

**FIRE MANAGEMENT PLAN**  
**RUBY LAKE NATIONAL WILDLIFE REFUGE**



2001

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## **EXECUTIVE SUMMARY**

When approved, this document will become the Ruby Lake National Wildlife Refuge Fire Management Plan. Major components include:

- updated policy for full suppression of all wildland fires using strategies that minimize damage to resources at Ruby Lake National Wildlife Refuge.
- A plan of action to accomplish goals and objectives as provided by the Refuge Management Plan and the Habitat Management Plan.
- Format changes under the direction of the Fire Management Handbook (U.S. Fish and Wildlife Service).
- A prescribed fire program for management of wildlife habitat and healthy plant communities.

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

## INTRODUCTION

A Fire Management Plan (plan) for Ruby Lake National Wildlife Refuge was written in 1982 and revised in 1986 and 1989. This document will update the plan for Ruby Lake National Wildlife Refuge (refuge). An Environmental Analysis (EA) covering prescribed fire was prepared and approved in 1992. This plan will meet the requirements of the National Environmental Policy Act (NEPA) and the National Historic Preservation Act (NHPA). An Environmental Action Statement (EAS) certifies that no new actions are being proposed in this plan, therefore, additional NEPA analysis is not needed (Appendix C). Pursuant to the Endangered Species Act of 1973, Section 7 consultation was completed in 2001. A species list was requested and received from the USFWS indicating the bald eagle (designated as Threatened) is the only listed species known to occur in the area (Appendix C). It was determined by refuge personnel that actions executed under this Plan will not affect bald eagles. This determination was based on the small numbers of the bald eagles that use the refuge, their use period, and their habitat use areas.

This plan is written as an operational guide for managing the wildland fire and prescribed fire programs at the refuge. It defines levels of protection needed to ensure safety, protect facilities and resources, and restore and perpetuate natural processes, given current understanding of the complex relationships in natural ecosystems. It is written to comply with a Service-wide requirement that refuges with burnable vegetation develop a fire management plan (620 DM 1).

This plan will discuss appropriate wildland fire suppression actions and use of prescribed fire to maintain optimum populations of native plants and animals and their habitats. Wildland fire and prescribed fire will be managed to protect wildlife habitat and to accomplish resource management objectives.

Ruby Lake National Wildlife Refuge is an important migratory bird breeding area. Emergent marsh, meadows, grasslands, and shrub-steppe uplands provide nesting sites for a number of birds. Fire is an essential ecological element for maintaining healthy plant communities which provide valuable wildlife habitats on the refuge. Prescribed fire is used to restore nesting habitats, remove undesirable vegetation, rejuvenate vegetation, and restore open areas in the emergent marsh. Wildland fire occurrence is uncommon and many fires are extinguished naturally.

Fire-qualified staff at the refuge consists entirely of collateral duty personnel. A permanent fire-funded position has been approved for the refuge, but has not been filled. Collateral duty personnel include individuals with many years of fire management experience and individuals new to fire. Refuge personnel are qualified in a variety of wildland fire suppression and prescribed fire positions. Fire management support for the refuge is provided by the fire personnel located at Sheldon-Hart Mountain National Wildlife Refuge Complex; these fire staff are responsible for coordinating budget, training, and support of all fire management activities.

The refuge cooperates with the Bureau of Land Management (BLM), the U.S. Forest Service (USFS), and the Nevada Division of Forestry (NDF) on interagency fire management business. The refuge is an active member of the Elko Interagency Dispatch Center (EIDC) and the Ely Interagency Coordination Center (EICC). The refuge has primary suppression responsibility for lands administered by the U. S. Fish and Wildlife Service (USFWS) in Ruby Valley.

## COMPLIANCE WITH USFWS POLICY

Ruby Lake National Wildlife Refuge was established by presidential proclamation in July 1938 with the primary purpose as a “refuge and breeding ground for migratory birds and other wildlife”. The refuge was created from purchased land and from land withdrawn from the public domain. Additional land at the south end of the refuge was acquired in 1964. A pending three-party land exchange and land withdrawal also at the south end of the refuge will further increase the size of the refuge.

This plan will guide the fire management program in achieving refuge management goals and objectives as provided in the Refuge Management Plan (1986) and the draft Habitat Management Plan (1997). The preparation of a Comprehensive Conservation Plan (CCP) for the refuge is scheduled to begin in 2011. In the absence of a CCP, the Refuge Management Plan (1986) provides the refuge goals and objectives. The draft Habitat Management Plan (1997) provides upland habitat management strategies and serves as the guide for management of non-marsh vegetation. The Water Management Plan (1988) provides wetland habitat management strategies and serves as the guide for management of marsh vegetation. An Environmental Analysis covering prescribed fire was prepared and approved in 1992.

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

“Wildfires may result in loss of life; have detrimental impacts upon natural resources, and damage to or destruction of man-made developments. However, the use of fire under carefully defined conditions is to be a valuable tool in wildland management. Therefore, all wildfires within the Department will be classified either as wildfire or as prescribed fires.

Wildfires, whether on lands administered by the Department or adjacent thereto, which threaten life, man-made structures, or are determined to be a threat to the natural resources or the facilities under the Department's jurisdiction, will be considered emergencies and their suppression given priority over normal Departmental programs.

Bureaus will give the highest priority to preventing the disaster fire - the situation in which a wildfire causes damage of such magnitude as to impact management objectives and/or socio-economic conditions of an area. However, no wildfire situation, with the possible exception of threat to human survival, requires the exposure of firefighters to life threatening situations. Within the framework of management objective and plans, overall wildfire damage will be held to the minimum possible giving full consideration to (1) an aggressive fire prevention program; (2) the least expenditure of public funds for effective suppression; (3) the methods of suppression least damaging to resources and the environment; and (4) the integration of cooperative suppression actions by agencies of the Department among themselves or with other qualified suppression organizations.

Prescribed fires...may be used to achieve agency land or resource management objectives as defined in the fire management plans....Prescribed fires will be conducted only when the following conditions are met:

- a. Conducted by qualified personnel under written prescriptions.
- b. Monitored to assure they remain within prescription.

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

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

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

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

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

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

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

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

## **FIRE MANAGEMENT GOALS**

The overall goals for fire management on the refuge are to promote a program to ensure firefighter and public safety, to suppress all wildland fires using appropriate management strategies, and to continue the use of prescribed fire. Specific fire management goals are:

- Promote a fire management program and suppress all wildland fires on or threatening the refuge.
- Safely protect life, property, and resources from wildland fires at costs commensurate with resource values at risk.
- Use prescribed fire to restore fire to fire-dependent plant communities, to stimulate and restore natural ecological processes, to maintain functional biological communities and cultural/historic scenes where appropriate, and to accomplish resource management objectives.
- Use appropriate management strategies and tactics that protect critical and sensitive areas and minimize long-term impacts of suppression actions.

## DESCRIPTION OF REFUGE

The Ruby Lake National Wildlife Refuge is located in northeast Nevada in Elko and White Pine counties (Figure 1). The refuge headquarters is 65 miles southeast of Elko and 100 miles northwest of Ely. The refuge is located at the south end of Ruby Valley in a narrow valley between the rugged and scenic Ruby Mountains and the Maverick Springs mountain range. The refuge is 37,632 acres in size, is 16 miles long and three miles wide at the widest point. It is situated mostly on the valley floor and the elevation ranges from 5,962 feet at marsh level to 6,900 feet. Refuge land types include a large pristine shallow marsh surrounded by meadows, grasslands, shrub-steppe uplands, and alkali playa. The refuge is bordered by National Forest System land on the west, Bureau of Land Management land on the east and south and private land on the north and in a small area on the west.

During the Pleistocene Epoch, Ruby Valley was inundated by a large water body called Ancient Lake Franklin. This ancient lake covered over 300,000 acres and was more than 200 feet deep. Ruby Lake and nearby Franklin Lake, located one mile north of the refuge, are the only remnants of this large lake. Over 160 springs, located on the refuge, supply water to Ruby Lake. During periods with above average snow pack, the refuge maintains nearly 20,000 acres of wetlands, while during long periods with below average snow pack, the refuge maintains less than 10,000 acres of wetlands.

Prior to pioneer settlement, the area was inhabited by Western Shoshone Indians called Wadaduka (“rye grass eaters”). The density of these people was higher in Ruby Valley than in adjacent valleys because of the high productivity of the area (Casjens, 1974). These people utilized abundant wildlife and consumed various plant parts and products. Fire was often used to aid in the harvest of game and to stimulate production of plant seeds.

Pioneers settled Ruby Valley in the mid-1800s and introduced farming and cattle ranching into the area. Early uses on what is now refuge land included grain production and later cattle grazing and haying on the more productive ground. Grazing and haying became the dominant land uses about 1890 when grain production ceased. Grazing and haying use increased after the refuge was established. The intensity, duration, and seasons of use of grazing remained stable for many years. A significant reduction in grazing occurred between 1992 and 1997 because it was in conflict with wildlife management objectives.

Refuge management goals and objectives include providing a diversity of high quality habitats for breeding and migrating birds with an emphasis on waterfowl, sandhill cranes, colonial nesting birds, songbird species, and species of special concern. Wetland habitat is managed through water manipulation and prescribed fire where possible. Upland habitats are managed using a variety of vegetation manipulation techniques including prescribed fire, grazing, and haying. Public use of the refuge includes primarily fishing, hunting, and wildlife observation.

### CULTURAL RESOURCES

Numerous sites containing pre-settlement items of archeological and cultural interest have been identified on the refuge. These items include pottery shards and lithic scatter. One historic cabin and two pioneer grave sites exist on the refuge. The pending acquisition of the Fort Ruby Ranch, located adjacent to the south end of the refuge, would add historic structures associated with Fort Ruby, an outpost operated by the military during the mid-1800s. A map depicting the general location of historic structures is provided in Appendix E.

Figure 1: Vicinity Map

## FISH AND WILDLIFE

Wildlife populations concentrate on the refuge because of the abundance, diversity, and quality of habitat, particularly in the marsh. The refuge is a significant waterfowl use area in Nevada providing important nesting and foraging habitat for migratory birds in the Pacific and Central Flyways. Birds also use the refuge to rest and refuel during spring and fall migration. During spring, birds converge on the refuge from the Humboldt River drainage to the west, the Owens Valley to the southwest, the Great Salt Lake to the east, the Sacramento Valley to the west, the Klamath Basin to the northeast, and the lower Colorado River and Imperial Valleys to the south. The refuge supports 225 bird species, 50 mammal species, and a small number of amphibian and reptile species (Appendix D). An additional 23 bird species have been recorded on the refuge but their occurrence is limited to rare observations. A total of 93 species nest on the refuge in emergent marsh, meadows grassland, and shrub-steppe habitats. Although breeding waterfowl are of primary importance on the refuge, other breeding birds include sandhill crane, white-faced ibis, long-billed curlew, black tern, sage grouse, and numerous passerine species. Mammals using the refuge include the American pronghorn, coyote, small numbers of mule deer, and numerous rodent species. The relict dace is the only native fish on the refuge. Bass and trout exist on the refuge from stocking. Amphibians include the leopard frog. Reptiles include the gopher, garter, and rattlesnake snakes, and the fence lizard.

The bald eagle is the only known Endangered Species found on the refuge. The period of use for the bald eagle is during winter with generally less than five eagles present annually. No more than three bald eagles have been observed using the refuge at any one time during the winter. The core bald eagle winter use area is the open-water areas of the Collection Ditch and the South Marsh. Prescribed fire is not used in these areas and thus activities associated with prescribed fires will not impact bald eagles or their habitat.

Species of concern listed by the USFWS which may occur in the area include seven mammal species, six bird species, one fish species, and one invertebrate species (Appendix C). Further biological research on these species is needed to resolve their conservation status (Williams, Robert D. pers. comm.). The pygmy rabbit, which inhabits dense, tall sagebrush, is considered a resident and may occur on the refuge. This habitat type is limited on the refuge and is not subject to prescribed burning. The six bat species are migratory and are not likely present during the prescribed fire periods. All the bird species of concern are migratory and are not present on the refuge during the prescribed fire periods. The relict dace is the only fish species of concern present on the refuge. This species inhabits five known springs and consideration is given during prescribed fire planning to preventing negative impacts to their habitat. The status of the single invertebrate species of concern, the Grey's silverspot butterfly, on the refuge is not known.

## VEGETATION

Refuge habitats are highly productive and support a diverse assemblage of wildlife species because of the association of abundant water and vegetated upland areas. Refuge habitats include permanent and seasonal wetland, meadow, grassland, woody riparian, and shrub-steppe. These vegetation types occur in zones and are positioned parallel to the north-south trending axis of the marsh. Permanent and seasonal marsh account for approximately 20,096 acres and uplands account for approximately 17,536 acres. Burnable vegetation on the refuge totals approximately 25,950 acres and can be separated into three broad vegetation types (Table 1). Burnable vegetation accounts for 69 percent of the refuge while open water accounts for the remaining 31 percent.

