

FIRE MANAGEMENT PLAN
FOR
UPPER SOURIS
NATIONAL WILDLIFE REFUGE

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I. INTRODUCTION

U.S. Fish and Wildlife Service policy requires that an approved Fire Management Plan must be in place for all of Service lands with burnable vegetation. Service Fire Management Plans must be consistent with firefighter and public safety, protection values, and land, natural, and cultural resource management plans, and must address public health issues. Fire Management Plans must also address all potential wildland fire occurrences and may include the full range of appropriate management responses. The responsible agency administrator must coordinate, review, and approve Fire Management Plans to ensure consistency with approved land management plans.

Service policy allows for a wildland fire management program that offers a full range of activities and functions necessary for planning, preparedness, emergency suppression operations, emergency rehabilitation, and prescribed fire operations, including non-activity fuels management to reduce risks to public safety and to restore and sustain ecosystem health.

Prior to the 20th century, the role of fire in the northern plains had been one of continued now designated as the Upper Souris National Wildlife Refuge.

Since the early 20th century and the establishment of the Refuge in 1935, nearly all fire in the prairie ecosystem on the Refuge. In more recent years, there has been an accumulation of knowledge which recognizes fire as an essential part of maintaining a healthy and vigorous prairie ecosystem.

A Compatibility Determination in the Final Environmental Assessment of the Management

Authority and guidance for implementing this plan are found in:

1. Protection Act of September 20, 1922 (42 Stat. 857; 16 U.S.C. 594).
2. Economy Act of June 30, 1932 (47 Stat. 417; 31 U.S.C. 1535)
3. Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66,
4. National Wildlife Refuge System Administrative Act of 1966 as
5. Federal Fire Prevention and Control Act of October 29, 1974 (88 Stat. 1535; 15 U.S.C. 2201).
6. Wildfire Assistance Act of 1989, (P.L. 100-428, as amended by P.L. 101-11, April 7, 1989).
7. Department of Interior Departmental Manual, Part 620 DM 1, Wildland Fire Management (April 10, 1998).

8. United States Fish and Wildlife Service Refuge Manual, 621 FW 1-3, Fire Management (February 07, 2000).
9. United States Fish and Wildlife Service Wildland Fire Management Handbook (December 28, 2000).

II. COMPLIANCE WITH FWS POLICY

A. Purpose

The Upper Souris National Wildlife Refuge consists of one administrative unit and was established for the following purposes:

". . . as a refuge and breeding ground for migratory birds and other
wildlife:..."
(Upper Souris NWR-Executive Order 7161, August 27, 1935)

". . . for use as an inviolate sanctuary, or for any other management purpose, for migratory birds." (16 U.S.C. § 715d; Migratory Bird Conservation Act)

B. Goals and Objectives

At present, the Refuge does not have an approved Master or Comprehensive Conservation Plan. Various operational plans for the Refuge include objectives which pertain to fire management.

Refuge goals and objectives include managing for: wildlife and habitat diversity, water, environmental education, wildlife-dependent recreation and interpretation, and environmental quality. Goals for Upper Souris NWR can be found in Appendix A.

The goal of wildland fire management is to plan and make decisions that help accomplish the mission of the National Wildlife Refuge System. That mission is to administer a national network of lands and waters for the conservation, management, and, where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans. Fire management objectives (standards) are used in the planning process to guide management to determine what fire management responses and activities are necessary to achieve land management goals and objectives.

The primary goal is to provide for firefighter and public safety, property, and natural resource values. Service policy and the Wildland Fire Policy and Program Review direct an agency administrator to use the appropriate management response concept when selecting specific actions to implement protection and fire use objectives. The resulting Appropriate Management Response are specific actions taken in response to a wildland fire to implement protection and fire use objectives. With an approved Fire Management Plan, the Refuge staff may use wildland fire in accordance with local and State ordinances and laws to achieve resource management objectives (habitat improvement).

