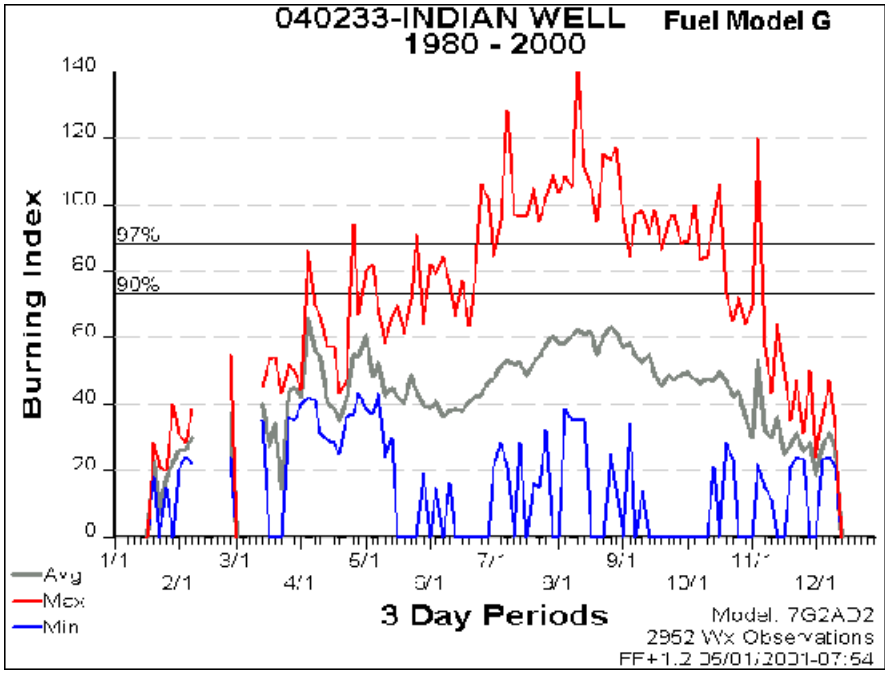
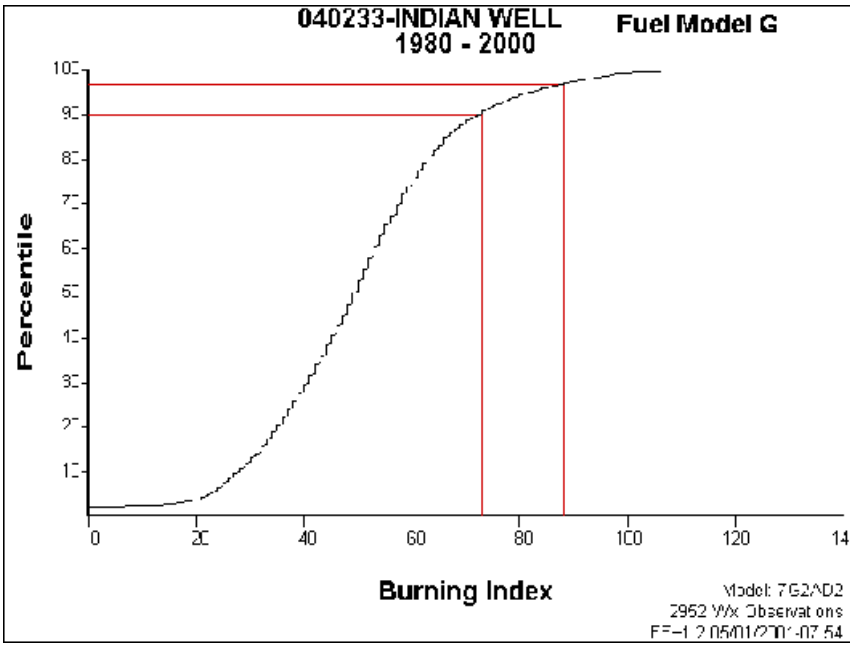



Figure 21: Indian Wells Raws BI Percentile Curve Fuel Model G



## APPENDIX L: TABLES

Table 1: Klamath Basin NWR Complex Structures by Refuge

| Refuge | Facilities and Structures |
|---|---|
| Tulelake NWR | 1 - Office/Visitor Center<br>1 - Modular Office<br>1 - Apartment Complex<br>1 - Residence<br>1 - Fire Office/Shop<br>3 - Storage/Parking Garage Structures<br>1 - Visitor Kiosk<br>1 - Gasoline/Diesel Fueling Area<br>1 - Water Pump Station<br>1 - Historic Complex Consisting of 5 Buildings |
| Lower Klamath NWR | 1 - Auto Shop/Office Complex<br>1 - Vehicle Storage<br>1 - Shop<br>1 - Duck Hospital/Incinerator Site<br>1 - Gasoline/Diesel Fueling Area<br>1 - Hazardous Materials Storage Building<br>1 - FTS Weather Station<br>1 - Visitor Kiosk |
| Clear Lake NWR | No Structures |
| Bear Valley NWR | No Structures |
| Upper Klamath NWR | No Structures |
| Klamath Marsh NWR | 1 - Modular Office/Visitor Center<br>2 - Residences<br>1 - Barracks Complex<br>2 - Shops/Vehicle Storage Buildings<br>1 - Gasoline/Diesel Fueling Area<br>2 - Visitor Kiosks<br>1 - FTS Weather Station |

Table 2: NFFL Fuel Models by Fire Management Unit

| Refuge | Fire Management Unit | NFFL Fuel Model |
|---|---|---|
| Lower Klamath NWR | Lower Klamath California | 1&3 |
| Lower Klamath NWR | Lower Klamath Oregon | 1 |
| Tulelake NWR | Tulelake | 1&3 |
| Tulelake NWR | Peninsula | 1 |
| Tulelake NWR | Sheepy Ridge | 1 |
| Clear Lake NWR | Clear Lake West | 1 |
| Clear Lake NWR | Clear Lake East | 1 |
| Bear Valley NWR | Bear Valley | 2,6,8,9,10, & 11 |
| Upper Klamath NWR | Uplands | 3 |
| Upper Klamath NWR | Recreation Creek | 3 |
| Upper Klamath NWR | Thomason Creek | 3 |
| Upper Klamath NWR | Pelican Bay | 3 |
| Upper Klamath NWR | Hanks Marsh | 3 |
| Klamath Marsh NWR | Wocus Bay | 3,4,8,10, & 11 |
| Klamath Marsh NWR | Military Crossing | 2,3,4,8,10, & 11 |
| Klamath Marsh NWR | North Marsh | 2,3,4,8,10, & 11 |