Table 1: Burnable vegetation on Ruby Lake National Wildlife Refuge

Vegetation	Habitat	Acres	% of Total	Fuel Model
Grass	Meadow/Grassland	7,217	27.8	1

Bulrush	Marsh	8,482	32.7	3
Brush	Shrub-steppe	10,251	39.5	6

**CLIMATE**

Winters are long and cold with a mean minimum temperature of 13°F. Winter temperatures seldom fall below -20°F. Summers are short and warm with a mean maximum temperature of 87°F. Summer temperatures seldom exceed 95°F. Relative humidity frequently falls below 20 percent during summer months. Mean annual precipitation is 13 inches and mean annual snow is nearly 50 inches. Most precipitation is received as snow from November through April. Summer lightning storms, spawned by monsoon moisture, are frequent and produce moderate but localized rain. The marsh freezes generally during early November and is ice-free usually by mid-March. Maximum ice thickness ranges from 8 to 18 inches although during extreme cold periods up to 24 inches of ice can form. Ice coverage is complete except for springs and areas with flowing water. The adjacent mountain ranges and numerous canyons influence local wind speeds and directions.

**PHYSICAL RESOURCES**

Refuge wetlands are maintained primarily by over 160 springs which discharge along the west edge of the refuge. Few springs exist on the east side of the refuge. Numerous springs beneath Ruby Lake contribute significantly to the total inflow. Direct runoff from snow and rain contribute far less to the overall water balance than the flow from the springs. There is no outlet from Ruby Lake; the refuge is contained in a hydrologically closed basin. The effect of two or more successive years of very low precipitation is carried forward one or two years after precipitation returns to normal. During consecutive years with low amounts of precipitation the shallow marsh areas become dry.

The Pleistocene-era Ancient Lake Franklin left substantial shore features along the west side of Ruby Valley in the form of gravel bars and spits. These gravel deposits are now mostly covered by sagebrush associations. Soil types have not been described in detail. Soils in the uplands on the west side of the marsh are well drained rocky gravel over an impermeable layer of caliche. Soils in the meadows and grasslands range from well drained to moist and are loamy or gravelly loam. On the east side of the marsh, the soils are poorly drained and more alkaline with some fine textured clay areas. Soils in the marsh are mostly peat over fine clay.

Air quality within the interior west was not pristine prior to European settlement in the late 1800s, especially in regards to smoke. Many historical accounts refer to the presence of smoke and burned areas within the Great Basin. Levels of smoke declined as fire was excluded from the land, particularly after the initiation of organized fire suppression. Regional air quality is impacted for short periods during the wildland fire season. During infrequent high wind storms, dust blowing from dry alkali playas located on the west side of the Ruby Mountains impairs air quality. Local air quality is slightly impaired during days when prescribed burning is conducted.

**STRUCTURES AND FACILITIES**

Refuge structures and facilities include: office, shop, oil shed, two above-ground bulk fuel tanks, storage shed, equipment parking area, materials storage area, grain silo, barn, bunkhouse, five employee residences, two detached employee garages, two wildlife viewing blinds, four vault toilets, over 50 miles of fence, three entrance signs, and ten informational and interpretive kiosks. The monetary value of refuge structures and facilities is provided in Appendix E.

The state-operated Gallagher Fish Hatchery is located on the refuge, one mile south of the refuge headquarters. Hatchery structures include: office-shop complex, hatchery building, fish rearing raceways, generator shed, two above-ground bulk fuel tanks, materials storage area, six employee residences, three detached employee garages, and one out-building. The monetary value of these structures and facilities is

estimated at \$1.5 million.

The NDF maintains a single-bay fire engine garage on the refuge adjacent to the fish hatchery.

The USFS South Ruby campground on the Humboldt National Forest is located 1.5 miles south of the refuge headquarters. The facility contains 35 campsites with fire pits and picnic tables, four vault toilets, recreational vehicle sewage disposal station, fish cleaning facility, fenced camp host site, potable water storage facility, and an informational kiosk.

A small housing development referred to as “Shanty Town” is located on the west side of the refuge, four miles south of the refuge headquarters. Shantytown contains a variety of structures from shacks (“shanties”) to modern houses and from tents to travel trailers and numerous out-buildings. At present only two residents reside permanently in Shantytown while the majority of use occurs during the summer and fall months by seasonal residents and weekend visitors.

A second housing development named the Ruby Lake Estates is located adjacent to a portion of the north refuge boundary. Development is just beginning with only a few structures (mobile homes and out-buildings) present at this time. During summer and fall a few property owners occupy their sites with travel trailers.

A map depicting the general location of refuge, fish hatchery, and private structures is provided in Appendix E.

## **WILDLAND FIRE MANAGEMENT SITUATION**

### **HISTORIC ROLE OF FIRE**

#### **Pre-settlement Fires**

Historically, wildland fire caused either by natural sources of ignition or by native peoples, is believed to have been a frequent and major ecological factor in North America. Before fire suppression began fires were likely common in the summer because grass and sagebrush are highly flammable when dry. Estimates place the interval between fires for any given area in sagebrush vegetation communities between 11 and 100 years and for pinyon-juniper an interval of 10 to 30 years with severe crown fires every 200 to 300 years (Miller, 1998). These data are not specific to this area as no studies have been made to quantify the local fire history. It is known that the Western Shoshone Indians used fire when hunting to drive game animals out of the brush and to enhance seed production of basin wildrye (Casjens, 1974). These fires were not actively suppressed and likely burned for long periods of time. The number of fires that burned annually is unknown. Further, the sizes of these fires are unknown but were most likely large because the spread of the fires would have been stopped only by natural barriers and weather events which would have aided in natural suppression. It is reasonable to assume that fires originating in sagebrush could have easily been driven by wind in the meadows and marsh areas thus affecting the ecology of these habitats.

#### **Post-settlement Fire History**

Settlement of Ruby Valley began in the mid-1800s with the arrival of pioneers. By the late 1800s ranchers and farmers were established in the area. Limited fire suppression most likely began with increased settlement to protect physical developments, crops, and livestock forage. Intensive fire suppression began in the mid-1900s in northeast Nevada with the initiation of organized fire suppression. Fire season in northeast Nevada is generally June 1 through September 30, with the peak of the season occurring during August. During recent years in northeast Nevada, several large wildland fires have burned during October and November.

The wildland fire occurrence on the refuge is low (Table 2). Since 1948 a total of 27 known wildland fires have occurred on the refuge; 13 human-caused and 14 lightning-caused. When escaped prescribed fires are excluded, human-caused fires have burned 98.5 percent more acres than lightning-caused fires. From 1991 to 2000 there have been 13 wildland fires on the refuge which burned 309 acres. Four of the 13 fires were human-caused (290 acres), and nine were lightning-caused (19 acres). Lightning has ignited several additional fires in bulrush fuels of the South Marsh but these fires were extinguished naturally. These fires have been small and some have gone undetected for many months.

In the past 52 years, four large human-caused fires have occurred on the refuge. Few details are available on the 1,200 acre fire in 1948 or the 3,300 acre fire in 1961. The 1948 fire burned on steep slopes in pinyon-juniper-sagebrush vegetation. The 1961 fire occurred during a drought year and burned in grass and marsh vegetation. The 8,500 acre Shantytown fire in 1979 was started by an unattended campfire at the USFS South Ruby campground and burned in sagebrush, pinyon, juniper, and mountain mahogany on the mountain slopes, west of the county road. In this fire, about 800 acres of pinyon-juniper and shrub-steppe habitat burned on refuge land. The fire occurred after a period of drought when relative humidity and fuel moisture was low. Ambient temperatures in excess of 90°F, winds of 40 mph and steep slopes contributed to the rapid spread of the fire. The 1,918 acre Ruby Dump fire in 1996 started (human-cause suspected) at the local landfill and re-burned areas of the 1979 Shantytown fire near the refuge headquarters. This fire burned nearly 300 acres of brush and grass on the refuge.

Table 2: Summary of wildland fire history on Ruby Lake National Wildlife Refuge

Year	Human-caused		Lightning-caused	
	# of Fires	Acres	# of Fires	Acres
1948	1	1,200		
1952	1	0.1		
1960	1	Unknown		
1961	1	3,300		
1969			1	25
1979	1	800		
1975			2	27
1982			1	1
1987			1	15
1988	1	450		
1991	1	320	1	4
1993	1	626	2	14
1994	1	200		
1995			1	0.1
1996	1	285		
1997	1	5	2	0.2
1998	1	0.3		
1999	1	0.1	1	0.1
2000			2	0.2
<b>TOTAL</b>	<b>13 fires</b>	<b>7186.5 acres</b>	<b>14 fires</b>	<b>86.6 acres</b>

### Prescribed Fire History

Prescribed burning pre-dates the refuge when the land was privately owned. Baltic rush and bulrush were burned to promote plant vigor, improve species composition, and increase palatability of cattle forage (Duval, Don, Ruby Valley, pers. comm., 1980). Refuge records indicate that prescribed fire was used infrequently from 1938 to 1981. During this period a total of 41 prescribed fires were ignited. Use of prescribed fire increased significantly beginning in 1982 and continues to be used as an important vegetation management tool (Table 3).

Prior to 1958, prescribed fire was used to create open areas in the marsh (Refuge Narrative Reports). From 1958 to the present, prescribed fire has been used to restore bird nesting cover in meadows and grasslands where plant litter has become matted in addition to maintaining and restoring open areas in the marsh (Refuge Narrative Reports). Burning in the marsh, meadows and grasslands is cyclic to maintain high quality habitat. Prescribed fire has recently been used to restore native grassland vegetation in areas infested with green rabbitbrush. Green rabbitbrush displaced desired native vegetation over large areas of the refuge which resulted in the loss of valuable wildlife habitat. Burning areas infested with green rabbitbrush is generally limited to less than two applications of fire to accomplish resource management objectives.

Prescribed fires are executed when grasses and forbs are dormant. Two narrow windows exist during the spring and fall for prescribed burning. Spring burning can be conducted between late February and late April depending on weather patterns. Fall burning is conducted only after a killing frost has occurred to protect living vegetation. The fall prescribed burn window occurs during October. Wet and cold weather during November through February often precludes burning during the winter months. Summer burning is not conducted because of the impact to plant communities and wildlife.

Table 3: Summary of prescribed fire history

Year	Number of Fires	Acres Burned
1982	6	158
1984	4	176
1985	4	153
1986	6	285
1987	5	319
1988	2	42
1989	2	95
1990	3	107
1991	4	134
1992	6	315
1993	7	1,552
1994	7	300
1995	3	705
1996	6	2,010
1997	7	2,123
1998	7	2,375
1999	5	1,965
2000	3	1,040
<b>TOTAL (18 years)</b>	<b>87 fires</b>	<b>13,854 acres</b>

**FIRE MANAGEMENT RESPONSIBILITIES**

Responsibilities for the refuge fire management program reside with personnel at the Ruby Lake National Wildlife Refuge and fire staff at Sheldon-Hart Mountain NWRC. Refuge personnel are qualified in a variety of fire management positions (Appendix F). The fire management program is supported by zone and regional fire management personnel. Specific responsibilities are outlined below.

Refuge personnel have long assisted with suppression of off-refuge wildland fires. From 1990 to 2000, refuge staff have taken action on 10 fires which were on or threatening the refuge. Additionally, refuge staff, through interagency agreements with cooperating agencies, have assisted with 70 wildland fires in the refuge’s initial attack response area during the past 10 years. Refuge resources have been dispatched to wildland fires in Ruby Valley, Butte Valley, Long Valley, Mooney Basin, south Huntington Valley, and north Newark Valley.

**Regional Director/ CNO Manager**

- < Approves the Fire Management Plan.
- < Approves Wildland fire Rehabilitation Plans.

**Regional Fire Management Staff**

- < Lead fire program reviews and escaped prescribed fire reviews.
- < Provide budget and technical leadership to refuge personnel.

**Refuge Manager (Project Leader)**

- < Responsible for the overall management of the refuge and supervision of refuge personnel.
- < Serves as the Line Officer.
- < Approves prescribed fire plans.
- < Approves updates to the Fire Management Plan.
- < Prepares and authorizes WFSAs.
- < Prepares Delegation of Authority for the IC during wildland fires.