C. Effect of Fire Upon Refuge Objectives

Fire, whether anthropogenic or caused by lightning, has been a natural part of the prairie for thousands of years (Sauer 1950, Higgins 1986). Fire provides one or more of the following benefits to prairie (Vogl 1974, Wright and Bailey 1982):

- Removal of dead vegetation that hinders new growth

- Removal of litter and woody vegetation that decreases the potential for catastrophic wildfire events

- Release of nutrients bound up in litter to enrich the soil

- Decrease of exotic grasses, forbs, club moss and woody plants and encourage native species

- Recreate environmental conditions attractive to wildlife that existed during presettlement times

Use of fire as a management tool began in 1965 (Higgins et al. 1989). Grasslands are burned primarily to manipulate vegetation, soil microbes, nutrient cycles, and to enhance the biological productivity and diversity of specific organisms, or to accomplish specific objectives. Specific objectives may be broad (prairie restoration and maintenance) or narrow (management for endangered or rare species or reduction of woody plants). Where native prairie is not a major component of the management area, nearly all prescribed fires are used to: reduce vegetative litter, control noxious weeds, reestablish native grasses through reseeding, or improve the chemical kill on exotic grasses prior to reseeding native grasses and forbs. Where native prairie is a major part of a management area, primary reasons for burning are to restore, improve, or enhance prairie habitat for wildlife. Occasionally, fire is used for specific reasons such as to reduce Kentucky bluegrass or other undesirable, exotic cool season grasses, to enhance native grass and forb growth, control undesirable shrubs or trees, or to enhance the esthetic appearance of an area. Fire is an essential tool for managing Refuge lands for wildlife.

Fire can also negatively affect Refuge programs when uncontrolled. Wildfires can burn vegetation that may be important habitat for certain species. Wildfires during some periods of the year may increase exotic grasses or other plants, creating favorable conditions for their spread or increased vigor. Wildfires may also cause damage to improvements and sensitive areas.

While short term damage from a wildfire to the Refuge could be serious, long term effects on Refuge resources would most likely be negligible or positive. Wildfires on Refuge lands that reach adjoining private lands could have disastrous economic consequences during certain periods of the year. Rural land use in the Refuge area is primarily small grain farming and livestock grazing. Wildfires have the potential to eliminate individual crops or grazing lands during a season. Fires escaping from Refuge lands could have considerable negative economic and political implications.

While wildfires can produce positive effects for Refuge resources, there is also a possibility of negative effects upon resources and public safety. Therefore, all wildfires are suppressed to minimize damage, and controlled prescribed fire is used to maximize benefits. Future guidelines resulting from the Federal Wildland Fire Management Policy and Program Review may allow the Service to utilize wildland fires to achieve management objectives providing they exist within established prescribed parameters.

III. DESCRIPTION OF AREA AND FIRE EFFECTS

A. Location

Upper Souris NWR is in northwestern North Dakota, located in both Renville and Ward counties along the Souris (sometimes referred to as the Mouse) River. Refuge headquarters is about 25 miles northwest of the city of Minot. The long, narrow, riverine refuge extends for approximately 35 miles along the Souris River, starting 12.5 miles from the Canadian border and extending southward 6 miles beyond Refuge headquarters and contains 32,084 acres. Upper Souris Refuge is 0.5 mile wide at it's narrowest point and ranges up to 3.25 miles wide at it's widest point.

B. Physiography and Geology

This area of North Dakota includes one major physiographic region, the Northwestern Drift Plain (Bluemle 1977).

The distinctive physiography of the Souris River valley was created by glacial meltwater cutting through the vast ground moraine known as the Drift Plain. Upland topography changes from the gently rolling Drift Plain to steep (> 15°) slopes that descend 50-125 feet to the river valley. The slopes are interrupted with numerous wooded draws and coulees, which have intermittent streams that drain hundreds of square miles of adjacent Drift Plain.

Elevation varies from approximately 1,550 to 1,800 feet.

Predominant soil types are gently rolling to very steep, well drained, medium textured soils on side slopes of the river valley belonging to the Zahl-Max association. In areas generally near refuge boundaries, away from the valley, are found undulating to nearly level, well drained to moderately well drained, medium textured soils on glacial till plains of the Barnes and Barnes-Hamlet associations.

C. Climate

The "continental" climate of northwestern North Dakota is highly variable, resulting in periodic drought, severe winter blizzards (often as early as October or as late as April), low relative humidity, frequent cloudless days, brief but intense late afternoon thunderstorms (some with hail and tornadoes) in summer, early and late summer frosts, and frequent strong winds (> 20-30 mph). There are huge annual, as well as daily, temperature fluctuations and precipitation is erratic (Kraenzel 1966, Jensen 1972). Average annual precipitation is about 16 inches, most of which falls as rain during April-September. Average monthly temperatures range from 70°F in July to 7.3°F in January. The prevailing wind is from the northwest. The growing season is approximately 100 to 110 days.