## APPENDIX M: BIOLOGICAL EVALUATION

### INTRA-SERVICE SECTION 7 BIOLOGICAL EVALUATION

**Prescribed and Wildfire Suppression on the Klamath Basin National Wildlife Refuge Complex**
(Lower Klamath, Tule Lake, Bear Valley, and Klamath Marsh NWRs)

Originating Person(s): Dave Mauser, Dave Sinclear

Telephone Number: (530) 667-2231
Date: August 23, 2001

**I. Region:** Region 1, Klamath/Northcoast Ecoregion

**II. Service Activity** (Program): Refuges and Wildlife

**III. Pertinent Species and Habitat:**

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

Tule Lake NWR
Shortnose and Lost River Sucker
Bald eagle
Lower Klamath NWR
Bald eagle
Klamath Marsh NWR
Bald eagle
Bear Valley
Bald eagle
Upper Klamath NWR
Lost River and shortnose sucker
Bald eagle
Clear Lake NWR
Lost River and shortnose sucker
Bald eagle

**B. Proposed species and/or proposed critical habitat within the action area:**

Tule Lake NWR, Clear Lake, and Upper Klamath NWR are within proposed critical habitat for the shortnose and Lost River sucker. Proposed or designated critical habitat for the bald eagle does not exist.

**C. Candidate species within the action area:**

The Oregon spotted frog exists on Klamath Marsh NWR and may exist on Upper Klamath NWR

**IV. Geographic area or station name and action:**

This evaluation represents an assessment of potential effects to listed and candidate

species from implementation of the Fire Management Plan for the Klamath Basin National Wildlife Refuge Complex. Refuges include Tule Lake, Lower Klamath, Bear Valley, Klamath Marsh, Upper Klamath, and Clear Lake NWRs.

**V. Location:**

**A. Ecoregion Name:** Klamath/Northcoast Ecoregion

**B. County and State:** These 6 refuges of the Klamath Basin NWR Complex are located in Modoc and Siskiyou Counties of California and Klamath County of Oregon.

**C. Section, Township, and range:**

**D. Distance (miles) and direction to nearest town:**

Klamath Falls, Oregon is centrally located within the Complex. Other communities nearby include include Malin, Merril, Worden, and Chiloquin, Oregon and Tulelake and Dorris, California.

**E. Species/habitat occurrence:**

Shortnose and Lost River Sucker (Endangered)

"The Lost river sucker (*Deltistes luxatus*) and shortnose sucker (*Chasmistes brevirostris*) are large, long-lived suckers endemic to the upper Klamath Basin of Oregon and California. Both were originally described by Cope (1879) and both have gone through considerable taxonomic revision. The limited distribution of both sucker species, combined with the level of agricultural development and associated water and land use threats within the drainage, make these fishes susceptible to past and present habitat loss and degradation throughout their distribution. Both Lost River and shortnose suckers were federally listed as endangered species on July 18, 1988 (Federal Register 53:27130-27134)" (U.S. Fish and Wildlife Service 1993).

Additional details on the life history, habitat requirements, and causes of decline of the species can be found in the Lost River and Shortnose Sucker Recovery Plan (U.S. Fish and Wildlife Service 1993) as well as the Biological Opinion dated April 6, 2001 governing Klamath Project Operations.

Although water bodies within the Klamath Basin were historically eutrophic, agricultural development in the Klamath Basin has accelerated the eutrophication process until many water bodies within the Klamath Project are now considered hypereutrophic (Dileanis et al 1996). Water quality in Tule Lake suffers similar water quality problems as other water bodies within the Upper Klamath Basin (low DO, high pH, and high levels of unionized ammonia) and is directly impacted by hypereutrophic water quality conditions in Upper Klamath Lake (U.S. Fish and Wildlife Service 1993). Upper Klamath Lake is the primary source of water for Tule Lake. Dileanis et al. (1996) concluded that

extensive hydologic modifications of the Klamath Basin has degraded aquatic habitats and associated biological communities. Specifically, these authors determined that fish and aquatic invertebrate species assemblages retained little of their historic ecological structure and are now represented primarily by pollution tolerant species.

Given the size of historic Tule Lake and its associated wetlands, it is likely that a large population of both sucker species resided in the lake (U.S. Fish and Wildlife Service 1995). Coots (1965) in interviews with long-time residents of the area documented that set lines and snagging gear were used in approximately 1919 to take rainbow trout and "large"suckers at the mouth of the Lost River. Moyle (1976) believed both species of suckers were extirpated from the lake after 1924. Despite this belief, low numbers of suckers may have continued to survive in the lake. Although, surveys by Koch and Contreras (1973) failed to document either suckers species in Tule Lake, a single "28 inch mullet sucker" was found along the eastern shoreline of Sump 1(A) in May of 1964 (Klamath Basin NWR Narrative Report 1964). In May of 1991 suckers were observed spawning below Anderson-Rose Dam (U.S. Fish and Wildlife Service 1993). Presumably these fish originated in Tule Lake. Given the low numbers of suckers in the sumps and their localized distribution, it is not surprising that reports of individuals is sporadic at best. The decline in both sucker species in Tule Lake from the historic past is likely due to degraded water quality conditions, a lack of suitable depth, and limited spawning habitat in the Lost River.

Research conducted after publication of the Shortnose and Lost River Sucker Recovery Plan indicates that Tule Lake contains an estimated 159 (95% CI = 48-289) shortnose and 105 (95% CI = 25-175) Lost River suckers (Scoppetone and Buettner 1995). Confidence intervals for these estimates are large because of small sample sizes and low rates of recapture. Recruitment rates for the Tule Lake population via spawning below Anderson-Rose Dam appears to be extremely low with significant larval production occurring only in 1995 (monitoring occurred 1991-99) (M. Buettner, USBR, pers. comm). Entrainment from the irrigation system is likely the largest source of fish for Tule Lake (U.S. Bureau of Reclamation 1998).