### **Zone Fire Management Officer**

- < Provides technical fire management program support to refuge personnel.
- < Reviews and inputs fire program budget requests into Firebase.
- < Maintains and inputs into the Interagency Fire Qualification System (IFQS) personnel training and qualification records.
- < Reviews and inputs fire reports (DI-1202) into the Fire Management Information System.
- < Assists with the preparation of the Wildland Fire Situation Analysis (WFSA).
- < Reviews prescribed fire plans.
- < Coordinates fire and aviation training.
- < Assists with implementation of prescribed fires

### **Wildlife Biologist**

- < Responsible for coordinating refuge fire management activities in conjunction with the zone FMO, as qualified.
- < Coordinates and directs preparedness activities.
- < Serves as the refuge Incident Commander as qualified.
- < Works with the Refuge Manager and zone FMO to plan and conduct prescribed fires.
- < Proposes and submits fire program budget, Fire Management Plan updates, and fire records/reports to the zone FMO.
- < Supervises refuge fire personnel.
- < Coordinates interagency fire program activities.
- < Serves as the refuge representative to the Operations Groups of the Elko Interagency Dispatch Center and the Ely Interagency Coordination Center.
- < Incorporates biological objectives into the Fire Management Program.

### **Prescribed Fire Burn Boss**

- < Implements approved prescribed fire plans within prescription.
- < Assists with administration and evaluation of prescribed fire projects.
- < Documents necessary information to complete DI-1202 reports.

### **Lead Range Technician (Engine Foreman)**

- < Assists in the implementation of the fire management program.
- < Serves as the crew leader for seasonal fire crew.
- < Ensures daily equipment inspections are completed and fire cache and fire equipment are maintained in a state of readiness.
- < Maintains fire records and a daily log of work project activities.
- < Assists with training.

### **Collateral Duty and Seasonal Firefighters**

- < Maintain assigned fire equipment in a constant state of readiness.
- < Accountable for and uses required personal protective equipment.
- < Maintain physical condition and meet minimum qualifications annually under the Work Capacity Test.
- < Participate in refuge resource management programs as directed.

### **Incident Commander**

The Incident Commander (IC) uses appropriate suppression tactics to accomplish goals and objectives. All past fires on the refuge have been Type IV or lower fires, have not extended beyond the first burning period, and have been suppressed using refuge and local resources. A specific written Limited Delegation

of Authority (Appendix G) will be provided to the IC only for Type I or II fires. Major duties of the IC are given in NWCG Fireline Handbook, including:

- < Briefs subordinates and direct and monitor their actions.
- < Ensures that safety standards identified in the Fire Orders, the Watch Out Situations, and agency policies are followed at all times.
- < Personally scouts and communicates with others to be knowledgeable of fire conditions, fire weather, tactical progress, safety concerns and hazards, condition of personnel, and needs for additional resources.
- < Orders resources to implement the management objectives for the fire.
- < Informs appropriate dispatch of current situation and expected needs.
- < Utilizes minimum impact suppression tactics when possible.
- < Assures aviation safety is maintained to the highest standards.
- < Completes S209 report as needed.

### **Initial Attack Teams**

Initial attack teams will consist of fully-qualified firefighters including those on their first fire, and well-qualified leadership. Teams will be prepared and equipped with hand and power tools as needed and will be dispatched with a day's supply of food and water, so they can continue work for 24 hours without additional support.

Personnel participating in wildland fire suppression activities on National Wildlife Refuge System land or cooperator's lands will meet qualifications requirements established in the National Wildland Fire Coordination Group (NWCG) Wildland and Prescribed Fire Qualification System Guide (PMS 310-1).

### **INTERAGENCY OPERATIONS**

Cooperative agreements with various federal and state agencies generally provide that resources of each agency are available to assist in initial attack efforts. Ruby Lake National Wildlife Refuge works cooperatively on fire management activities with federal and state agencies including the BLM (Elko and Ely Field Offices), the USFS (Humboldt-Toiyabe National Forests), and the NDF (Northern Region) under the "Cooperative Fire Protection Agreement Between the United States Department of the Interior, Bureau of Land Management; United States Department of Agriculture, Forest Service; and the Nevada Division of Forestry" (Appendix H). The USFWS is represented by the BLM in the current version of the Agreement (2000).

The refuge is serviced by two interagency dispatch centers. The Elko Interagency Dispatch Center; covers lands in Elko county and that portion of Ruby Valley in White Pine County. The Ely Interagency Coordination Center covers lands in White Pine County. The refuge is a member of the EIDC Board of Directors. The Wildlife Biologist participates in the EIDC Operations Group which consists of agency FMOs. This group oversees the day-to-day operations of the EIDC and interagency fire business in the dispatch area. Similar formal groups have not been established for the EICC, however, the Wildlife Biologist participates in coordination meetings with agency FMOs and other cooperators in the EICC dispatch area.

Under the terms of the Cooperative Fire Protection Agreement red-carded refuge personnel and fire suppression equipment are available for initial attack on wildland fires occurring outside of the refuge. Refuge fire suppression resources are dispatched directly by either EIDC or EICC depending on the location of the fire and contingent upon availability. Both dispatch centers utilize the "closest forces" concept when dispatching resources to the detected ignition regardless of land ownership. Red-carded collateral duty refuge personnel will be available for initial attack on all fires and extended attack on a fire-by-fire basis with approval by the Refuge Manager or as directed by the Secretary of the Interior, the USFWS Director, or the USFWS Pacific Region Director. Dedicated refuge fire personnel will be

available for initial attack, extended attack, and fire assignments.

Ruby Lake National Wildlife Refuge will use the Incident Command System (ICS) as a guide for fireline organization. Qualifications for individuals are per DOI Wildland Fire Qualifications and Certification System, part of NIIMS and NWCG PMS 310-1. Depending on fire complexity, some positions may be filled by the same person.

#### **PROTECTION OF SENSITIVE RESOURCES**

Archeological, cultural, and historic resources have been identified through numerous surveys conducted on the refuge. Information gained from surveys will be utilized in developing prescribed fire plans and wildland fire suppression tactics. Wildland fires present a threat to the remaining historical structures that are located on the refuge. Appropriate measures will be taken to protect these structures during wildland fire suppression efforts. Prescribed fire plans will outline protection measures to be taken to preserve these structures.

The use of earth moving equipment poses a threat to cultural resources found below the ground surface. The use of earth moving equipment for suppression activities must be approved by the Refuge Manager or designee, except in cases of threats to life and/or property. The possible presence of cultural resources will be considered in the approval process. Whenever possible, efforts will be made to contact the Regional Archaeologist to discuss the consequences of the use of earth moving equipment prior to the deployment of heavy equipment on the fire.

The Regional Archaeologist and/or his/her staff will work with fire staff, project leaders, and incident commanders to ensure that cultural resources are protected from fire and fire management activities. The "Request For Cultural Resource Compliance" form (RCRC, attached) will be used to inform the Regional Archaeologist of impending activities, thereby meeting the regulations and directions governing the protection of cultural resources as outlined in Departmental Manual Part 519, National Historic Preservation Act (NHPA) of 1966, Code of Federal Regulations (36CFR800), the Archaeological Resources Protection Act of 1979, as amended, and the Archaeological and Historic Preservation Act of 1974. The NHPA Section 106 clearance will be followed for any fire management activity that may affect historic properties (cultural resources eligible to the National Register of Historic Places).

Impacts to archaeological resources by fire resources vary. The four basic sources of damage are (1) fire intensity, (2) duration of heat, (3) heat penetration into soil, and (4) suppression actions. Of the four, the most significant threat is from equipment during line construction for prescribed fires or wildfire holding actions (Anderson 1983).

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

#### **Wildland Fires**

1. Minimum impact fire suppression tactics will be used to the fullest extent possible.
2. Resource Advisors will inform fire suppression personnel of any areas with cultural resources. The Resource Advisor should contact the Regional Archaeologist and/or his/her staff for more detailed information.
3. Foam use will be minimized in areas known to harbor surface artifacts.
4. Mechanized equipment should not be used in areas of known cultural significance.
5. The location of any sites discovered as the result of fire management activities will be reported to the Regional Archaeologist.
6. Rehabilitation plans will address cultural resources impacts and will be submitted to the Regional Archaeologist using the RCRC.

## Prescribed Fires

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

## **WILDLAND FIRE ACTIVITIES**

Fire program management describes the operational procedures necessary to implement fire management at Ruby Lake National Wildlife Refuge. Program management includes: fire prevention, preparedness, emergency preparedness, fire behavior predictions, step-up staffing plan, fire detection, fire suppression, minimum impact suppression, minimum impact rehabilitation, and documentation.

All fires not classified as prescribed fires are wildland fires and will be suppressed. Natural ignitions will not be managed for resource benefit on Ruby Lake National Wildlife Refuge. The IC will select the appropriate suppression tactic using the following as a guide:

1. On fires in flooded emergent marsh or on islands the primary suppression strategy will be monitoring.
2. On low intensity fires (flame lengths less than 4 feet, low rates of spread) in dry emergent marsh and upland areas the primary suppression strategy will be direct attack with engines. This is the most common type of wildland fire on the refuge.
3. If conditions occur that sustain higher intensity fires (flame lengths greater than 4 feet) the primary suppression strategy will be indirect attack using a burn-out tactic from natural (e.g. spring channels) or human-made (e.g. gravel roads) fire barriers. Fire barriers should be selected to safely suppress the fire, minimize resource damage, and be cost efficient. This is an uncommon type of wildland fire on the refuge.

Fire occurrence records (BLM, USFS, and NDF) show that the local fire season is typically from mid-June through September with the majority of wildland fires occurring during August. Depending on the specific weather patterns of any particular year the seasons may be shorter or longer and, therefore, may start earlier or last longer.

### **FIRE MANAGEMENT STRATEGIES**

Fire suppression strategies for Ruby Lake National Wildlife Refuge will place primary emphasis on a fire suppression program that is capable of suppressing wildland fires quickly before significant resource damage can occur. A wildland fire occurring on the refuge not only threatens refuge resources but may threaten resources on adjacent public and private lands.

All unplanned wildland fires will be suppressed in a prompt, safe, and cost-effective manner to produce fast, efficient action with minimum damage to resources using an appropriate management response. Suppression strategies will be unique to each incident and depend on safety considerations, weather, fuel type and condition, potential suppression costs, availability of resources, and location of fire relative to facilities, structures, cultural and historical resources, and critical wildlife habitat.

Although resource impacts of suppression alternatives must always be considered in selecting a fire suppression tactic, resource benefits will not be the primary consideration. Appropriate management responses will be taken to ensure firefighter safety, public safety, and protection of the resources, in that order.

Critical protection areas, such as the refuge and hatchery buildings and structures, private property, and critical wildlife habitat will receive priority consideration in fire control planning efforts. In all cases, the primary concerns for all fire suppression personnel shall be safety and, if needed, all individuals not involved in the suppression effort will be advised to evacuate.

Suppression strategies should be applied so that the equipment and tools used to meet the desired objectives are those that inflict the least impacts upon the natural, cultural, and historical resources. Minimum impact suppression tactics will be employed to protect all resources. When natural fire breaks

do not exist, fire line construction will be conducted in such a way as to minimize long-term impacts to resources. Natural fire breaks include spring channels, roads, and areas where dense vegetation transitions to sparse vegetation.

Sites impacted by fire suppression activities or by the fire will be restored or rehabilitated as appropriate, based on an approved course of action for each incident. Regional USFWS archeological personnel will be consulted prior to any implementation of rehabilitation. A Emergency Fire Rehabilitation Plan will be prepared as needed.

**PREPAREDNESS**

Preparedness is the work accomplished prior to fire occurrence to ensure that the appropriate management response, as directed by the Fire Management Plan, can be fully accomplished. Preparedness activities include: budget planning, equipment acquisition, equipment maintenance, dispatch (initial attack, extended attack), equipment inventory, and personnel qualifications, fitness, and training. The preparedness goal is to have a well trained and equipped fire management organization to manage initial attack of fires on and threatening the refuge. Preparedness efforts are to be accomplished in time frames outside the normal fire season dates to the extent possible (Table 4).

Table 4: Annual fire management preparedness activities

Activity	J	F	M	A	M	J	J	A	S	O	N	D
Update interagency agreements/AOPs			X	X								
Complete training needs analysis	X											
Inventory cache and equipment				X						X		
Procure supplies and equipment	X	X	X		X						X	X
Prepare pre-season risk analysis			X									
Review step-up and dispatch plans					X							
Annual medical examinations/Fitness testing				X	X							
Annual refresher training				X	X	X						
Complete pre-season equipment preparation					X							
Draft fire budget (as needed) and zero fire accounts							X	X				
Service and winterize equipment					X						X	
Review and update FMP	X											X

**HISTORICAL WEATHER ANALYSIS**

A specific wildland fire season is generally not evident on the refuge due to the low frequency of wildland fires. Summer lightning can be frequent and intense, however, few ignitions occur. Wildland fires have been ignited by lightning on the refuge but have burned only briefly. Most fires have not spread due apparently to high live fuel moisture. The low frequency of fires and minimal fire spread during the fire season suggest a low wildland fire risk on the refuge.

An analysis of weather data (1992-2000) from the Ruby Lake RAWS (Latitude 40:10:20, Longitude 114:29:0, elevation 5970 ft., WIMS number 260312) located in a meadow adjacent to the marsh on the refuge appears to validate this observation (Appendix I). Maximum burn index (BI) values during the traditionally accepted fire season (June through September) at the 97<sup>th</sup> percentile fall mostly below 90. Maximum energy release component (ERC) values at the 97<sup>th</sup> percentile fall below 21. Ruby Lake RAWS data indicate higher BI and ERC values occur on the refuge during the months of April, May,

October, and November than during the summer months.