Annual growing conditions for green up of cool and warm season grasses depends on precipitation and soil moisture. Vegetation during drought years often produce little forage and cures rapidly. Year to year variation in green up and curing of grasses affects fire danger throughout the growing season. The Refuge fire season runs from April 1 to October 30.

D. Vegetation

Upper Souris NWR contains 32,084 acres. This includes approximately 12,642 acres wetlands (lake, river, marsh), 777 acres woodlands (bottom land and upland timber), 360 acres administrative (buildings, public use areas, roads), 16,679 acres native, mixed grass prairie and about 1,626 acres planted herbaceous cover.

1. Grasslands

The major native grasses are little bluestem, green needle grass, prairie June grass, blue grama and wheatgrasses. Forbs are mainly asters, goldenrods and legumes.

Portions of the Refuge have been seeded to tame grass mixtures composed of tall and int

Exotic invader grasses such as Kentucky bluegrass, crested wheatgrass, quack grass a

2. Trees

Riparian woodlands, planted shelterbelts, and single trees are scattered throughout the refuge. Common species include silverberry, hawthorn, chokecherry and buffaloberry. The exclusion of fire has led to an invasion of a shrubdominated community in some areas.

3. Wetland Vegetation

Predominant wetland or aquatic vegetation on Upper Souris is white top, phragmites, sago pondweed, common and hybrid cattail, hardstem and river bulrushes, spikerush, and common reed. These common wetland plants occur in all main refuge impoundments, with sago pondweed in open water and emergent vegetation around margins of the main lakes and throughout shallow and deep marsh areas.

4. Endangered Plants

There are no known endangered plant species on the Upper Souris NWR and the Refuge is not within the range of any endangered plant species of the northern Great Plains.

5. Noxious Plants

Several noxious plant species occur on the Refuge. A problematic species in the northern Great Plains is leafy spurge. An estimated 1,500 acres of uplands on Upper Souris NWR contain leafy spurge. Other noxious weeds occurring are Canada thistle, sow thistle and absinth wormwood. These species often compete with and negatively affect native plants. The control of noxious plants is important to maintain native plant communities.

E. Fire History

Fire history information for the refuge has only been recently recorded accurately. It appears that prior mid-1970's there were no prescribe-fire and all wildfires were controlled immediately. Prescribe-fire has been used sparingly from the mid-1970's to present, with wildfires still being controlled immediately. Fire data from 1985 through 1998 indicate a total of 52 fires, both prescribed and wildfire, totalling 4,821.2 refuge acres. This averages to 3.7 fires and 344.4 acres annually burned. (Appendix B)

F. Wildlife

Many wildlife species could potentially occur on the Refuge. The information that follows is not intended to be exhaustive:

1. Endangered Species

Upper Souris NWR contains a number of threatened, endangered, and candidate species. The Refuge will implement its fire management program within the constraints of the Endangered Species Act of 1973, as amended, and will take action to identify and protect from adverse effects any rare, threatened, or endangered species located on the Refuge.

Whooping cranes, gray wolves, piping plovers, peregrine falcons and bald eagles might occur on the Refuge. Whooping cranes are occasionally observed during spring and fall migration, mostly feeding and resting on adjacent private lands. The migration route of the crane directly traverses the area. Bald eagles are common fall and spring migrants and occur rarely during winter months. Concentrations of up to 30 bald eagles have occurred in late October, associated with the peak of waterfowl migration. Peregrines are rare visitors in the spring and fall; apparently associated with peak shorebird migration. Piping plovers have occurred on Lake Darling during periods of low water when large areas of exposed shoreline exist. Gray wolves are a wide-ranging species and have been documented near the Refuge. Sightings have been reported within traveling distance of Upper Souris NWR in recent years and potentially could occur on the Refuge.

Several FWS "species at risk" or candidate species might also occur on the Refuge. These include : northern goshawk, an occasional late fall through winter visitor; black tern, a common nesting species of marshes; loggerhead shrike, an uncommon nesting species; Baird's sparrow, an uncommon nesting species of upland prairie; ferruginous hawk, which has declined but still occasionally nests in the area (Murphy 1993); Dakota skipper, associated with little bluestem and purple coneflowers.