Both species of suckers in Tule lake are in good physical condition relative to fish in Clear Lake and Upper Klamath Lake with Tule Lake fish being generally heavier and exhibiting few if any problems with parasites or lamprey. (Scoppetone and Buettner 1995). Shortnose suckers consume primarily zooplankton (cladocerans) while Lost River sucker's primary food items are chironomids (Scoppetone and Buettner 1995).

In 1993, 6 Lost River and 5 shortnose suckers were radio-marked in the English Channel between Sumps 1(A) and 1(B) and were monitored for 18 months. In May through early October, fish resided near the south end of Sump 1(A) in a relatively deep water near a small area of emergent vegetation (termed the "donut hole"). In late October through March, radio marked fish moved to the NW portion of Sump 1(A) and by April, fish had moved back to the English Channel. Additional monitoring of radio-marked suckers by Service and Reclamation biologists 1n 1999 and 2000 has confirmed this same general pattern of movements within Sump 1(A) during the year (Hicks et al. 2000). Additional water quality data collected by Hicks et al. (2000) indicates that summer water quality conditions in the "Donut Hole" is likely crucial to the year long survival of both sucker species in Tule Lake.

Sucker use of the sumps is restricted to areas greater than 3 feet in depth (M. Buettner, Klamath Reclamation Project, pers. comm.). Areas of suitable depth occur in both Sumps however, based on bathymetric surveys conducted by Reclamation in 1958, sedimentation has been steadily reducing the depths in both sumps. Although suckers are restricted to these depth, use within these areas is fairly restricted as evidenced by movements of radio-marked suckers (Hicks et al. 2000).

Juvenile suckers- Klamath tui chub (Gila coerulea) and blue chub (G. bicolor) dominate the fish assemblage on Tule Lake and are believed to compete with both species of juvenile sucker. To date, no studies of the ecology of juvenile suckers in Tule Lake has been performed, although it is believed that populations are extremely low. E. Snyder - Conn (USFWS, pers. comm) in collections of native fishes from Tule lake caught only one juvenile sucker while capturing many thousands of tui and blue chub. On June 16, 1999, 635 fish were captured at 3 deep water (>3 ft) sites in Sump 1(B) using trap nets; 449 tui chub, 164, blue chub, 16 fathead minnows, and 6 Sacramento perch. No suckers of either species were captured (U.S. Bureau of Reclamation, unpubl. data). Competition with tui and blue chubs may be one reason for the low population of suckers. Juvenile fish may reach the sumps via the irrigation system as evidenced by the fact that Reclamation routinely captures juvenile suckers in the "J" Canal system north of the refuge during fall sucker salvage operations (M. Buettner, Klamath Reclamation Project, pers. comm.).

Juvenile suckers were found by Buettner and Scoppettone (1990) to prefer dissolved oxygen levels of 4.5 to 12.9 mg/l. During July and August of 1992, Reclamation measured water quality in the "donut hole" in the south central area of Sump 1(A) as well as a deep area (>3 feet) in Sump 1(B). "Donut hole" DO levels never fell below 5 mg/l while the sampled area in Sump 1(B) experienced DO levels below 5 mg/l 8 of 21 days (38%) in which data were collected. Although this data is somewhat limited it may indicate that DO levels may limit habitability of Sump 1(B) for juvenile suckers during the summer months.

Response by larvae and juveniles to pH is variable. Buettner and Scoppettone (1990) found juvenile fish largely at sites with pH < 9.0, as did Simon et al. (1996) in 1994. However, in 1995, Simon et al. (1996) found that most juvenile fish (54%) were captured in areas of higher pH (>10.0). Laboratory studies indicate significant mortality of larval and juvenile fish at high pH values (>9.55) ( Falter and Cech 1991) and 9.92-10.46 (Bellerud and Saiki 1995).
In addition to Tule Lake and Upper Klamath Lake, both species of sucker also reside in Clear Lake with shortnose suckers being the predominant species. Unlike Upper Klamath Lake, Clear Lake populations are comprised of a more diverse age class of fish.

Bald Eagle (Threatened)

The bald eagle (Haliaeetus leucocephalus) was federally listed on February 14, 1978 as an endangered species in all of the conterminous United states except Minnesota, Wisconsin, Michigan, Oregon, and Washington, which it was classified as threatened. ( U.S. Fish and Wildlife Service 1986). A general description of the ecology and threats to the Pacific population of bald eagles can be found in the Pacific Bald Eagle Recovery

Plan (U.S. Fish and Wildlife Service 1986).

The Upper Klamath Basin is nationally known as one of the most heavily used bald eagle wintering areas in North America. Eagles begin arriving in November with peak populations occurring in January and February (500-1,000 birds) (Klamath Basin NWR, unpublished data). Wintering eagles use waterfowl as their primary prey item while in the Basin (Keister et al.1987). Food availability is generally felt to be the single most important habitat component dictating bald eagle use of habitat (U.S. Fish and Wildlife Service 1986). Wintering bald eagle use of the California side of the Basin (including Tule Lake NWR) regularly accounts for approximately 50% of the bald eagles wintering in California (Detrich 1981, 1982).

Keister et al. (1987) determined that Tule Lake NWR was one of the 3 key wintering areas in the Klamath Basin with the other areas being Lower Klamath NWR and Klamath Drainage District lands. Since this study was conducted; however, eagle use of Tule Lake has fallen dramatically largely because of the decline in wintering waterfowl use of the refuge. In addition to wintering eagles, 2-8 breeding pairs forage on Tule Lake and Lower Klamath NWRs during the spring and summer (U.S. Fish and Wildlife Service 1995).

Spotted Frog (Candidate species) - The western spotted frog exists in the Klamath Basin and Upper Klamath River at elevations between 4,000 and 4,400 feet. Hayes (1994a) states "Klamath Basin historically harbored more shallow warm-water marshland, the habitat likely most suited to the western spotted frog, than in any other area of the state [Oregon]". Changes in historic wetlands in the Klamath Basin have undoubtably impacted the species. In addition to habitat modification, exotic warm water species such as the bullfrog (Rana catesbeiana) are also believed to have impacted the species (Hayes 1994b). A recent survey of Spotted frogs in the Oregon portion of the Basin found frogs at only 1 location (Wood River Ranch). Since this survey, spotted frogs have also been located at Klamath Marsh NWR as well as several other Basin locations. Western Spotted frogs are now believed to be extirpated in all historical sites in the State of California (Hayes 1994b).