In contrast, an analysis of data from the Spruce Mountain (BLM) RAWS (Latitude 40:26:25, Longitude 114:48:40, elevation 6100 ft., WIMS number 260306) in sagebrush and grass located 40 miles northeast of the refuge indicates a different set of BI and ERC values during the accepted fire season (Appendix I). Maximum BI values during the fire season at the 97<sup>th</sup> percentile fall mostly above 115. Maximum ERC values during the fire season at the 97<sup>th</sup> percentile fall mostly above 25. Analysis of weather data from this station indicates a fire season from June through September with a peak of activity in August. Numerous large wildland fires in the vicinity of the refuge have occurred during the fire season as indicated by the Spruce Mountain RAWS data.

### **FIRE PREVENTION**

An active fire prevention program will be conducted in cooperation with other agencies to protect human life and property, prevent damage to cultural and historical resources or physical facilities, and protect wildlife habitats. Prevention actions initiated by the refuge will be coordinated with cooperating agencies.

A program of internal and external education regarding potential fire danger will be implemented. Bulletin board materials and handouts may be utilized to increase visitor and neighbor awareness of fire hazards. Information provided to the public will discuss the beneficial effects of prescribed fires as opposed to unwanted human-caused fires, with emphasis on creating an understanding about the potential severity of human-caused wildland fires and how to prevent them.

It is essential that employees be well informed about fire prevention and the objectives of the refuge's fire management program. Further, employees must be kept informed about changes in existing conditions throughout the fire season.

During periods of extreme or prolonged fire danger, emergency restrictions regarding refuge operations or area closures may become necessary. Such restrictions, when imposed, will be generally consistent with those implemented by cooperators. Closures will be authorized by the Refuge Manager.

### **STAFFING PRIORITY LEVELS**

The Ruby Lake National Wildlife Refuge Step-up Plan identifies staffing classes and prescribes actions to be taken based on fire danger rating indices (Appendix J). The Step-up Plan uses the daily fire danger rating indices (BI) from the Spruce Mountain RAWS because these data represent fire danger conditions in local fuel types where a wildland fire is most likely to occur. The most typical initial attack response by refuge personnel will be to a wildland fire threatening the refuge rather than to a fire on the refuge. The Step-up Plan will guide fire preparedness actions and the use of emergency preparedness funding only for actions taken to protect natural resources, structures, and facilities on the refuge.

The refuge has not historically initiated step-up actions in response to very high or extreme levels of fire danger because of the low occurrence of wildland fires on the refuge and because the refuge does not have a fire crew. In general, red-carded refuge personnel have detected and responded quickly to wildland fires. There has not been a need historically to implement public use restrictions because the majority of public use occurs in the marsh during the peak fire danger period. Upland areas are not open to the public, thus the potential for human-caused fires in these areas is minimal. In general, restrictions on refuge operations and public use are not necessary but the Refuge Manager reserves the right to implement such restrictions when needed.

## **Training**

Departmental policy requires that all personnel engaged in fire suppression and prescribed fire duties meet the standards set by the National Wildfire Coordinating Group (NWCG). Ruby Lake National Wildlife Refuge will conform strictly to the requirements of the NWCG PMS 310-1 guidelines.

Basic wildland fire training refreshers are required annually for red-carded firefighters. Records are maintained in refuge files and in a centralized database. Training is available from local federal and state agencies. Costs of approved training will be covered by the USFWS (Pacific Region Office). On-the-job training is encouraged and will be conducted at the field level. The use of fire qualification task books will be used to document fire experience of trainees. The zone FMO will coordinate fire training needs with those of other refuges within the zone and the Regional Office.

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

All personnel over the age of 40 or newly hired and involved in arduous fire management activities are required to complete an annual physical fitness examination. Standard forms and procedures required by the USFWS will be used and followed. The cost of authorized examinations will be covered by the USFWS. Results of the examinations will be filed with the regional Division of Personnel.

Personnel performing fire management duties will maintain a high level of physical fitness. This requires successful completion of a fitness pack test that conforms to fitness standards currently authorized by the USFWS. Refuge employees performing fire management duties will meet the arduous fitness level, except where an exemption is granted to personnel for a moderate fitness level.

## **Supplies and Equipment**

One permanent fire supply cache is maintained at the Ruby Lake National Wildlife Refuge (Appendix K). The cache is located at the refuge headquarters. Issue of supplies and equipment will be coordinated through the Wildlife Biologist or Lead Range Technician. At the conclusion of the fire management season the cache will be inventoried and replacement supplies procured.

Refuge fire equipment is located at the refuge headquarters (Appendix K). Engines are the primary initial attack resource on the refuge because of short response times and routes of access. Heavy equipment is available, however it will only be used when no other alternatives exist and must be authorized by the Refuge Manager or Refuge Resource Advisor. Refuge engine resources consist of two type 6 engines and one type 4 water tender. The type six engines are stocked with standard suppression equipment and supplies. Water capacities on the type six engines are 200 and 250 gallons.

Additional equipment and supplies are available through cooperators and the interagency cache system. Requests for additional personnel and equipment are made through the EIDC. The IC will place all resource orders to EIDC via radio or cellular phone following standard supply ordering procedures. Personnel from cooperating agencies assigned to refuge wildland fires will be qualified as specified in the Wildland and Prescribed Fire Qualification System Guide (PMS 310-1).

## **DETECTION**

The refuge relies on refuge and hatchery personnel, visitors, and neighbors to detect and report wildland fires on or threatening the refuge. The refuge Step-up Plan specifies patrols may be conducted by refuge personnel during periods of extreme (Staffing Class 5) fire danger when specific conditions are met.

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

**COMMUNICATIONS**

All vehicles used in fire management activities are equipped with mobile radios. Radios contain refuge and cooperator frequencies and are capable of communicating with local wildland fire suppression resources (Appendix L). All personnel engaged in wildland fire suppression and prescribed fire activities are issued hand-held radios. Hand-held radios are capable of communicating with local wildland fire suppression resources (Appendix L)

Ruby Lake National Wildlife Refuge maintains Radio Frequency Authorizations (RFA) with the BLM (Elko and Ely Field Offices) and the NDF for the use of radio frequencies not assigned to the refuge (Appendix M). An RFA with the USFS (Humboldt-Toiyabe National Forest) has been submitted for approval.

**PRE-ATTACK PLAN**

Upon discovery or report of a fire, all subsequent actions will be based on the Ruby Lake National Wildlife Refuge Wildland Fire Dispatch Plan (Appendix N) and the following:

1. The Incident Commander (IC) will size-up and coordinate suppression actions.
2. The IC and fire personnel will provide for public safety.
3. Considering 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 should be predicted, as well as the total suppression force required to initiate effective containment action at the beginning of each burning period.
4. The IC will assess the need for law enforcement personnel for traffic control, investigations, evacuations, etc.
5. The IC will document decisions and complete the fire report (DI-1202).
6. For Type I and II fires only, a written Limited Delegation of Authority will be invoked (Appendix G). Once a written Limited Delegation of Authority has been authorized the IC will make the final decisions pertaining to the fire.

**FIRE MANAGEMENT UNITS**

The entire Ruby Lake National Wildlife Refuge will be considered as one fire management unit for suppression purposes. The refuge is divided into three prescribed fire management units (Table 5). The units were established using habitat types under the assumption that each habitat type presents its own unique resource values, resource management objectives, fire behavior, and prescription parameters.

Table 5: Prescribed fire units

Habitat	Fuel type	Acres	% of Total	Fuel Model
Meadow/Grassland	Short Grass	7,217	27.8	1
Emergent Marsh	Tall Grass	8,482	32.7	3
Shrub-steppe	Brush	10,251	39.5	6

Due to a limited number of red-carded refuge personnel, relatively small land management parcels, long cooperator response times, valuable natural resources, and values at risk on neighboring public and private lands, this Plan does not recommend wildland fire managed for resource benefit as an option for any of the prescribed fire units. Wildland fires will be suppressed using the appropriate management response. Prescribed fire will be used to meet resource management objectives.

## Vegetation Type

### Wetland

Wetland habitat includes intermittently flooded alkali playa and seasonal and permanent marsh. Annual snow pack on the Ruby Mountains influences the amount of wetland acreage on the refuge each year. During low to moderate snow pack periods, alkali playas are dry. In high snow pack periods, the playas are shallowly flooded in the spring and are dry by mid to late summer. The alkali playa is typically devoid of vegetation except during prolonged dry periods. During the recent severe drought, grasses pioneered some areas of the South Marsh alkali playa and these areas resembled a grassland. The permanent marsh includes both shallow and deep water areas.

Seasonal and permanent emergent marsh is dominated by hardstem bulrush (*Scirpus acutus*) with minor, but increasing amounts of cattail (*Typha* spp.). Deeper areas of the permanent marsh preclude growth of emergent vegetation which creates a mosaic of vegetation and open water. Scattered throughout the marsh are islands which contain vegetation similar to meadows, grasslands, and shrub-steppe.

Fuel loads in the vegetated alkali playa are moderate. Fuel loads in the emergent marsh are moderate to high. Fuel loads on the islands are moderate.

### Meadow and Grassland

Meadows, although not flooded, are classified as wetlands because of their hydrophytic soils and the presence wetland plant species. However, for the purpose of this plan, meadows are combined with grasslands because they resemble grasslands structurally, they provide similar wildlife habitat, and fire behavior in meadows resembles that in grasslands. Fuel loads are moderate to high in both meadows and grasslands.

Meadows are the interface between marsh and grasslands. Meadows are dominated by Baltic rush (*Juncus balticus*) but include a variety of sedge, grass, and forb species. Grasslands occur at drier sites than meadows and their location is a function of elevation. Grasslands are dominated by basin wildrye (*Elymus cineris*), bluebunch wheatgrass (*Agropyron spicatum*), creeping wildrye (*Elymus triticoides*), Western wheatgrass (*Agropyron smithii*), intermediate wheatgrass (*Agropyron intermedium*), and foxtail barley (*Hordeum jubatum*). Some grasslands are infested with dense stands of green rabbitbrush (*Crysothamnus viscidiflorus*) and grassland plant species have been displaced. Fuel loads in the rabbitbrush infested grasslands are high. The use of prescribed fire has been successful in killing old and decadent rabbitbrush plants. In these areas grasslands have been restored from existing native seed banks.

### Shrub-steppe

Shrub-steppe vegetation is located at higher elevations than meadows and grasslands and accounts for the largest amount of habitat type on the refuge excluding wetlands. The west side of the refuge is dominated by sagebrush. The east side is dominated by greasewood on lower elevation alkaline soil sites and by sagebrush on higher elevation gravely well drained sites. Shrub-steppe areas are dominated by woody shrub species but contain grass and forb plant species. Fuel loads are low to moderate in this vegetation type.

Shrub species in the sagebrush-dominated uplands include big sage (*Artemesia tridentata*), black sage (*Artemesia nova*), silver sage (*Artemesia cana*), green rabbitbrush (*Crysothamnus viscidiflorus*) and serviceberry (*Amalanchier florida*). Grass species include basin wildrye (*Elymus cineris*), bluebunch wheatgrass (*Agropyron spicatum*), crested wheat (*Agropyron cristatum*), Indian ricegrass (*Oryzopsis hymenoides*), needleandthread (*Stipa comata*), Idaho fescue (*Festuca idahoensis*), Sandberg bluegrass (*Poa sanbergii*), and a variety of other less common species. Forb species include indian paintbrush (*Castilleja angustifolia*), larkspur species (*Delphinium* spp.), phlox species (*Phlox* spp.), globe mallow

species (*Sphaeralcea* spp.), and a variety of other less common species.

Shrub species in the greasewood-dominated uplands include greasewood (*Sarcobatus vermiculatus*), green rabbitbrush (*Crysothamnus viscidiflorus*), shadscale (*Atriplex confertifolia*), four-winged saltbush (*Atriplex canescens*), budsage (*Artemisia spinescens*), and spiny hopsage (*Grayia spinosa*). Grass species include basin wildrye (*Elymus cineris*), bluebunch wheatgrass (*Agropyron spicatum*), and saltgrass (*Distichlis spicata*).

Scattered juniper (*Juniperus osteosperma*) and pinyon pine (*Pinus monophylla*) occur in the shrub-steppe zone.

## **Fuel Types**

**Fuel Model 1 Short Grass** - describes areas dominated by short grass, such as creeping wildrye. This fuel model occurs between the marsh and the shrub-steppe .

**Fuel Model 3 Tall Grass** - describes areas dominated by tall grass or grasslike vegetation averaging 3 feet in height. This includes cured stands of bulrush and areas of basin wildrye. This fuel model occurs in dry emergent marsh areas and in grassland and shrub-steppe areas.