At least 20 other species of special concern (as per state, FWS, and other

lists) occur in the area mostly as breeding species, such as Cooper's hawk, merlin, common tern, LeConte's and sharp-tailed sparrows, Sprague's pipit, yellow-breasted chat, long-eared owl, pigmy shrew, yellow lady's slipper, and mealy primrose.

2. Invertebrates

There have been no quantitative studies of invertebrate populations on Upper Souris NWR, even though invertebrates comprise main foods of most breeding birds. Abundance and species composition of aquatic invertebrates in prairie wetlands relate especially to wetland hydrology and chemistry and basin morphology (reviewed by Kantrud *et al.* 1989). Populations of invertebrates that breed in seasonal wetlands tend to peak 1-2 years after the end of a drought. For example, midges (Chironomidae) are abundant in wet years and are one of the most important foods of water-dependent birds. Other important invertebrates in seasonal and semi-permanent wetlands include copepods, cladocerans, mollusks, amphipods, rotifers, hemipterans, and dipterans (Kantrud *et al.* 1989). Abundant terrestrial invertebrates are mainly insects and arachnids.

3. Fish

Viable fish populations occur in the Souris River, including Lake Darling. Lake Darling is a 9,600 acre impoundment designed to hold a two year supply of water to safeguard marshes downstream against the threat of drought. Its primary purpose is to furnish a regulated water supply for downstream marshes on Upper Souris NWR and also marshes on J. Clark Salyer NWR, 110 miles downstream. Lake Darling Dam also makes it possible to reduce flooding downstream when managed in conjunction three reservoirs in Saskatchewan. Some of the finest fishing in the area is found on Lake Darling and along the Souris River in the Refuge. Northern pike, walleye, yellow perch, small mouth bass, brown bullhead and white suckers and a variety of minnows are found in the river and lake.

4. Reptiles and Amphibians

There have been no quantitative studies of reptiles and amphibians on the refuge. Species that should occur on the Refuge include smooth green snake, plains garter snake, painted turtle, snapping turtle, tiger salamander, leopard frog, chorus frog, and wood frog. Abundance of salamanders and frogs varies over years with wetland availability (Wheeler and Wheeler 1966).

5. Birds

No comprehensive surveys of birds have been conducted specifically on the

Refuge. Since 1935, at least 293 species of birds have been found on the "Souris River Loop", which includes Upper Souris NWR. Of these, about 150 are known to nest in the area, 23 are accidentals and one species is extirpated (USFWS 1993). Composition and abundance of refuge breeding birds have been documented in numerous surveys and research studies over the years.

Spring and fall migrations find spectacular numbers of migrating waterfowl, shorebirds, p

6. Mammals

No comprehensive surveys of mammals have been conducted specifically on the Refuge. At least 37 species of mammals have been found on the Refuge. Of these, about 20 are common in the area, the remaining are uncommon or transient species (USFWS 1981). Composition and abundance of refuge mammals have not been well documented over the recent years.

Mule deer, elk, and pronghorn are observed occasionally, and moose are expanding in the area. Appearance of beaver in the late 1940s and marked increases in porcupine and white-tailed deer populations since the 1930s, concurrent decreases in Richardson's ground squirrel and white-tailed jackrabbit populations, plus recent records of fox squirrel and woodchuck, relate largely to increases in woody cover on the refuge associated with fire suppression as well as regional changes in distribution of these species.

IV. UPPER SOURIS NWR FIRE MANAGEMENT POLICY AND OBJECTIVES

A. Fire Management Considerations

The following considerations influenced the development of the Refuge's fire management goals and objective. These observations are established in various sections of this plan.

1. Fire is an essential part of the native biotic communities in the Refuge.
2. Uncontrolled wildfire has potential for negative impacts on and off the Refuge.
3. Positive or negative effects of prescribed fire on vegetation, wildlife, and cultural resources depend on burning conditions and fuel loading.
4. Rapid rates of spread, extended fire suppression response times, and the lack of fuel breaks pose significant suppression

problems and increase the likelihood of escape onto adjacent lands.

5. Use of the "Light Hand on the Land" concept to minimize environmental damage is important throughout the Refuge.

B. Refuge Fire Management Goals:

1. Protect life, property, and other resources from wildfire.
2. Use prescribed fire as a tool to restore the natural fire regime and vegetative communities and to accomplish other refuge habitat objectives as necessary.