Two species of frogs currently exist on Tule Lake, the native Pacific chorus frog (Pseudaeris regilla) and the introduced bullfrog. Dileanis et al. (1996) conducted frog surveys of Tule Lake and detected both the Pacific chorus frog and bullfrog; however, no spotted frogs were detected on these surveys. Hayes (1994b) in spotted frog surveys in the Klamath Basin detected no spotted frogs in areas already populated with bullfrogs. Hayes (1997) in a survey of spotted frogs in the Klamath Basin concluded that Tule lake and the surrounding region was no longer suitable for spotted frogs. Large changes in hydrology, water quality, and biota have occurred in the Basin, which alone or in combination, have resulted in the unsuitability of the remaining habitat (Hayes 1997).

Egg mass surveys and surveys for adult spotted frogs on Klamath Marsh NWR conducted in 2000 and 2001 indicated that important egg deposition sites exist in the Cholo Unit, along the Willimson River, in and adjacent to springs and spring fed creeks and canals in the Loosely Unit (Pat Kane and Loosely Spring and Big Spring Creek) and in a permanently flooded emergent marsh on the north side of Military Crossing Road. Egg masses have all been located in relatively open shallow waters and usually in aggregates

of 2 to 25 egg masses. Although only 2 years of egg mass surveys have been completed, egg masses are generally located within 5-10 meters of locations from the previous year. Recruitment of young frogs from tadpoles appears excellent and at present Klamath Marsh supports the densest population of this species in the Upper Klamath Basin. Surveys on Upper Klamath NWR conducted in April of 2001 in the vicinity of Malone Springs detected no egg masses or adult spotted frogs.

**VI. Description of proposed action:**

Wildfire Suppression

Wildfire suppression is an important component of the fire program on Klamath Basin NWRs and is needed to protect refuge physical and biological resources as well as life and property. Suppression strategies and tactics would be applied so that equipment and tools used to meet desired objectives are those that inflict the least impacts upon the natural and cultural resources. Minimum impact suppression strategies will be employed to protect all resources. Natural and artificial barriers will be used as much as possible for containment. When necessary, fire line construction will be conducted to minimize long-term impacts to resources. Fire Management Units that are identified as being sensitive to chemical firefighting tools (retardant and foam), having known archaeological sites, critical habitat, peat soils, erodible soils or other sensitive natural resources, tactics will include some of these activities:

13. Use water or fugitive dye retardant instead of fire retardant chemicals in air tankers. The use of aerial retardant should be restricted to emergency use only.
14. Use water without wildland fire whetting agents (foam).
15. Cold trail the fire edge when practical.
16. Use wetlines whenever possible and waterbars constructed on handlines on steep slopes.
17. Utilize soak hoses or foggers in mop-up. Avoid hydraulic "boring" action on shallow soils.
18. Fire lines will be kept to the minimum width and follow natural contours as necessary to allow backfiring or safe blackline to be created and utilize natural barriers whenever possible.
19. Construct waterbars when line is on steep slopes.
20. Archeological sites, when possible, will be identified prior to a fire and protected.
21. Scatter or remove debris, utilizing fire suppression crews prior to demobilization.
22. After the fire emergency is over transport of personnel, equipment, and trash out of the refuge will be consistent with objectives and policy.
23. All fire lines, spike camps, base camps, and other disturbed areas will be rehabilitated as much as possible by crews before demobilization. Any follow-up work necessary will be accomplished in a timely manner.
24. Assign a Cultural Resource Advisor and Resource Advisor when feasible to all initial attack wildland fires.

Listed in Section VII B. are specific measures by refuge that will be used to protect

endangered/threatened species and their habitats. Fire personnel will abide by these guidelines unless life or property is threatened. If these guidelines are violated for the above reasons, re-consultation will occur. A more detailed description of the proposed action regarding wildfire suppression is included within the Fire Management Plan (See Appendix 1).

Prescribed Fire

Acreage of prescribed fire varies by Refuge, by year specific habitat management objectives, and weather and fuel conditions. Prescribed fire within the agricultural lease lands on Tule Lake and Lower Klamath NWRs was addressed within a Biological Opinion dated November 2, 1998.

| **Refuge** | **Acreage** |
|---|---|
| Lower Klamath | 3,000 to 10,000 acres of upland, permanent and seasonal marsh.<br>3,000 to 5,000 acres of agricultural lands<br>100 to 200 acres of roadsides, canals, berms, infrastructure maintenance. |
| Tule Lake | 1,000 to 5,000 acres of uplands and permanent and seasonal wetlands.<br>500 to 2,000 acres of agricultural lands<br>100 to 200 acres of roadsides, canals, berms, and infrastructure maintenance. |
| Bear Valley | 200 to 400 acres or possibly larger area of understory with or without preliminary fuels reduction.<br>50 to 100 acres of piled woody debris. |
| Klamath Marsh | 2,000 to 10,000 acres of uplands and seasonal and permanent wetlands.<br>200 to 400 acres forest understory<br>100 to 200 acres of canals, roadsides, infrastructure maintenance |

Prescribed fire is one of the most important habitat management tools on the Refuge Complex. Fire is used to alter successional processes in wildlife habitats, enhance forage quality, reduce height and density of vegetation, and reduce fuel accumulations, thereby reducing risks of catastrophic wildfire. Prescribed fire is also used to facilitate weed control, road grading, water movement through canals, and to prepare construction sites. Below is description of each type of prescribed fire proposed.

***Emergent seasonal marsh***–During the months of August, September, October and November,
from 1,000 to 5,000 acres of seasonal marshes are burned to create habitat openings in otherwise closed emergent marshes. These areas are especially attractive to fall and spring migrant waterfowl and shorebirds and, when shallowly flooded, are often major night roosting habitat for fall migrant greater sandhill cranes. Generally, from 20-100%

of a particular management unit may be burned. Within the current wetland/agricultural rotation, marsh vegetation is burned the fall preceding conversion back to agricultural habitats. In some areas, selective discing of burned areas is accomplished to increased plant diversity and retard the re-invasion of the area by emergent vegetation. Primary location for these burns is Lower Klamath, Tule Lake, and Klamath Marsh NWRs.