**Fuel Model 6 Shrub** - describes areas where the shrub layer carries the fire at windspeeds greater than 8 miles/hour. This fuel model occurs in extensive upland areas containing sagebrush, greasewood, and several other species of desert shrub. Little fine dead fuels may be present, and the shrub layer will only carry a fire under moderate to severe wind speeds.

## **Fire Behavior**

Fire behavior is dependent on many factors. Some of the most important influences are relative humidity, air temperature, fuel type, fuel moisture, windspeed, slope, aspect, time of day, and season. On-site predictions of estimated fire behavior can be made with the above inputs and provide outputs of rate of spread, fireline intensity, heat per unit area, and flame length through the use of the BEHAVE software program developed for this purpose.

Wildland fire can be dangerous and unpredictable during any season of the year, however the months of July, August, and September typically have the potential for the most severe fire behavior and the most likely period of occurrence. During these months, cool season grasses and other plants have cured out, relative humidity is usually low, temperatures are the highest of the year, wind speeds are typically high in the afternoon, and ignition sources (lightning and visitors) are common.

**Fuel Model 1 Short Grass** - Fires are surface fires that move rapidly through cured grass and residual plant material. Rate of spread of 78 chains/hour with flame lengths of 4 feet are possible under moderate conditions.

**Fuel Model 3 Tall Grass** - Fires are more intense than in fuel model 1. Rates of spread are high under the influence of wind. Rate of spread of 104 chains/hour with flame lengths of 12 feet are possible under moderate conditions.

**Fuel Model 6 Shrub** - Fires carry through the shrub layer under moderate winds (greater than 8 miles/hour). Fire drops to the surface layer at lower wind speeds or openings in the stand. Rate of spread of 32 chains/hour with flame lengths of 6 feet are possible under moderate conditions.

## **SUPPRESSION TACTICS**

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

Personnel and equipment must be efficiently organized to suppress fire effectively and safely. All wildland fires will be supervised by a qualified IC. The IC will be responsible for all management aspects of the fire. All resources will report to the IC either in person or by radio upon arrival to the fire and prior to initiation of suppression actions.

In the unlikely event of an extended attack situation on Type I and II fires, a written Wildland Fire Situation Analysis (WFSA) will be provided to the IC by the Refuge Manager (Appendix O). The zone FMO will be notified of the situation and will be available to assist in preparation of the WFSA.

Natural and human-made barriers will be used to the maximum extent possible for anchor points and containment lines including: existing roads and trails, bodies of water, and areas of non-continuous light fuels.

Vehicle access to normally closed areas of the refuge will be made using existing roads and trails when possible. When off-road travel is determined to be necessary, vehicle access will be allowed as directed by the IC. Off-road travel by engines will not be allowed in meadows and near springs and spring channels because of saturated soils.

Heavy equipment such as crawlers, tractors, dozers, or graders will not be used within the refuge boundaries unless their use is necessary to prevent fire from destroying or damaging privately-owned property off-refuge, federal and state government buildings and structures, and cultural and historic resources. The use of any heavy equipment requires approval from the Refuge Manager or Refuge Resource Advisor.

Burnouts may be used to stabilize and strengthen primary control lines.

The use of aerial retardant will be allowed only in non-wetland areas and no closer than 100 yards to wetlands unless needed to protect personnel or structures that are at risk.

## **Suppression Conditions**

Wildland fires ignited in flooded emergent marsh are difficult to access with fire suppression equipment and will be monitored by suppression personnel. If fires in flooded marsh spreads to dry areas of the emergent marsh or uplands appropriate management response will be taken.

Wildland fires occurring in dry emergent marsh, grassland, and shrub-steppe areas are generally accessible by engines but access routes should be scouted prior to entry. Wildland fires occurring in meadows are generally not accessible. Appropriate management response will be taken depending on current and expected fire behavior.

Need specific measures that may be taken on structures; i.e., prevention and/or trigger points that would initiate actions.

## **Structure Protection Tactics**

### *Private Inholdings and Structures*

There are no private inholdings on the refuge that contain structures. Private structures on private property are located near the refuge boundary at three locations. Shantytown is separated from the refuge by the county road. The road would be used as a control line

for burn-out operations as needed. One lot of the Ruby Lake Estates, on the north refuge boundary, contains one out-building. The vegetation in the this area of the refuge is dense sagebrush and grass. The vegetation on the Ruby Lake Estates includes grass and sparse sagebrush. A Wildland-Urban Interface project proposal has been prepared and submitted. The project would create a green strip between the north refuge boundary and adjacent private property. Depending on the fire behavior and rate of spread, burn-out operations would be conducted from the green strip. One summer house is located approximately within one-quarter mile of the refuge headquarters on private property. Vegetation on the property consists of grass and sparse sagebrush. Direct attack using light engines would be used to suppress wildland fire near this structure.

#### *USFWS and Gallagher Fish Hatchery Structures*

A plow-line fire break is constructed annually around refuge and hatchery headquarters structures. A plow-line fire break is also constructed on the north side of the South Ruby campground. Burnout operations will be conducted from the plow lines as needed to protect refuge and hatchery facilities. The refuge and hatchery facilities are equipped with a fire hydrant system.

Other refuge structures will be assessed annually by refuge personnel for hazardous fuels. Annual hazard fuel reduction to create buffers will be conducted as needed. Fuel reduction methods will include hand-clearing and mowing.

#### **Wildland Fire Situation Analysis**

For Type I and II wildland fires that cannot be contained in one burning period, a written WFSA will be prepared. For Type I and II fires requiring extended attack, the Refuge Manager or designee and the IC, in conjunction with the zone FMO, will prepare the WFSA. Approval of the WFSA resides with the Refuge Manger or designated refuge personnel.

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

For fires requiring extend attack public safety will require coordination among refuge staff and the IC. Notices will be posted to warn visitors, traffic control will be conducted where smoke crosses roads, and areas of the refuge will be closed. Every attempt will be made to utilize natural and constructed barriers, including changing fuel complexes, in the control of wildland fire. Rehabilitation and restoration efforts will concentrate on the damages done by suppression activities rather than on the burned area itself.

#### **Aircraft Operations**

Aircraft may be used in all phases of fire management operations. All aircraft will be Office of Aircraft Services (OAS) or USFS approved.

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

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

## **EMERGENCY STABILIZATION AND REHABILITATION**

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 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. Consider and plan more extensive rehabilitation or revegetation to restore sensitive impacted areas.

If revegetation or seeding is necessary, only native plant species will be used.

If Emergency Stabilization and Rehabilitation (ESR) measures are needed or if rehabilitation is needed to reduce the effects of a wildland fire then the refuge can request appropriate funding through the burned area ESR fund. The ESR fund is administered through the Service's ESR coordinator at the National Interagency Fire Center.

Fire rehabilitation will be as prompt as possible to prevent erosion and spread of non-native plants. A fire rehabilitation plan will be developed by refuge personnel and submitted to the Regional Fire Management Coordinator for review within 90 days of the unplanned ignition being declared out.

## **REQUIRED REPORTING**

The IC will be responsible for documenting decisions and completing fire reports (e.g., ICS-209 on Type I and II fire, DI-1202 on all fires). The zone FMO will be responsible for any additional required reports.

## **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 IC.

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 and trained in fire investigation protocols.

Personnel and services of other agencies may be utilized to investigate wildland fire arson or fire incidents involving structures. Wildland fire investigations can be requested from the NDF. Requests for investigation are made through the EIDC.

For all human-caused wildland fires where responsibility can be determined, trespass actions will be taken to recover the cost of damage to resources or improvements and to recover the costs of suppression.

## PRESCRIBED FIRE ACTIVITIES

### PRESCRIBED FIRE PROGRAM GOALS

Prescribed fire can be a useful tool for restoring and maintaining natural conditions and biological processes at Ruby Lake National Wildlife Refuge. The goals of the prescribed fire program are to: maintain and restore the ecological processes, vitality, and diversity of ecosystems, improve wildlife habitat, remove or reduce non-native species, reduce hazard fuels, and conduct research. Specific management needs for the refuge as a whole and for specific areas will be determined annually. Specific burn objectives, fire frequency rotation, firing methodology, and prescriptions will vary from year to year. Prescribed fire burn plans will be updated to reflect any variations.

Prescribed burning pre-dates the refuge when the land was privately owned. Baltic rush and bulrush were burned to promote plant vigor, improve species composition, and increase palatability of cattle forage (Duval, Don, Duval Ranch, Ruby Valley, pers. comm., 1980). Refuge records indicate that prescribed fire was used only infrequently from 1938 to 1957. Use of prescribed fire increased significantly beginning in 1958 and continues today as an important vegetation management tool.

Prior to 1958, prescribed fire was used mostly to create open areas in the emergent marsh. From 1958 to the present, prescribed fire has been used to restore bird nesting cover in meadows and grasslands where plant litter has become matted, in addition to maintaining and restoring open areas in the emergent marsh. Burning in marsh, meadows, and grasslands is cyclic because vegetation regrows in the burned areas. Repeated burning is required in these areas to maintain desired habitat conditions. Prescribed fire has also been used recently to restore native grassland vegetation in areas infested with green rabbitbrush. Green rabbitbrush is a native shrub but occurs in very low densities and is adapted to pioneering in areas with soils sensitive to disturbance. With the introduction of livestock grazing on refuge lands, it has invaded and expanded in grasslands and shrub-steppe areas through repeated soil disturbance. Expanding stands of green rabbitbrush displaced desired native vegetation which resulted in the loss of valuable wildlife habitat. Restoration of the grasslands has required as few as two applications of fire in areas infested with green rabbitbrush.

During the last 10 years, prescribed fire has been used annually on an average of approximately 1,250 acres. During this 10-year period, the total acres burned annually using prescribed fire ranges from 100 to 2,500 acres. Total acreage burned annually has increased since 1991 with a corresponding decrease in grazing. Wet weather or lack of qualified fire personnel precluded executing planned prescribed fires during some years. The Refuge Habitat Management Plan (1997) identifies a need for manipulation (burning, haying, or grazing) of upland vegetation on a range of 1,300 to 3,000 acres annually to accomplish resource management objectives. The Habitat Management Plan recommends using prescribed fire to treat a minimum of 1,300 upland acres annually under current vegetation management strategies. Prescribed fire needs in the emergent marsh have not been specified on an annual basis. The total acreage burned annually will increase when prescribed burning is conducted in emergent marsh areas. Further, total acreage may increase if decreases occur in the use of alternative vegetation management strategies in uplands.

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

- < Conduct a vigorous prescribed fire program using the highest professional and technological standards;

- < Efficiently accomplish resource management objectives through the application of prescribed fire;
- < 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 advancements;
- < Prepare prescribed fire plans with review by zone fire personnel and approval by the Refuge Manager.
- < Execute prescribed fire projects with an adequate number of qualified personnel to safely conduct the burn as well as to mop-up.

Prescribed fire complexity on the refuge will be determined for each prescribed fire project using the fire complexity analysis table from FIREBASE. Complexity ratings for prescribed fire projects on refuge range from low complexity to moderate complexity. Complexity is increased with burn unit size, location, ignition sequence, and burn team size.

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

### **FIRE MANAGEMENT STRATEGIES**

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

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

Prescribed fire burn plans will include components such as a GO/No-Go Checklist, contingency actions to be taken in the event the prescription is exceeded, and the need for alerting neighbors and appropriate public officials to the timing and the planning of the burn.

Monitoring can assist managers in documenting success in achieving overall programmatic objectives and limiting occurrence of undesired effects. Fire monitoring will be used to evaluate the degree to which prescribed fire objectives are accomplished.

### **PRESCRIBED FIRE PLANNING**

#### **Annual Activities**

An annual fire summary report will be completed by refuge fire personnel. The report will contain the number of fires by type, acres burned by fuel type, cost summary, personnel utilized, and fire effects.

Prescribed fire program activities will be reviewed annually by refuge personnel (Table 6). 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 Manager to determine if such alterations warrant a re-approval of the plan.

Prescribed fires are executed when grasses and forbs are dormant. Two narrow windows exist during the spring and fall for prescribed burning. Spring burning can be conducted during late March through late April. During years with dry winters prescribed fires can be executed from late February to mid-April. Fall burning is conducted only after a killing frost has occurred to protect living vegetation. The fall prescribed burn window occurs during October. Wet and cold weather during November through February often precludes burning during the winter months. Summer burning is not conducted because of the impact to nesting and feeding birds.