C. Refuge Fire Management Objectives:

1. Safely suppress all wildfires using strategies and tactics appropriate to safety considerations and the values at risk, and in accordance with Service policy.
2. Minimize the impact to the environment and cost of fire suppression.
3. Use prescribed fire to the fullest extent practical to restore the natural fire regime and vegetative communities and to restore and perpetuate native wildlife species on the Refuge. Treat 1,250 acres annually.
4. Manage the risks associated with hazard fuels. Use prescribed fire near structural/wildland interface, sensitive resources and boundary areas to reduce the risk from wildfire damage. Treat 1,250 acres annually.
5. Utilize prescribed fire when it is the most effective and efficient means for achieving management objectives.
6. Educate the public regarding the natural role of fire within the Refuge's ecosystems.

V. FIRE MANAGEMENT STRATEGIES

The following strategies will be employed to meet fire management objectives.

- A.** Using the appropriate management response concept, suppress all wildfires in a safe and cost-effective manner consistent with resources and values at risk. Strategies employing a range of suppression options will be used in conjunction with minimum impact suppression techniques where appropriate.

Table 1: Appropriate Management Response

SITUATION	STRATEGY	TACTIC
1. Wildland fire on Refuge lands which does not threaten life, natural or cultural resources or property values.	Restrict the fire within defined boundaries established either prior to the fire or during the fire.	1. Holding at natural and man-made barriers. 2. Burning out. 3. Observe and patrol.
1. Wildland fire on Service property with low values to be protected. 2. Wildfire burning on to Service lands. 3. Escaped prescribed fire entering another unit to be burned.	Take suppression action, as needed, which can reasonably be expected to check the spread of the fire under prevailing conditions.	1. Direct and indirect line construction. 2. Use of natural and man-made barriers. 3. Burning out 4. Patrol and mop-up of fire perimeter.
1. Wildland fire that threaten life, property or sensitive resources. 2. Wildland fire on Service property with high values to be protected. 3. Observed and/or forecasted extreme fire behavior.	Aggressively suppress the fire using direct or indirect attack methods, holding the fire to the fewest acres burned as possible.	1. Direct and indirect line construction 2. Engine and water use. 3. Aerial retardant 4. Burn out and back fire. 5. Mop-up all or part of the fire area.

- B.** Conduct all fire management programs in a manner consistent with applicable laws, policies and regulations.

- C. Due to the wide spread land holdings of the Service and the lack of adequate Refuge staff, local fire agencies (volunteer fire departments) may be utilized for initial attack on wildfires in distant areas. Refuge initial attack equipment and personnel are located to maintain a maximum response time of one hour to fires on the Refuge. Fire crews from neighboring Des Lacs NWR and J. Clark Salyer NWR will be utilized whenever possible or necessary. Cooperative agreements with local fire agencies will be maintained to provide for cooperative suppression actions and to ensure reimbursement is available. Provide assistance to local or federal cooperators under the "closest resource" concept in accordance with Service policy.

- D. Utilize prescribed fire as a management tool for achieving hazard fuel and resource management objectives. Hazard fuel prescribed fires will be used to reduce levels of unnatural fuel accumulations. Resource management ignited prescribed fire will be used to accomplish specific objectives established for individual land units. Where both treatment objectives exist, planning and implementation efforts will be combined where practical to provide for cost effective treatments. Prescribed fire will be used in a manner that seeks to emulate presettlement fire history to the extent practical.

- E. Initiate cost-effective fire monitoring, which will tell managers if objectives are being met. Monitoring information will also be used to refine prescribed burn prescriptions to better achieve objectives.

F. Limits to Strategies

- 1. Limit disturbance to the soil by minimizing mechanical fire breaks to control wildfires and when preparing for prescribed burns.

- 2. To the greatest extent possible, hazard fuel reduction prescribed burns will be used only when they can compliment resource management objectives.

- 3. Prescribed burning in areas where threatened, endangered, and candidate species may exist will be conducted utilizing small to medium size burns (10-300 acres) so that the burns can increase local habitat diversity by creating a mosaic of habitats and increased habitat interspersion and edge. Section 7 clearance will be secured, as appropriate.

- 4. Heavy equipment (dozers, discs, plows, and graders) will not be used for fire suppression except in life threatening situations without the express approval of the Project Leader or his/her designee.