***Permanent hardstem bulrush marsh***–During December, January, February and early March, 1,000 to 10,000 acres of permanently flooded hardstem bulrush marsh is burned on the refuge complex. Primary refuge locations include Tule Lake, Lower Klamath, and Klamath Marsh NWRs. The objectives of these burns is create a more optimum interspersion of open water and emergent vegetation for waterfowl, shorebirds, wading birds, and cranes. Use of burned permanent wetlands is especially high during the spring migration.

***Under-burning in forested habitat***–From 50-800 acres of fuels reduction burning in forested habitat is proposed to reduce the risk of catastrophic wildfire and move the forested community toward a more natural fire tolerant community. Burning in these areas would occur in fall (September, October, November) or during spring (March, April, or May). The exact timing of burns would depend on moisture conditions of fuels and the ability to conduct prescribed fire in these habitats in a safe efficient manner. Depending on fuel conditions, prescribed fire would be conducted alone or, if fuel loadings are high, fire would follow understory thinning of smaller trees. Habitat types are primarily ponderosa pine and mixed coniferous forests. Primary locations for these burns would be Bear Valley and Klamath Marsh NWRs.

***Slash pile burning***–As part of fuels reduction in forested habitats, smaller under story trees would be cut and piled for later burning. This would be the most economical approach where the trees have no commercial value and the expense of hauling off site would be prohibitive. In some cases small understory trees would be chipped and either removed or burned at a later date. Slash burning would occur in the late fall, winter, or early spring (December through March) with the exact timing depending on atmospheric conditions, condition of the fuel, and fire hazard to the surrounding forest. This activity would take place on Bear Valley and Klamath Marsh NWRs.

***Upland burning***–Burning of uplands on the refuges is accomplished to reinvigorate grasslands and/or reduce brush species, control rodent populations, as site preparation for seeding or weed control activities, and to provide green browse for spring migrant geese. Primary locations for this activity are Tule Lake, Lower Klamath, and Klamath Marsh NWRs. Burns would be conducted from August through December with the exact timing dependent on fuel and atmospheric conditions.

***Infrastructure maintenance***–Infrastructure maintenance includes burning along roadsides (including weed flaming), at water control structures, within dry canal bottoms, around parking lots and buildings. Roadside burning and/or flaming is conducted prior to road grading to prevent the incorporation of unwanted debris into the roadbed. This activity would occur on Tule Lake, Lower Klamath, and Klamath Marsh during most months of the year.

Burning of canals is necessary to clear weeds and promote the efficient movement of

water among wetland areas of the refuges. This activity would be conducted on Lower Klamath, Tule Lake, and Klamath Marsh NWRs. Burning around water control structures is necessary for safe access to pumps, canal gates, and other water control structures and facilitates. These burns would be conducted on Tule Lake, Lower Klamath, and Klamath Marsh NWR, generally during the February through April time period.

Burning around buildings and parking lots is intended to reduce fuels near these facilities thus reducing fire danger during summer. These burns would be conducted on Lower Klamath, Tule Lake, and Klamath Marsh NWR, generally during February through August. Burning is often used as a site preparation tool prior to construction.

***Agricultural croplands***–Prescribed burning of grain crop residues is the current practice for preparing farmed areas of the Tule Lake and Lower Klamath NWRs for subsequent planting of crops. Burning of grain stubble is also used to increase the attractiveness of the area to waterfowl by increasing the availability of grain. On Tule Lake NWR 90% or greater of the small grain acreage is burned during February through April followed by pre-irrigation in approximately 50% of fields. On Lower Klamath NWR approximately 50% of grainfields are burned from September through November and the other 50% burned in February through April. On Lower Klamath NWR, fall burning is followed by pre-irrigation whereas in spring the order is reversed.

***Noxious weeds***–The objective of burning this type of vegetation is site preparation for planting to more desirable plant species, or application of biological or chemical control. Burning typically takes place in August through November and/or February through March. This program occurs on Tule Lake, Lower Klamath, Bear Valley, Upper Klamath, and Klamath Marsh NWRs. Of particular emphasis on Tule Lake and Lower Klamath NWR is the control of noxious weeds on dikes and berms.

**VII. Determination of Effects:**

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

Lower Klamath NWR

***Wildfire suppression---***Wildfires are most likely to occur on Lower Klamath NWR during the July through November period (uplands) or the September through November period (wetlands). Fall fires (even wildfires), when flooded, are highly attractive to waterfowl which are the primary prey items for wintering bald eagles.

***Prescribed fire--***While the shortnose and Lost River sucker occurred on historic Lower Klamath Lake, all evidence indicates they no longer reside on the refuge. Historic spawning areas on Sheepy Creek and access to the Klamath River has been blocked by Project irrigation facilities. Presently, very few areas of the refuge are greater than 3 feet deep (considered the minimum water depth for the species).

Although, both species of endangered suckers are not believed to exist on the refuge, refuge waters are indirectly connected to sucker bearing waters in the Klamath River and

therefore have the potential to impact water quality in the river. However, monitoring conducted by Tim Mayer, Regional Hydrologist, USFWS indicates that during March-November of 1999 and May-November of 2000, Lower Klamath NWR removed (average between years) 76% of the nitrate, 61% of ammonia, 55% Total Kjeldahl N, 48% total phosphorus, and 24% of the soluble/reactive phosphorus from the water it had received. These nitrogen removal rates are comparable to natural surface flow treatment wetlands described by Kadlec and Knight (1996). These nitrogen removal rates have occurred with the current prescribed fire program in place. What is especially noteworthy is that both the Regional USFWS Hydrologist and Oregon Department of Environmental Quality believe that the Klamath River below the outlet of the Straits Drain is a nitrogen limited system, thus the large proportional removal of nitrogen entering the refuge and subsequently released is especially important. Thus, the proposed prescribed fire program may effect but is not likely to adversely affect either sucker species.

Lower Klamath NWR supports the single greatest concentration of wintering bald eagles in the Klamath Basin. Birds are primarily attracted to this refuge by its large wintering waterfowl population and dense populations of microtine rodents that become available to eagles as agricultural fields are pre-irrigated during the wintering period. With the exception of burning for facilities maintenance and construction, all other prescribed fire activities are intended to enhance habitat for waterfowl and other waterbird species. Prescribed fire is one of the primary habitat management tool on the refuge and represents a cost effective and efficient way to manipulate the ratio of open water to emergent vegetation and alter physical structure of marsh habitats. In general, waterfowl use of Lower Klamath NWR has increased by a factor of 2-3 times over the last 15 years due to a large part to the prescribed fire program on the refuge. Thus, the prescribed fire program on Lower Klamath is not expected to effect the bald eagle and, in fact, is likely beneficial.