Table 6: Annual prescribed fire program activities on Ruby Lake National Wildlife Refuge

Activity	J	F	M	A	M	J	J	A	S	O	N	D
Prepare prescribed fire plans		X						X				
Prepare risk analysis			X									
Execute prescribed fires			X	X						X		
Conduct post-fire and fire effects monitoring				X			X	X		X		
Prepare prescribed fire project reports											X	X
Prepare prescribe fire program budget	X	X										

**Management Unit Objectives**

The objectives of prescribed fire program at the Ruby Lake National Wildlife Refuge are to:

1. Remove matted vegetation from nesting habitats.
2. Kill green rabbitbrush in native grassland areas.
3. Create open areas in emergent marsh vegetation.
4. Remove decadent vegetation in woody-riparian and shrub-steppe areas.
5. Remove residual hay from hay meadows as needed.

This Plan calls for full suppression of all wildland fires for each of the units of the refuge. Any prescribed fire outside prescription will be designated a wildland fire and will be appropriately suppressed.

**Prescribed Fire Plan**

Refuge personnel will conduct a field reconnaissance of the proposed burn location to discuss objectives, special concerns, and gather all necessary information to write the burn plan. After completing the reconnaissance, the Wildlife Biologist or the Lead Range Technician will write the prescribed fire plan.

All prescribed fire burn plans will be reviewed by zone fire personnel and approved by the Refuge Manger. The prescribed fire burn plan is a site specific action plan describing the purpose, objectives, prescription, and operational procedures needed to prepare and safely conduct the burn. The treatment area, objectives, constraints, and alternatives will be clearly outlined. No prescribed fire will be ignited unless all prescriptions of the plan are met. Fires not within those parameters will be suppressed. Prescribed fire burn plans will follow the format specified in the Fire Management Handbook (USFWS).

The term “burn unit” refers to a specific tract of land to which a prescribed fire burn plan applies.

### **Strategies and Personnel**

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

Weather and fuel moisture conditions will be monitored closely in burn units to determine when the prescription criteria are met. A belt weather kit may also be utilized to augment monitoring.

Prior to ignition of the prescribed fire a smoke management permit will be obtained, a current spot weather forecast will be reviewed, appropriate personnel will be assembled and briefed, a Go/No-go checklist will be completed and signed, and a test fire will be completed.

Prior to execution of the prescribed fire, a thorough pre-burn briefing will be given by the Prescribed Fire Burn Boss and specific assignments and placement of personnel will be discussed. A 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.

For low complexity prescribed fires, a qualified Type III Incident Commander will be available within a three hour response in the event of an escaped prescribed burn. For prescribed fires with moderate to high complexity, a qualified Type III Incident Commander will be on-site. If the prescribed fire 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 zone FMO will be notified immediately of any control actions on a prescribed fire. If the fire exceeds the initial suppression efforts, the prescribed fire will be declared a wildland fire and suppressed using guidelines established in this Plan. For Type I and II fires, a WFSA will be completed and additional personnel and resources ordered as determined by the IC. An incident management overhead team may be requested to assume command of the fire if needed.

### **MONITORING AND EVALUATION**

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

During prescribed fires, monitoring can serve as a precursor to invoking suppression action by determining if the fire is in prescription, assessing its overall potential, and determining the effects of the prescribed burn. During prescribed burning, monitoring will include weather, site and fuel measurements, and direct observation of fire characteristics such as flame length, rate of spread, and fire intensity. Operational monitoring provides a check to insure that the fire remains in prescription and serves as a basis for evaluation and comparison of management actions in response to measured, changing fire conditions, and changes such as fuel conditions and species composition.

Current prescribed fire monitoring includes pre- and post-fire monitoring and is tailored to the specific burn units. Pre-fire monitoring has been conducted in burn units to document pre-fire vegetation conditions. Quantitative data have been collected from plots along transects. Parameters measured include plant species composition, plant height, percent cover by plant group, percent of bare ground,

depth of matted vegetation, percent coverage of matted vegetation, and Robel pole readings. Post-fire first order fire effects monitoring has been conducted to document accomplishment of prescribed fire objectives. Parameters evaluated include ocular estimates of the percent of burned area and consumption of standing and matted vegetation. Photographs are taken during pre- and post fire monitoring. Pre- and post-fire monitoring at this level will continue following established written monitoring protocol.

Research has been conducted on the use of prescribed fire to restore waterfowl nesting habitat in meadow areas. As vegetation becomes matted nesting habitat becomes degraded over time and is eventually lost. Nest-searching conducted in meadows after the use of prescribed fire has shown that nesting increased following the restoration of nesting cover. The process is cyclic and matted conditions in meadows return within four to six years following the treatment.

Post-fire long-term quantitative monitoring in meadows has occurred coincident with pre-fire monitoring because the frequency of burning meadows to restore bird nesting habitat has been every four to six years. This level of monitoring is sufficient to evaluate long-term fire effects in meadows and will be continued.

#### **REQUIRED REPORTS**

All prescribed fire forms and reports will be completed as outlined in the USFWS Fire Management Handbook (2000). A fire monitor may be assigned to collect all predetermined information and complete all necessary forms prior to, during, and after the burn. All records will be placed in the refuge fire files for future use and reference.

#### **PRESCRIBED BURN CRITIQUE**

The senior members of the zone prescribed fire team and refuge personnel will critique each prescribed burn. A report detailing the events of the burn including success or failure of methods, the effectiveness of the prescription in achieving burn or smoke management objectives, and safety concerns will accompany any recommendations or changes deemed necessary in the program. This report will be placed in the refuge fire files.

### **AIR QUALITY / SMOKE MANAGEMENT GUIDELINES**

The State of Nevada has implemented a draft smoke management plan. A smoke management permit is required by the Nevada Department of Environmental Quality, Bureau of Air Quality, prior to implementation of any prescribed fire. Nevada has not classified any non-attainment areas near the refuge. The Jarbidge Wilderness, 120 miles north of the refuge, is the nearest Class 1 airshed. The city of Elko is 65 miles northwest of the refuge and is separated from the refuge by the 11,500 foot Ruby Mountains. The city of Wells is 90 miles northeast of the refuge and is separated by the 11,000 foot East Humboldt Range of the Ruby Mountains. The city of Ely is 90 miles southeast of the refuge and is separated by several lesser (less than 10,000 feet) mountain ranges. Smoke sensitive areas include the refuge and hatchery headquarters, Shantytown, and a growing number of residents at the Ruby Lake Estates development. Agricultural burning in Ruby Valley is common and widespread.

Prescribed fire operations will be conducted in compliance with the Nevada State Smoke Management Plan. Prescribed fire plans will address smoke management concerns including notifying local residents and visitors of planned ignitions. Combustion of fuels during prescribed fire operations may temporarily impact local air quality, but the impacts are mitigated by prescription parameters, small burn unit size, light fuel loads, short burning durations, predominance of fine fuels, favorable transport winds, and distance from populations centers. Prescriptions are developed to avoid impacting smoke sensitive areas.

A "Request for Authorization for Open Burn Variances" form will be completed and submitted to Nevada Department of Environmental Quality, Bureau of Air Quality, prior to implementation of any prescribed fire.

## FIRE RESEARCH

Research on the use of prescribed fire to restore native grasslands has been ongoing since 1997. Prescribed fire is being evaluated as a means to kill green rabbitbrush. Green rabbitbrush is a native shrub but historically occurred in very low densities. It is adapted to pioneering sensitive soil areas following disturbance. With the introduction of livestock grazing on refuge lands, it has expanded in grasslands and shrub-steppe areas through repeated soil disturbance. The increased cover of green rabbitbrush has displaced desired native vegetation, thereby resulting in the loss of wildlife habitat.

Annual pre- and post-fire monitoring has been conducted to document the mortality of green rabbitbrush plants, and the response by grass and bird species. Preliminary results show high mortality rates of green rabbitbrush plants and a significant increase in grasses (Table 7). Wildlife have also responded positively to the restoration of grassland habitat. Both the number of bird species and the number birds using the area have increased (Table 7). Annual monitoring will continue to document green rabbitbrush mortality, recovery of grassland vegetation, and wildlife populations following established written research protocol.

Table 7: Preliminary research results on Ruby Lake National Wildlife Refuge

Monitored Element	Pre-Burn	Post-Burn
Wildlife Diversity (# of bird species)	4	17
Wildlife Population (# of birds)	80	295
Green Rabbitbrush (% cover of live plants)	56	6
Grasses and Forbs (% cover of live plants)	24	82

While execution of the prescribed fires is partially funded out of fire accounts and supported by zone fire personnel, monitoring activities are conducted by non-fire personnel funded with station base operating (1261) funds. No dedicated fire funding for fire research is provided to the refuge.

## **PUBLIC SAFETY**

Ruby Lake National Wildlife Refuge is dedicated to ensuring the safety of each visitor and all residents and property adjacent to the refuge. Public access routes near prescribed fire burn units may be appropriately signed and may be closed to ensure public safety. Traffic control may be activated when smoke causes hazardous conditions on the Ruby Valley road.

Areas of fire activity may be clearly signed at the visitor center and on bulletin boards. Residents adjacent to the refuge will be notified by letter in advance of any prescribed burn. Press releases will be issued to local media to notify residents outside of Ruby Valley.

During prescribed burns at least one burn team member will have first aid training. A first aid kit will be on-site for prescribed fires as well as wildland fires. The servicing dispatch center will be notified prior to the ignition of any prescribed fire.

## **PUBLIC INFORMATION AND EDUCATION**

Educating the public on the value of fire as a natural process is important for increasing public understanding and for support of the fire management program. The refuge will use the most appropriate and effective means to explain the overall fire and smoke management programs. This may include supplemental handouts, signing, personal contacts, interpretive displays on 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 may be developed as follows:

- < Concepts of the prescribed fire program will be incorporated, as appropriate, in publications, brochures, and interpretive displays.
- < News releases will be distributed to the media as appropriate.
- < The fire management program may be incorporated into visitor contacts.
- < The fire management program will be discussed when appropriate in informal talks with all employees, residents, and neighbors.

Prior to ignition execution of prescribed fires, information will be made available to visitors, local residents, and the press about prescribed fire activities, the resource management needs, and expected results of the projects. 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.

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

## **FIRE CRITIQUES AND ANNUAL PLAN REVIEW**

### **FIRE CRITIQUES**

Fire reviews will be documented and filed with the final fire report. A copy will be retained in the refuge files.

### **ANNUAL FIRE SUMMARY REPORT**

Refuge fire personnel 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 for prescribed fires and wildland fires, personnel utilized, and fire effects. The report will be placed in the refuge fire files.

### **ANNUAL FIRE MANAGEMENT PLAN REVIEW**

The Ruby Lake National Wildlife Refuge Fire Management Plan will be reviewed annually by refuge personnel. Necessary updates or changes will be completed prior to the next fire season. Any additions, deletions, or changes will be reviewed by the Refuge Manager to determine if such alterations warrant re-approval of the plan.

## **CONSULTATION AND COORDINATION**

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

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

Andrew Goheen, Prescribed Fire Specialist, Sheldon-Hart Mtn. NWRC, Lakeview, OR

Richard Hadley, Assistant Refuge Supervisor, California/Nevada Operations, Sacramento, CA.

Dennis Macomber, Fire Management Consultant, Portland, OR.

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

Robert Means, Fire Planner, Bureau of Land Management, Elko Field Office, Elko, NV

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

Dan Walsworth, Refuge Supervisor, California/Nevada Operations, Sacramento, CA.

## **APPENDICES**

### **APPENDIX A: REFERENCES CITED**

Casjens, L.A., 1974. The prehistoric human ecology of southern Ruby Valley, Nevada. Ph. D. Thesis, Harvard University, Cambridge, Mass. 593 pp

Miller, Melanie, 1998. Landscape Fire Return Intervals in the West. Proceedings of the Prescribed Fire/Fuels Management Workshop, Boise, Idaho, February 24-26, 1998. Bureau of Land Management, National Office of Fire and Aviation.

National Wildfire Coordinating Group, 1999. Wildland and Prescribed Fire Qualification System Guide, PMS 310-1.

U.S. Fish and Wildlife Service, 2000. Fire Management Handbook

## **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, Refuge Manager (FWS); Director, Regional Director, Park Superintendent, or Unit Manager (NPS), or Director, Office of Trust Responsibility, Area Director, or Superintendent (BIA).

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

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

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

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

Bureau Bureaus, offices or services of the Department.

Class of Fire (as to size of wildland fires):

Class A - ¼ acre or less.

Class B - more than ¼ but less than 10 acres.

Class C - 10 acres to 100 acres.

Class D - 100 to 300 acres.

Class E - 300 to 1,000 acres.

Class F - 1,000 to 5,000 acres.

Class G - 5,000 acres or more.

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

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

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

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

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

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

flames.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Wildfire An unwanted wildland fire.