5. The use of prescribed fire to achieve management objectives must be conducted in a cost effective manner.
6. Aerial Retardants and foams will not be used within 300 feet of any waterway as described in the Guidelines for Aerial Delivery of Retardant or Foam near Waterways.

VI. FIRE MANAGEMENT UNITS

Service policy allows for a wildland fire management program that offers a full range of activities and functions necessary for planning, preparedness, emergency suppression operations, emergency rehabilitation, and prescribed fire operations, including non-activity fuels management to reduce risks to public safety and to restore and sustain ecosystem health.

Upper Souris NWR will be managed as one Fire Management Unit that is broken into 4 Fire Management Areas (Appendix C). Each area may contain several different vegetation types as described in Section VI. A. 1-4. Within each of these area are many prescribed burn blocks. Most of the prescribed burn blocks are undefined and change occasionally. Fuel Model Types, as described by Anderson (1982) in Aids to Determining Fuel Models for Estimating Fire Behavior, for the FMU's are mostly NFFL Fuel Model 1 in the uplands associations and NFFL Fuel Model 3 in the marshlands.

A. Upper Souris National Wildlife Refuge

1. Upland Grassland Area

a. Predominant Fire Environment

Upland topography changes from the gently rolling Drift Plain to steep (> 15°) slopes that descend 50-125 feet to the river valley. The slopes are interrupted with numerous wooded draws and coulees, which have intermittent streams that drain hundreds of square miles of adjacent Drift Plain. Vegetation is predominantly mid-grass prairie with scattered brush and trees. Vegetation is continuous with few natural or man-made fuel breaks. Mowed trails are minor firebreaks within the refuge. Major firebreaks are adjacent private farmland which may or may not contain grass type fuels, and grazed or ungrazed native prairie. County and township roads, along with Lake Darling and the Souris River also serve as major fire breaks. Fires can be moderately intense with extreme rates of spread.

b. Access and Response Time

Access is available to 4-wheel drive vehicles via refuge trails, or section line roads off the refuge. Vehicle travel off trails is generally possible. Response time should be not more than 1 hour, and generally considerably shorter.

c. Values at Risk

The primary concern would be escape of fire from this unit onto private property or into the refuge wildland/structural interface area. Escape into these areas could pose a serious threat to life and property. An additional concern is the loss of fencing improvements that would limit future grazing management of the lands. Neighboring farmsteads consisting of occupied residences, livestock operations, outbuildings and miscellaneous farm equipment, machinery and supplies are scattered along the refuge boundary. An additional concern is the loss of fencing improvements and pasture lands that would limit future grazing management of the lands. The refuge headquarters area is divided among two main areas: the office area and shop area. The office area consists of the refuge's office, the three stall garage (which houses office supplies and vehicles) and government quarters #1, where the refuge manager and family reside. The shop area consist of eight shop/storage buildings, government quarters #7, #560 and #561.

This unit serves as habitat for a wide variety of native wildlife species. Small fires pose no significant impact, and large fires may or may not impact wildlife and habitat depending on timing of burn. Large fires during nesting season or during the dormant season may reduce local breeding success by eliminating residual cover. Dormant season fires will also increase the risk of soil and wind erosion impacts.

d. Management Restrictions

There are no restrictions other than Service policy.

e. Suppression Strategies

Primary suppression strategy is aggressive initial attack with engines. Indirect attack may be used to protect values at risk and/or if engines are unable to suppress the head of the fire directly because of extreme rates of spread or topography prevents access.

2. Woodland Area

a. Predominant Fire Environment

Topography ranges from steep slopes on both sides of the Souris River Valley to relatively flat terrain along the river bottom. Vegetation is variable and includes deciduous woodlands interspersed with grass and brushlands. Primary fuels are green ash, elm and box elder trees, with western snowberry, chokecherry, juneberry and other shrubs and grasses, primarily smooth brome and Kentucky bluegrass. Immediately adjacent to riverine woodlands there may be cattail/phragmites marshes with an overload of fine fuels. Most fires in this unit exhibit low to moderate intensity due to moisture levels, however, past fire suppression has allowed for the buildup of large amounts of woody fuels and ladder fuels with potential for high intensity surface and crown fires under drought or dormant conditions. During drought conditions, we have experienced underground burning of peat-like materials and stump roots that prolong mop-up

b. Access and Response Time

Access is available to 4-wheel drive vehicles via refuge trails. Vehicle travel off trails may be possible in some areas, but most areas are too densely vegetated for direct vehicle access. Response time should be not more than 1 hour.