Prescribed burning with the Area K lease lands was covered in a Biological Opinion for the Integrated Pest Management Plan dated November 2, 1998. Although burning activities on cooperative farm fields on Lower Klamath were not covered in this Biological Opinion, burning practices are identical. While some nutrients and sediments may be released from burning these agricultural lands, the February and March dewatering of these fields would occur when water temperatures in the Klamath River are low and flows high. Thus, little impact to water quality would be expected in the river. Periodic cleaning of refuge canals and drains as currently occurs would remove most of the sediment lost from the fields prior to its reaching the Klamath River. Prescribed burning of refuge cooperative farming fields exposes rodents to raptors including bald eagles and makes grain more available to waterfowl, sharply increasing use by both waterfowl and eagles.

Tule Lake

***Wildfire suppression (uplands)--***Wildfires are most likely to occur on Tule Lake NWR during the July through November period (uplands/croplands). In the case of wintering bald eagles, this time period occurs prior to eagles migrating into the Tule Lake Basin. The suckers in Sump 1(A) are restricted to the center of the sump (“Donut Hole”) far from upland or cropland areas.

***Wildfire suppression (wetlands)--*** Wildfires within wetlands are most likely to occur during the September through November period (seasonal wetlands) or the December through April period (permanent wetlands). During these times, water quality is generally improving within Sump 1(A) as temperatures are cooling and dissolved oxygen level raising, thus few if any impacts to listed sucker are anticipated.

***Prescribed fire***--A small population of shortnose and Lost River suckers reside in Sump 1(A) on Tule Lake NWR and are believed to largely be imported by the surrounding irrigation system. Over the short-term, it is believed that summer water quality is the greatest threat to the survival of these fish. Presently, during the May-September period, only the "Donut Hole" in the center of the Sump possess adequate water quality to maintain this population. Over the longer term, siltation will gradually fill Sump 1(A) until insufficient water depth remains for the fish.

Presently, the 2,500 acre hardstem bulrush marsh in the Northeast corner of Sump 1(A) is burned every 2 years with the goal of creating open water habitat for spring migrant waterbirds. This marsh is over 1 mile from the Donut Hole with dense stands of submergent aquatic plants and filamentous green algae occupying the in between habitat as well as the entire area surrounding the Donut Hole. If nutrients are released from burning of the marsh, these dense stand should preclude effects to the Donut Hole by removing nutrients from the water column.

Tule Lake Marsh was burned in 1999 with greater than 90% consumption and again in 2001 with approximately 50% consumption. Monitoring of water quality in the Donut Hole in both summers indicated adequate water quality to assure survival of the suckers. During both summers only 1 radio-marked sucker of 19 died during the summer months. This represents a much greater survival rate than suckers marked elsewhere in the Basin. Thus, prescribed burning of Tule Lake Marsh as well as other prescribed fire activities away from the Sumps may effect, but is not likely to adversely effect either sucker species.

Bald eagle use of Tule Lake has declined in the last 20 year primarily due to the decline in overall waterbird numbers on the refuge. Recent projects to restore productive wetlands on the refuge have been encouraging in that bird use of Tule Lake appears to be increasing. Burning of Tule Lake Marsh in late winter and early spring in particular has done much to increase spring use of the refuge.

Other prescribed burning programs on the refuge generally occur on the levees and berms surrounding the Sumps and within the agricultural lease lands. The potential effects of these activities was covered by a Biological Opinion for the Integrated Pest Management Plan on the leased lands dated November 2, 1998. Burning activities for the cooperative farm fields on Tule Lake NWR would be identical to those on the adjacent lease lands and thus would similarly result in a may affect but not likely to adversely affect determination.

Klamath Marsh NWR

***Wildfire suppression–***Wildfires on Klamath Marsh NWR are most likely during July

through November. Several eagle nests exist around the perimeter of the marsh. To the maximum extent possible, all fire suppression activities (including aerial) will refrain from impacting eagle nests. To protect spotted frogs and other aquatic resources, fire retardants or foam would not be used within 300 feet of water. If for unforeseen circumstances, these guidelines are compromised, the Refuge will reconsult.

***Prescribed fire***--Klamath Marsh NWR supports one of the largest populations of spotted frogs in the Klamath Basin. Spring egg mass and summer adult surveys over the last several years have indicated that populations of the frogs are primarily located near springs or spring fed creeks, the Williamson River and year-round canals and marshes adjacent to the Williamson. To date no spotted frogs or their egg masses have been located south of Military Crossing Road, probably because the permanence of water may not be adequate in this region.

Burning of emergent marshes south of Military Crossing and south of Silver Lake Highway occurs generally in October through November after rain or snowfall has reduced the fire hazard in surrounding lodgepole pine forests and frost had killed the summer's growth of bulrush and cattail. Thus far, surveys for spotted frogs or their egg masses in these marshes have been negative probably because these marshes periodically dry during extreme drought (such as 1992 and 1994). If frogs did exist in these areas, they would be dormant and below the water or sediment surface when burning occurred. Since these fires only burn the above-water portions of the marsh plant, the frogs would not be effected.

Prescribed fire in uplands would occur in August through December. Although spotted frogs are active during August, they are restricted to wetland habitats which would be green and wet and thus might not burn in this month. Some burning of these areas might occur later in the fall after frost has killed the emergent vegetation; however, at this time the frogs are dormant and below the water or sediment surface. Egg mass surveys conducted the last 2 years has indicated that egg masses tend to be found in open areas in which water warms quickest in spring. Burning some of the seasonally flooded uplands within or adjacent spotted frog habitat may improve the habitat for egg deposition by removing vegetation and allowing these wetlands to warm more quickly in spring. Egg masses on the refuge are frequently found in areas hayed the previous summer.

Similar to upland burning, prescribed fire on canal banks, roadsides, within canals, or around refuge infrastructure would occur during August through November. While frogs are active in August, vegetation within occupied habitat is green and would remain unburned. After August, frogs are dormant and would be below water or sediment surfaces and would be unaffected by fire.