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

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

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

## **APPENDIX C: COMPLIANCE DOCUMENTS**

**APPENDIX D: FISH AND WILDLIFE**

## APPENDIX E: STRUCTURES AND FACILITIES

<u>Real Property No.</u>	<u>Description</u>	<u>Base Replacement Cost (1999)</u>
8	Quarters 8	\$185,000
15	Office/Headquarters	\$350,000
17	Quarters 17	\$185,000
19	Four-Car Garage	\$50,000
46	Quarters 46	\$200,000
67	Horse Barn	\$35,000
78	Bressman Cabin	\$30,000 <sup>1</sup>
87	Storage Building <sup>2</sup>	\$25,000
96	Storage Building <sup>3</sup>	\$400,000
100	Quarters 100	\$185,000
101	Quarters 101	\$185,000
102	Two-Car Garage	\$30,000
110	Oil Storage Building	\$14,000
135	Above-Ground Fuel (Gas) Tank	\$25,000
136	Above-Ground Fuel (Diesel) Tank	\$15,000
143	Bunk House	\$300,000
153	Office Parking Area	\$60,000

<sup>1</sup> Invaluable, historical structure

<sup>2</sup> Fur shed

<sup>3</sup> Maintenance shop

Approximately 50 miles 4-strand barbed wire fence, \$2.1 million (1995 cost)

Approximately 300 refuge boundary signs, \$6,000 (1995 cost)

Three major entrance signs, \$42,000 (1995 cost)

Ten information and interpretive signs, \$4000 (1995 cost)

Four concrete vault toilets, \$40,000 (1999 cost)

**APPENDIX F: PERSONNEL**

Name	Position	Qualifications
Marti Collins	Refuge Manager	FFT2 (pending fitness quals)
Jeff Mackay	Wildlife Biologist	ICIV, ENGB, RXB3
Eddy Pausch	Refuge Operations Specialist	FFT2
Rob Carrell	Maintenance Mechanic	FFT2
Vacant	Lead Range Technician	Unknown

**APPENDIX G: WRITTEN LIMITED DELEGATION OF AUTHORITY**  
**LIMITED DELEGATION OF AUTHORITY**  
**Ruby Lake National Wildlife Refuge**  
**Ruby Valley, Nevada**

As of (time), (Date), I have delegated authority to manage the (Fire Incident Name), (Fire Number), Ruby Lake National Wildlife Refuge, to Incident Commander (Name) and his/her Incident Management Team.

As Incident Commander, you are accountable to me for the overall management of this incident including its control and return to local forces. I expect you to adhere to relevant and applicable laws, policies, and professional standards. While the suppression of the fire is your primary task, you are expected to do so in a manner that provides for the safety and well being of involved personnel. Consideration for the needs of local residents and communities is essential for successful management of the incident.

I am assigning (name) as the line officer representative to act as liaison and provide any help you need. (S)he is authorized to speak for me in the event a decision is needed.

My specific considerations for management of this fire are:

1. Ensure the safety of firefighters, visitors, and neighbors.
2. Protect private, other public, and refuge property to the extent possible.
3. Minimize damage to natural, cultural, and historical resources.
4. Key resource considerations are: preserving as much wildlife habitat as possible, minimizing disturbance to wildlife, and limiting degradation of the refuge's aesthetic values.
5. Restrictions for suppression actions are no earthmoving equipment (dozers, discs, plows, graders) without approval of the Refuge Manager and no use of retardant near water unless refuge, other public, or private property is at risk.
6. Manage the fire cost-effectively for the values at risk.
7. Provide training opportunities for U. S. Fish and Wildlife personnel where possible in order to strengthen our organizational capabilities.

\_\_\_\_\_  
Refuge Manager

(signed)

Date

**APPENDIX H: COOPERATIVE FIRE PROTECTION AGREEMENT AND EICC ANNUAL OPERATING PLAN**

## APPENDIX I: RAW DATA

**APPENDIX J: STEP-UP PLAN**

Staffing Class	BI	Step-Up Action
SC 1	0-24	Normal workweek and daily tours of duty for red-carded personnel.
SC 2	25-49	Normal workweek and daily tours of duty for red-carded personnel.
SC 3	50-70	SC 2 action plus:
		Fire engines maintained in state of readiness.
SC 4	70-98	SC 3 actions plus:
		Notify zone fire personnel and Refuge Manager when BI's are in this range.
		Water tender not used for refuge project work and maintained in state of readiness.
		Post notices on bulletin boards and information kiosks regarding fire danger.
		Automatically move up to SC 5 if Red-Flag Warning issued by NWS and dry lightning, LAL 5 or 6, and winds greater than 15 mph forecast
SC 5	98-118	SC 4 actions plus:
		Workweek and daily tours of duty may be expanded for red-carded personnel.
		Emergency pre-suppression funds will be accessed to cover expanded workweek and daily tours of duty for red-carded personnel.
		Red-carded personnel to remain on-refuge and be capable of staffing engines and water tender within 15 minutes of fire report if Red-Flag Warning issued by NWS and dry lightning, LAL 4, 5, or 6, and winds greater than 15 mph forecast.

		Red-carded personnel may be placed on stand-by and/or road patrol of refuge may be conducted between 1530 and 2000 hours if Red-Flag Warning issued by NWS and dry lightning, LAL 4, 5, or 6, and winds greater than 15 mph forecast when RH is less than 20 and LFM is less than 80 percent. Request may be made to BLM and USFS to pre-position their resources in south Ruby Valley.
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**APPENDIX K: FIRE SUPPLIES AND EQUIPMENT**

Ruby Lake NWR Fire Supply and Equipment Inventory		
	Fire Cache	Engines/Tender
AA Battery, Box	2	6
Backpack Board	4	2
Backpack Pump Set	2	4
Backpack Pump Replacement Bag	2	0
Backpack Pump Replacement Liner	6	0
Barricade	4	0
Barricade Flasher	5	0
Barricade Flasher Battery	10	0
Belt Weather Kit	0	2
Chain Saw	0	2
Cot	1	5
Drip Torch	2	4
Files - Bastard	3	2
Foam - 5 gallon container	1	2
Foam - 30 gal barrel	3	0
Foam Proportioner - Flow Mix 500	1	2
Foam tank bladder	2	0
Fold-a-tank	3	0
Food - Meals-Ready-To-Eat	36	48
Fuel Container - Unleaded/Mixed Fuel	3	6
Fuel Container - Drip Torch Fuel	1	2
Fuel Container - Saw Fuel (Dolmar)	1	1
Fusee - Case	2	2
GPS	0	2
Handtool - Brush Hook	1	0
Handtool - Fireline Rake	0	4
Handtool - McLeod	6	4
Handtool - Pulaski	12	4
Handtool - Shovel	6	4
Handtool Sharpening Gauge	1	2
Hi-lift Jack	0	2
Hose - Cotton Jacket 1" X 100'	11	12
Hose - Cotton Jacket 1.5" X 50'	1	2
Hose - Cotton Jacket 1.5" X 100'	6	10
Hose - Hardline 1" X 50'	0	6
Hose - Suction 1.5" X 8'	3	10
Hose - Suction 1.5" X 10'	0	3
Hose - Vinyl Jacket 2" X 100'	3	0
Hose Clamp	3	4
Hose Primer	1	4
Hose Roller	1	0
Hosepak Backpack	2	0
Fire Equipment Inventory, page 2		
	Fire Cache	Engines/Tender

Nozzle - 1"	4	6
Nozzle - 1.5"	1	4
Nozzle - Foam	1	2
Nozzle - Foam Medium Expansion Nozzle - FS type Fog-Stream 1"	0	2
Nozzle - Six Hole	6	0
Pump, Gorman-Rupp	2	0
Pump, Mark 3 and 26	0	1
Pump, Mini Mark	0	2
Sawyer Chaps	0	2
Sawyer Helmet and Face Screen	1	1
Spanner Wrench - Small	1	0
Spanner Wrench - Medium	0	2
Spanner Wrench - Large	2	4
Adapter 1.5 F NH - 1.5 F NH	2	2
Adapter 1.5 M NH - 1.5 M NH	3	3
Increaser 1 F NH - 1.5 M NH	0	1
Reducer 1.5 F NH - 1 M NPSH	4	4
Reducer 1.5 F NH - 1.5 M NPSH	2	2
Reducer 1.5 F NPSH - 1.5 NH	1	3
Reducer 1.5 F NPSH - 1 M NPSH	3	4
Valve - Ball 1"	6	2
Valve - Ball 1.5"	4	4
Valve - Foot	1	5
Valve - Wye 1"	2	4
Valve - Wye 1.5"	2	4
Valve - Hoseline Tee 1" - 1"	0	8
Valve - Hoseline Tee 1.5" - 1"	0	4
Water Container (Drinking)	0	2
Wheel Chock - Aluminum	0	4

Ruby Lake NWR Normal Unit Strength (NUS)		
Item	NUS (6 Fftr)	Amount On-Hand
Rations	12	60
Fire Shelter	8	10
Helmet	8	4
Head Lamp	8	16
Goggles	8	5
Goggle Strap	8	5
Red Gear Pack	8	5
IA Gear	8	9
First Aid Kit	8	12
Sleeping Bag, Summer	6	6
Sleeping Bag, Winter	4	3
Sleeping Pad	8	8
Water Bottles	15	20
Tent	4	0
Nomex Pant M 30	4	4
Nomex Pant M 32	8	8
Nomex Pant M 34	3	5
Nomex Shirt Medium	8	8
Nomex Shirt Large	4	2
Nomex Shirt X-Large	3	3
Gloves Medium	8	4
Gloves Large	2	4
Gloves X-Large	3	2
Shovel	8	9
Pulaski	8	9
McLeod	8	6
Fire Flail	4	4
Fire Rake	8	4
Backpack Pump	3	6
Replacement Bag	6	2
Replacement Liner	3	4
Chain Saw	2	1
Sawyer Chaps	2	2
Sayer Helmet/Screen	2	2
Portable Pump	4	3
Fold-a-tank	3	3

Ruby Lake NWR Normal Unit Strength (NUS)		
Item	NUS (6 Fftr)	# on Hand
Hose - 1 inch Hose - 1.5 inch Hard Line Suction Hose	1800 ft 1900 ft 600 ft 136	2600 ft 1550 ft 600 ft 118 ft
Foam	30 gal	90 gal
Nozzle 1 inch Nozzle 1.5 inch Nozzle Foam Nozzle Med Xpan. Foam	8 8 3 3	7 4 2 2
Wye 1 inch Wye 1.5 inch Tee 1 inch Tee 1.5 inch Spanner Wrench Small Spanner Wrench Medium Spanner Wrench Large Hose Clamp Ball Valve 1 inch Ball Valve 1.5 inch Foot Valve	9 7 9 7 7 7 5 7 9 7 7	5 4 10 4 1 6 4 7 4 4 5
A 1.5 F NH x 1.5 F NH A 1.5 M NH x 1.5 M NH		
I 1 F NH x 1.5 M NH		
R 1.5 FNH x 1 MNPSH R 1.5 FNPSH x 1 MNPSH R 1.5 FNH x 1.5 MNPSH R 1.5 FNPSH x 1.5 MNH	6 6 6 6	5 5 7 4

**APPENDIX L: COMMUNICATION FREQUENCIES**

Mobile and Base Radio Frequencies

CHAN	AGENCY	TRANSMISSION	RX	TX	TX TONE
1	USFWS	Local (RLNWR)	164.625	164.625	
2	Elko BLM	Local	169.400	168.525	
3	Elko BLM	Spruce Repeater	169.400	168.525	151.4
4	Elko BLM	Knoll Repeater	169.400	168.525	114.8
5	Elko BLM	Tenabo Repeater	169.400	168.525	186.2
6	Elko BLM	Kearns Repeater	169.400	168.525	203.5
7	Elko BLM	Jacks Repeater	169.400	168.525	173.8
8	Ely BLM	Local	169.775	169.775	
9	Ely BLM	Bald Repeater	169.775	169.025	114.8
10	Ely BLM	Prospect Repeater	169.775	169.025	186.2
11	Ely BLM	Kearns Repeater	169.775	169.025	203.5
12	Ely BLM	Wilson Repeater	169.775	169.025	151.4
12	NV BLM	Scene of Action	171.675	171.675	
13	NV BLM	Scene of Action Repeater	171.675	168.225	
14	NV BLM	Tactical	168.225	168.225	
15	NV BLM	Air-to-Ground-Secondary	170.225	170.225	
16	NDF	Local	158.895	158.895	
17	NDF	Spruce Repeater	158.895	159.450	146.2
18	NDF	Red #1	159.345	159.345	
19	NDF	Red #2	158.865	158.865	
20	USFS	Local	171.475	171.475	
21	USFS	All Repeaters	171.475	172.225	

Portable Radio Frequencies

CHAN	AGENCY	TRANSMISSION	RX	TX	TX TONE
1	USFWS	Local (RLNWR)	164.625	164.625	
2 3	Elko BLM Elko BLM	Local Spruce Repeater	169.400 169.400	168.400 168.525	151.4
4 5	Ely BLM Ely BLM	Local Bald Repeater	169.775 169.775	169.775 169.025	114.8
6 7 8	NV BLM NV BLM NV BLM	Scene of Action Tactical Air-to-Ground	171.675 168.225 170.225	171.675 168.225 170.225	
9 10 11 12	NDF NDF NDF NDF	Local/Main Red #1 Red #2 Spruce Repeater	158.895 159.345 158.865 158.895	158.895 159.345 158.865 158.450	146.2
13 14	USFS USFS	Local Spruce Repeater	171.475 171.475	171.475 172.225	

## **APPENDIX M: RADIO FREQUENCY AUTHORIZATIONS**

## APPENDIX N: WILDLAND FIRE DISPATCH PLAN

### I. Wildland Fire Reporting

a. When smoke or wildlife fire is reported, obtain the following information from the reporting party:

- Location of smoke or fire
- Location of caller
- Name and telephone number of caller
- Estimated size of fire
- Persons or vehicles seen in or leaving the fire area

b1. For wildland fires on or near Ruby Lake NWR notify (in order listed):

- Wildlife Biologist (responsible for the refuge fire program)
- Lead Range Technician
- Refuge Manager
- Refuge Operations Specialist
- Maintenance Mechanic

b2. For fires in Elko County and that portion of Ruby Valley in White Pine County, notify Elko Interagency Dispatch Center (EIDC): **1-775-748-4000 or 911**

b3. For fires in White Pine County outside of Ruby Valley, notify Ely Interagency Coordination Center (EICC): **1-775-289-1925**

c. Maintain a log of all radio and telephone communications.