c. Values at Risk

The primary concern would be escape of fire from this unit onto private property or into the refuge wildland/structural interface area. Escape into these areas could pose a serious threat to life and property. Neighboring farmsteads consisting of occupied residences, livestock operations, outbuildings and miscellaneous farm equipment, machinery and supplies are scattered along the refuge boundary. An additional concern is the loss of fencing improvements and pasture lands that would limit future grazing management of the lands. The refuge headquarters area is divided among two main areas: the office area and shop area. The office area consists of the refuge's office, the three stall garage (which houses office supplies and vehicles) and government quarters #1, where the refuge manager and family reside. The shop area consist of eight shop/storage buildings, government quarters #7, #560 and #561. The Outdoor Recreation Area is included in this unit and

contain public use items (picnic tables, parking barriers, fishing pier) that would be at risk.

This unit also serves as habitat for a wide variety of native wildlife species. Small fires pose no significant impact. Large fires during nesting season or during the dormant season may impact breeding success.

d. Management Restrictions

There are no restrictions other than Service policy.

e. Suppression Strategies

Suppression strategy will be determined by circumstances. Low to moderate intensity fires will be directly attacked by hand crews and engines (provided access is possible). Indirect attack and containment strategies will be used on intense fires or where steep terrain or dense undergrowth does not allow for a safe direct attack.

3. Wetland Area

a. Predominant Fire Environment

The topography is flat and consists of subirrigated meadow and emergent marsh wetland sites. Vegetation is mostly continuous but with natural fuel breaks in open water areas. Dikes when mowed in late summer also provide fuel breaks. Fire intensity can be extreme in dormant or drought conditions or low to moderate during the growing season. During drought conditions we have experienced underground burning of peat-like materials that prolong complete mop-up.

b. Access and Response Time

Access to marsh and meadows areas is generally not possible, except during winter, therefore most access is limited to surrounding roads, trails and dikes that provide excellent access. Response time should be one hour or less.

c. Values at Risk

The primary concern would be escape of fire from this unit into

grassland or woodland areas on the refuge, adjacent private property or into the refuge wildland/structural interface area. Escape into these areas could pose a serious threat to life and property. Neighboring farmsteads consisting of occupied residences, livestock operations, outbuildings and miscellaneous farm equipment, machinery and supplies are scattered along the refuge boundary. An additional concern is the loss of fencing improvements and pasture lands that would limit future grazing management of the lands. The refuge headquarters area is divided among two main areas: the office area and shop area. The office area consists of the refuge's office, the three stall garage (which houses office supplies and vehicles) and government quarters #1, where the refuge manager and family reside. The shop area consist of eight shop/storage buildings, government quarters #7, #560 and #561.

This unit also serves as habitat for a wide variety of native wildlife species. Small fires pose no significant impact. Large fires during nesting season or during the dormant season may impact breeding success. Recovery from fires in marshes is very rapid and would typically last only one growing season.

d. Management Restrictions

The use of Class A foams and heavy equipment should be avoided in wetland areas.

e. Suppression Strategies

Suppression strategy will be determined by circumstances, but is expected to be indirect in most cases, or direct attack from dry ground. Indirect attack and containment strategies will be used on most wetland fires. In some cases, open water serves as an effective firebreak, but in emergent marsh fires, the fire may burn across water areas that contain standing fuels.

4. Structural/Interface Area

a. Predominant Fire Environment

Topography is generally gently rolling slopes. Vegetation is primarily mixed-grass prairie interspersed with brush, woodland, and tree rows. Dense Nesting Cover fields of tame grasses and legumes, Fuel Model 3, also occur. Fire behavior is generally similar to that of the Upland Grassland Unit (see above). Structural improvements such as buildings, flammable

liquids, and electrical lines may also greatly increase fire intensity and spotting. Fires can be moderately intense with extreme rates of spread, especially in the early fall and spring seasons when fuels are cured and dormant and windy conditions exist.