<u>Bear Valley NWR</u>

***Wildfire suppression--*** The impacts of wildfire suppression should be weighed against the damage done by not suppressing wildfire. In some cases, particularly Bear Valley NWR, important night roosting habitat for bald eagles could be lost. However, once wildfire suppression begins, there are measures that can be done to minimize the impact of suppression activities.

For long-term health of forest habitats, the Refuge continues to work toward reducing fuel accumulations through understory thinning and prescribed fire both within and outside roosting and nesting habitat. The purpose of these programs is to reduce the likelihood and severity of catastrophic wildfire which would eliminate important bald eagle habitat. To reduce the potential for human caused wildfire, access to the refuge is restricted during the summer period.

Under current conditions, wildfires occur on Bear Valley NWR between June and November via lightning strikes or other causes. Because Bear Valley NWR contains 1-3 bald eagle nests/year, all wildfire suppression activities will be done to minimize impact on nest sites. Wildfire activities would include aerial suppression, ground attack, line construction, and mop-up. Suppression activities will also prioritize the protection of important roosting habitat with Roost 1 being most important followed by Roosts 3, 4, and 2. If it becomes necessary to conduct wildfire suppression beyond November 15 or within ½ mile of eagle nests, the Refuge will reconsult on the activity. Measures to reduce impacts to eagles and their habitats are also listed in Section VII, B.

***Prescribed fire--***Currently the greatest threat to the long term existence of bald eagle roosting and nesting habitat on Bear Valley NWR is the threat of catastrophic wildfire. Decades of fire suppression have left the refuge with overstocked numbers of trees. As trees die from over crowding and disease, the fuel accumulation becomes excessive, greatly increasing the potential for a crown replacing fire. Currently much of the roosting habitat is in this condition. Excessive fuels and the existence of hundreds of small (<4 inch DBH) trees provides ladder fuels which allow ground fires to reach the crowns of larger trees.

Soon after refuge establishment in the late 1970's, the Service recognized this problem and initiated studies with the cooperation of the Oregon State University. These studies identified important roosting habitat, described characteristics of the roosts and individual roost trees and recommended actions needed to sustain the important roosting habitat in perpetuity. Catastrophic wildfire was recognized as the primary threat and several recommendations were made including the re-establishment of fire into the roosts. Efforts to burn lower elevation areas dominated by ponderosa pine were successful in consuming excess fuels; however, as prescribed burns were conducted at increasingly higher elevations, the prevalence of small trees and downed fuels created increasing fire intensities and areas of torching.

In response the Refuge decided prior to additional prescribed fire, that understory thinning was required to reduce fuel accumulations. This program conducted by commercial timber sale is ongoing. After thinning is accomplished prescribed fire is used periodically to reduce fuel loadings and move the forest stand toward a more fire tolerant species composition predominantly composed of ponderosa pine and Douglas fire. Monitoring of roost trees to date has indicated no impacts to numbers of roosting eagles.

In addition to prescribed burning within the roosts additional prescribed fire will be conducted outside the roosts. This action will prevent fires, which start outside the roosts, from gaining the intensity needed to over-run roosting habitat. Because fuels treatment programs (including fire) will be accomplished outside the winter roost period and after eaglets have fledged, the prescribed fire program at Bear Valley NWR may

effect but is not likely to adversely effect.

Clear Lake NWR

***Wildfire suppression–***Wildfires on Clear Lake NWR can cause serious reductions in sage brush habitat on the refuge and thus will be vigorously suppressed. Use of fire retardants or foams will only be used in emergency situations and will not be used within 300 feet of aquatic habitats. Thus impacts to suckers and their aquatic habitats will be minimal.

***Prescribed fire–***Because of a recent large fire on the "U" and the reduction in sage brush habitat this caused, no prescribed fires are foreseen in the near future on Clear Lake NWR. If the need arises, however, the refuge will consult on the activity.

Upper Klamath NWR

***Wildfire suppression–***The highest likelihood of wildfires on Upper Klamath NWR exist during October through December when marsh vegetation is dry and lake and marsh levels are low. Because eagle nests on the west edge of the marsh are not occupied at this time of year, suppression activities will not result in impacts to these birds. Since fire retardants or foam would not be used in suppression activities, impacts to aquatic species including listed suckers would be minimal.
***Prescribed fire–***Prescribed fire in Upper Klamath NWR including Hank's Marsh has not been attempted (at least in the last 20 years). Burn windows are generally narrow, fuels are discontinuous, and lake and marsh water levels high. These factors tend to limit the effectiveness of potential burns. Prescribed fire in Upper Klamath NWR is not currently planned for the future.

**B. Explanation of actions to be implemented to reduce adverse effects:**

Lower Klamath NWR

***Wildfire suppression--***Wildfires are most likely to occur on Lower Klamath NWR during the July through November period (uplands) or the September through November period (wetlands). Fall fires (even wildfires) tend to improve habitat for waterfowl which are the primary prey items for wintering bald eagles. The following practices will be followed to reduce water quality impacts to the Straits Drain and Klamath River.

1. Water impounded over agricultural burns will be released prior to April 1 while temperatures in the Klamath River are low and flows are typically high.

2. Water within marsh units that have been recently burned will be held until at least May 15 to facilitate the uptake of nutrients by wetland plants. Monitoring indicates that uptake of available nitrogen by wetland plants is rapid during spring.

3. Fire retardant or foam will not be used with 300 feet of water areas during prescribed fire activities.

***Prescribed fire--***Similar to Tule Lake, prescribed fires in wetlands and agricultural fields increase the attractiveness of these habitats to waterfowl and make them important

feeding areas for wintering bald eagles. Of primary concern in burning at Lower Klamath are the potential release of nutrients and sediment into the Straits Drain which ultimately is released to the Klamath River. The following measures will be used to minimize potential impacts.

1. Water impounded over agricultural burns will be released prior to April 1 while temperatures in the Klamath River are low and flows are typically high.

2. Drains on the Refuge will be periodically cleaned to prevent excess sediments from reaching the Klamath River.

3. Water within marsh units that have been recently burned will be held until at least May 15 to facilitate the uptake of nutrients by wetland plants. Monitoring indicates that uptake of available nitrogen by wetland plants is rapid during spring.