<u>II. Refuge Fire Personnel</u>	<u>Qualification</u>	<u>Home Telephone</u>
Jeff Mackay	ICIV, ENGB	775-779-2286
Vacant (Lead Range Tech)	?	
Marti Collins	FFTII	775-779-2349
Eddy Pausch	FFTII	775-779-2399
Rob Carrell	FFTII	775-779-2336
Ed Partee	FFTII, ENOP	775-779-2376

### III. Zone, Regional, and National Fire Personnel

Chris Farinetti, Fire Management Officer, Lakeview, Oregon	503-947-3315 Office
Tom Romanello, Assistant Fire Management Officer, Lakeview, Oregon	503-947-3315 Office
Andy Goheen, Prescribed Fire Specialist, Lakeview, Oregon	503-947-3315 Office
Andy Anderson, Regional Fire Management Officer, Portland, Oregon	503-321-6175 Office
Roddy Baumann, Regional Prescribed Fire Specialist, Portland Oregon	503-231-2075 Office
Pam Ensley, Regional Fire Management Coordinator, Portland, Oregon	503-231-6174 Office
Roger Erb, FWS Fire Management Coordinator, NIFC, Boise, Idaho	208-387-5596 Office
Carlos Mendiola, Fire Management Specialist, NIFC, Boise, Idaho	208-387-5502 Office
Logistics Support, NIFC, Boise, Idaho	208-389-2400 Office

**WILDLAND FIRE SITUATION  
ANALYSIS**

**Incident Name:**

**Jurisdiction:**

**Date and Time Completed:**

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

**Section I, WFSA Information Page**

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

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

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

## **Section II. Objectives and Constraints**

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

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

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

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

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

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

**II.****Objectives and Constraints**

To be Completed by the Agency Administrator(s)

**A. Objectives** (Must be specific and measurable)

1. *Safety*  
- Public

- Firefighter

2. *Economic*

3. *Environmental*

4. *Social*

5. *Other*

**B. Constraints**

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

### **Section III. Alternatives**

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

<b>III. Alternatives (To be completed by FMO / IC)</b>			
	<b>A</b>	<b>B</b>	<b>C</b>
<b>A. Wildland Fire Strategy</b>			
<b>B. Narrative</b>			
<b>C. Resources needed</b>			
Handcrews	— _____	— _____	— _____
Engines	— _____	— — _____	— — _____
Dozers	— _____	— _____	— _____
Airtankers	— _____	— _____	— _____
Helicopters	— _____ _____	— — _____ _____	— — _____ _____
<b>D. Final Size</b>			
<b>E. Est. Contain/ Control Date</b>			
<b>F. Costs</b>			
<b>G. Risk Assessment</b>			
- Probability of success	_____ _____	_____ _____	_____ _____
- Consequence of failure	_____ _____	_____ _____	_____ _____
<b>H. Complexity</b>			
<b>I.</b>	<b>Attach maps for each alternative</b>		

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

#### **Section IV. Evaluation of Alternatives**

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

Sum of Economic Values: Calculate for each element the net effect of the rating system used for each alternative. This could include the balance of: pluses (+) and minuses (-), numerical rating (-3 and +3), or natural and cultural resource values in dollar amounts. (Again, resource benefits may be used as part of the analysis process when the wildland fire is within a prescription consistent with approved Fire Management Plans and in support of the unit's Resource Management Plan.)

IV. Evaluation of Alternatives			
To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander			
A. Evaluation Process	A	B	C
<b>Safety</b> Firefighter Aviation Public			
<i>Sum of Safety Values</i>			
<b>Economic</b> Forage Improvements Recreation Timber Water Wilderness Wildlife Other (specify)			
<i>Sum of Economic Values</i>			
<b>Environmental</b> Air Visual Fuels T & E Species Other (specify)			
<i>Sum of Environmental Values</i>			
<b>Social</b> Employment Public Concern Cultural Other (Specify)			
<i>Sum of Social Values</i>			
<b>Other</b>			

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

## **Section V. Analysis Summary**

- A. Compliance with Objectives: Prepare narratives that summarize each alternative's effectiveness in meeting each objective. Alternatives that do not comply with objectives are not acceptable. Narrative could be based on effectiveness and efficiency. For example: "most effective and least efficient," "least effective and most efficient," or "effective and efficient." Or answers could be based on a two-tiered rating system such as "complies with objective" and "fully complies with or exceeds objective." Use a system that best fits the manager's needs.
- B. Pertinent Data: Data for this Section has already been presented, and is duplicated here to help the Agency Administrator(s) confirm their selection of an alternative. Final Fire Size is displayed in Section III.D. Complexity is calculated in the attachments and displayed in Section III.H. Costs are displayed on page 4. Probability of Success/Consequences of Failure is calculated in the attachments and displayed in Section III.G.
- C. External and Internal Influences: Assign information and data occurring at the time the WFSA is signed. Identify the Preparedness Index (1 through 5) for the National and Geographic levels. If available, indicate the Incident Priority assigned by the MAC Group. Designate the Resource Availability status. This information is available at the Geographic Coordination Center, and is needed to select a viable alternative. Designate "yes," indicating an up-to-date weather forecast has been provided to, and used by, the Agency Administrator(s) to evaluate each alternative. Assign information to the "Other" category as needed by the Agency Administrator(s).

**Section IV. Decision**

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

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

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

**Section VII. Daily Review**

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

**Section VIII. Final Review**

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

<b>VIII. Daily Review</b>
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To be completed by the Agency Administrator(s) or Designate

Selected to be reviewed daily to determine if still valid until containment or control

			DAILY SURVEILLANCE	IN-CONTROL REPORT	RESOURCES AVAILABLE	WASTE TREATMENT	FUEL BURNER OR EQUIPMENT	WFSAs

Date	Time	By						

**If WFSAs are no longer valid, a new WFSAs will be completed!**

**VIII. Objectives**

**Final Review**

The elements of the selected alternative were met on: \_\_\_\_\_ Date \_\_\_\_\_ Time \_\_\_\_\_  
 By: \_\_\_\_\_  
 (Agency Administrator(s))

## **A GUIDE FOR ASSESSING FIRE COMPLEXITY**

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

### **Use of the Guide:**

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

## **GLOSSARY OF TERMS**

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

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

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

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

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

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

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

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

## FIRE COMPLEXITY ANALYSIS

A.	<b>FIRE BEHAVIOR: Observed or Predicted</b> 1. Burning Index (from on-site measurement of weather conditions). Predicted to be above the 90% level using the major fuel model in which the fire is burning.	_____	<b>Yes/No</b>
	2. Potential exists for "blowup" conditions (fuel moisture, winds, etc.)	_____	
	3. Crowning, profuse or long-range spotting.	_____	
	4. Weather forecast indicating no significant relief or worsening conditions.	_____	
	<b>Total</b>	_____	
B.	<b>RESOURCES COMMITTED</b>		
	1. 200 or more personnel assigned.	_____	
	2. Three or more divisions.	_____	
	3. Wide variety of special support personnel.	_____	
	4. Substantial air operation which is not properly staffed.	_____	
	5. Majority of initial attack resources committed.	_____	
	<b>Total</b>	_____	
C.	<b>RESOURCES THREATENED</b>		
	1. Urban interface.	_____	
	2. Developments and facilities.	_____	
	3. Restricted, threatened or endangered species habitat.	_____	
	4. Cultural sites.	_____	
	5. Unique natural resources, special designation zones or wilderness.	_____	
	6. Other special resources.	_____	
	<b>Total</b>	_____	
D.	<b>SAFETY</b>		
	1. Unusually hazardous fire line conditions.	_____	
	2. Serious accidents or facilities.	_____	
	3. Threat to safety of visitors from fire and related operations.	_____	
	4. Restricted and/or closures in effect or being considered.	_____	
	5. No night operations in place for safety reasons.	_____	
	<b>Total</b>	_____	
E.	<b>OWNERSHIP</b>		<b>Yes/No</b>
	1. Fire burning or threatening more than one jurisdiction.	_____	
	2. Potential for claims (damages).	_____	
	3. Conflicting management objectives.	_____	
	4. Disputes over fire management responsibility.	_____	
	5. Potential for unified command.	_____	
	<b>Total</b>	_____	
F.	<b>EXTERNAL INFLUENCES</b>		
	1. Controversial wildland fire management policy.	_____	
	2. Pre-existing controversies/relationships.	_____	
	3. Sensitive media relationships.	_____	
	4. Smoke management problems.	_____	
	5. Sensitive political interests.	_____	
	6. Other external influences.	_____	
	<b>Total</b>	_____	
G.	<b>CHANGE IN STRATEGY</b>		
	1. Change in strategy to control from confine or contain.	_____	
	2. Large amount of unburned fuel within planned perimeter.	_____	
	3. WFSA invalid or requires updating.	_____	
	<b>Total</b>	_____	
H.	<b>EXISTING OVERHEAD</b>		
	1. Worked two operational periods without achieving initial objectives.	_____	
	2. Existing management organization ineffective.	_____	
	3. IMT overextended themselves mentally and/or physically.	_____	
	4. Incident action plans, briefings, etc., missing or poorly prepared.	_____	
	<b>Total</b>	_____	

**Signature**

**Date** \_\_\_\_\_

**Time**

**APPENDIX P: SAMPLE BURN PLAN**

**APPENDIX Q: REQUEST FOR CULTURAL RESOURCE COMPLIANCE**

**REQUEST FOR CULTURAL RESOURCE COMPLIANCE  
U.S. Fish and Wildlife Service, Region 1**

<b>Project Name:</b>					<b>Program:</b> (Partners, Refuges, JITW, WSECP, etc.)	
<b>State:</b> CA, ID, HI, NV, OR, WA		<b>EcoRegion:</b> CBE, IPE, KCE, NCE			<b>FWS Unit: Org Code:</b>	
<b>Project Location:</b>	<b>County</b>	<b>Township</b>	<b>Range</b>	<b>Section</b>	<b>FWS Contact:</b> Name, Tel#, Address	
<b>USGS Quad:</b>					<b>Date of Request:</b>	
<b>Total project acres/linear ft/m:</b>		<b>APE Acres / linear ft/m (if different)</b>			<b>Proposed Project Start Date:</b>	
<b>MAPS Attached</b>		<b>Check below</b>				
Copy of portion of USGS Quad with project area marked clearly <b>(required)</b>				Project (sketch) map showing Area of Potential Effect with locations of specific ground altering activities <b>(required)</b>		
Photocopy of aerial photo showing location <b>(if available)</b>				Any other project plans, photographs, or drawings that may help CRT in making determination <b>(if available)</b>		
<b>Directions to Project:</b> (if not obvious)						
<b>Description of Undertaking:</b>	Describe proposed project and means to facilitate (e.g., provide funds to revegetate 1 mile of riparian habitat, restore 250 acres of seasonal wetlands, and construct a 5-acre permanent pond). How is the project designed (e.g., install 2 miles of fence and create approximately 25' of 3' high check dam)?					
<b>Area of Potential Effects (APE):</b>	Describe where disturbance of the ground will occur. What are the dimensions of the area to be disturbed? How deep will you excavate? How far apart are fenceposts? What method are you using to plant vegetation? Where will fill be obtained? Where will soil be dumped? What tools or equipment will be used? Are you replacing or repairing a structure? Will you be moving dirt in a relatively undisturbed area? Will the project reach below or beyond the limits of prior land disturbance? Differentiate between areas slated for earth movement vs. areas to be inundated only. Is the area to be inundated different from the area inundated today, in the recent past, or under natural conditions? Provide acres and/or linear ft/m for all elements of the project.					

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