4. Fire retardant or foams will not be used with 300 feet of water during prescribed fire activities.

Tule Lake NWR

***Wildfire suppression*--**To protect aquatic habitats used by shortnose and Lost River suckers on Tule Lake NWR, release of foam or fire retardants will not occur within 300 feet of sucker bearing waters. Waters occupied by suckers includes Sumps 1(A), and the Q, R, and N Canals.

***Prescribed fire***–Prescribed burning of marsh habitat on Tule Lake NWR is used as a tool to enhance habitat for migratory waterbirds, a primary prey item of wintering bald eagles. Burning of cooperative farm lands on the refuge similarly increases the attractiveness of these areas to waterfowl and thus are beneficial to wintering bald eagles. Of principal concern are the potential release of nutrients into Sump 1(A) which may degrade water quality for both sucker species.

1. Burning will be conducted prior to prior to March 15 or at least 2 months prior to potential onset of stressful water quality conditions in the Donut Hole of Sump 1(A).

2. Any drip torch fuel use in marsh burning will be mixed away from the Sump to prevent spills into water.

3. To protect aquatic habitats used by shortnose and Lost River suckers, no fire retardants or foam will be used with 300 feet of water during prescribed fire activities.

Klamath Marsh NWR

***Wildfire suppression–***Concerns on Klamath Marsh NWR include the bald eagle and spotted frog. The following guidelines will reduce impacts to these species.

1. From February 1 to August 15, when possible all suppression activities will minimize impact on eagle nests. The Incident Commander should use the appropriate suppression response dictated for the area. This varies based on fuels, adjective rating,(low, moderate, high, very high and extreme) and values at risk. These dates may be modified

if local biological information indicates eagles have fledged more than 2 weeks previous to suppression activities.

2. To protect the spotted frog and other aquatic organisms, no fire retardant or foam will be applied within 300 feet of water.

***Prescribed fire***--Primary concerns on Klamath Marsh are for potential impacts to the Oregon spotted frog and the bald eagle. The below activities are designed to minimize potential impacts.

1. Burns in spotted frog habitat areas will be conducted after September 30 when frogs are dormant for the winter. Areas of importance to the spotted frog include the Loosely Spring, Big Spring Creek, Pat Kane ditch, areas adjacent to the Williamson River, and ditches and canals in the Cholo Unit.

2. From February 1 to August 15, all fire suppression activities will minimize the impact of suppression efforts on eagle nests. The Incident Commander will take the appropriate suppression response. This is dictated by fuels, adjective rating (low, moderate, high, very high, and extreme) and values at risk. These dates may be modified if local biological information indicates eagles have fledged more than 2 weeks previous to suppression activities.

Bear Valley NWR

***Wildfire suppression***– To protect roosting and nesting habitat for bald eagles from catastrophic wildfire in Bear Valley NWR, vigorous suppression activities will be conducted. To the maximum extent possible, the following measures will be undertaken to minimize short-term impacts. If these guidelines are compromised during suppression activities, the Refuge will reconsult on the activities.

1. Critical time periods at Bear Valley NWR are March 1 and August 15. Eagles may be nesting during this time period. November 15 to April 1 represents the roosting time period. All suppression efforts will be tailored to minimize the impact on eagles. The Incident Commander will utilize the appropriate suppression response based on fuels, adjective rating(low, moderate, high, very high, and extreme), and values at risk. Suppression efforts will be aggressive to minimize the impact to the overall habitat of the refuge.

2. In protecting refuge resources, suppression priorities would be firefighter safety, protection of life and property, winter roosting habitat (Roosts 1, 3, 4, and 2), and eagle nest trees.

***Prescribed fire***--Of primary concern at Bear Valley NWR are prescribed fire activities which may affect nesting and winter roosting bald eagles. Impacts of burning on water quality are not anticipated to impact either sucker species because the tributaries within Bear Valley do not reach sucker bearing or suspected sucker bearing waters. The following is a list of actions used in prescribed fire which will minimize impacts to roosting and nesting bald eagles:

1. Prescribed fire (either understory burning or slash pile burning) and associated activities will not occur within ½ mile of active bald eagle nests at Bear Valley during the nesting or fledgling period (February 1 through August 1).

2. Prescribed fire (either understory burning or slash burning) and associated activities will be done to minimize impact on eagles during the primary eagle roosting period of November 15 through March 15.

3. Fire lines will use existing roads and natural fire breaks to the maximum extent practical. Waterbars will be constructed where lines exist on steep slopes.

Upper Klamath NWR

***Wildfire suppression***

1. No foam or fire retardants will be applied within 300 feet of water on Upper Klamath NWR. This will protect the aquatic habitats of the shortnose and Lost River sucker as well the spotted frog (potentially present).

2. Fire suppression activities will be tailored to minimize impact on active eagle nests from February 1 to August 15. The Incident Commander will take the appropriate suppression response. This is based on fuels, adjective rating(low, moderate, high, very high, and extreme) and values at risk.

Clear Lake NWR

***Wildfire suppression--***To protect aquatic habitats used by the shortnose and Lost River suckers in Clear Lake, no foams or fire retardants will be applied with 300 feet of Clear Lake or Willow Creek.

**VI: Effect Determination and response requested: (* = optional)**

| Determination | Response requested |
|---|---|
| **No effect/no adverse modification (species:_____)** | *Concurrence |
| **May affect, but is not likely to adversely affect (species: Bald eagle, shortnose and Lost River sucker)** | X **Concurrence** |
| **May affect, and is likely to adversely affect species/adversely modify critical habitat (species:_____)** | **Formal Consultation** |

**B. Proposed species/proposed critical habitat:**

| **Determination** | **Response requested** |
|---|---|
| **No adverse modification of proposed critical habitat (species: shortnose and Lost River sucker )** | X *Concurrence |
| **Is likely to jeopardize proposed species/ adversely modify proposed critical habitat (species:_____)** | **Conference** |

| **Determination** | **Response requested** |
|---|---|

**C. Candidate species:**

| | |
|---|---|
| **No effect (species: Oregon spotted frog )** | **X * Concurrence** |
| **Is likely to jeopardize candidate species** | |

**(species:_____)**
**Conference**

_____
**Signature Date**
**(Title/office of supervisor at originating station)**

**IX. 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 Date**
**(Title/office of reviewing official)**

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