b. Access and Response Time

Access is good in most areas and available to 4 wheel drive vehicles via refuge trails, and county, township or section line roads off the refuge. Vehicle travel off trails is generally possible. Response time should be quick, not more than 15-30 minutes, and generally considerably shorter. Carpio RFD is also available and response is less than 15 minutes for local fires.

c. Values at Risk

The primary concern would be the threat to the refuge headquarters area that is divided into two main areas: the office area and shop area. The office area consists of the refuge's office, the three stall garage (which houses office supplies and vehicles) and government quarters #1, where the refuge manager and family reside. The shop area consist of eight shop/storage buildings, government quarters #7, #560 and #561.

d. Management Restrictions

There are no restrictions other than Service policy. Service policy restricts firefighters from engaging in structural firefighting activities, but not in structural (exposure) protection.

e. Suppression Strategies

Primary suppression strategy within the unit will be aggressive direct attack. Indirect attack may be used to prevent a wildfire from spreading into this unit, or to protect structures. Protection of life and property will be the overriding priorities.

VII. FIRE MANAGEMENT ORGANIZATION AND RESPONSIBILITIES

The safety of firefighters and the public is the first priority. Persons engaged in fire suppression activities are exposed to a high element of risk. The Refuge Manager and fireline supervisors must make every effort to reduce the exposure to risk and enhance performance. One way is through formal and on-the-job training and improved physical fitness. The Service has adopted the training and fitness standards established in 310-1, and all firefighters must meet these and other standards established by the Service to participate in fire management activities.

The fire job responsibilities in the Fireline Handbook and the ones described for the positions below are to be fulfilled.

A. Project Leader

1. Responsible for overall management of the Refuge including fire management.
2. Insures effective cooperative relations among the Refuge, cooperating fire organizations, and adjoining landowners.
3. Insures sufficient collateral duty firefighters meeting Service standards are available for initial attack.
4. Responsible for planning programs to educate the public regarding the role of fire on the Refuge and fire prevention.
5. Approves prescribed burn plans.

B. Refuge Operations Specialist

1. Delegated the responsibility for coordination and supervision of the fire management program by the Project Leader.
2. Supervises the Refuge's collateral duty fire staff.
3. Responsible for planning, coordinating, and directing all preparedness activities including:
 - a. Fire training
 - b. Physical fitness testing and Fire Management Information System (FMIS) data entry
 - c. Fire cache and equipment inventory, maintenance and operations
 - d. Coordinating with cooperative agencies. Revises cooperative agreements as necessary
 - e.

C. Seasonal and Collateral Duty Firefighters

1. Responsible for their personal protective equipment and physical conditioning.
2. Qualifying annually on the pack test before April 1, or within 2 weeks of EOD date.
3. Maintaining assigned fire equipment in ready state and using all safety gear assigned.
4. Assisting the Refuge Operations Specialist in maintaining accurate fire records.

D. Wildfire Incident Commander (as assigned)

1. The Incident Commander (IC) will be responsible for the safe and efficient suppression of the assigned wildfire.
2. Fulfill the duties described for the IC in the Fireline Handbook
3. Notify the Zone FMO of all resource needs and situation updates, including the need for extended attack.
4. Ensure wildfire behavior is monitored and required data is collected, and insures that assigned resources are briefed on the strategy and tactics to be used, expected fire behavior, historic weather and fire behavior patterns, impacts of drought, live fuel moisture, escape routes and safety zones, and radio frequencies to be used.
5. Ensure that personnel are qualified for the job they are performing.
6. Identify and protect endangered and threatened species and sensitive areas according to the Fire Management Plan.
7. Utilize minimum impact tactics.
8. Ensure fire is appropriately staffed until declared out.
9. Submit completed DI-1202 wildfire report, crew time sheets, and a listing of any other fire related expenditures, losses or refurbishment items to FMO within 3 days of fire being declared out.

E. Prescribed Burn Boss (as assigned)

1. Write prescribed burn plans for the unit to be treated.
2. Implement approved prescribed burn plans.
3. Assist with the administration, monitoring, and evaluation of prescribed burns. Submit completed DI-1202 and complete Post-Burn section of prescribed burn plan within 3 days of being declared out.

F. Fire Cooperators

Along with other land management agencies, the Service has adopted the National Interagency Incident Management System (NIIMS) Wildland and Prescribed Fire Qualification Subsystem Guide, PMS 310-1 to identify minimum qualification standards for interagency wildland and prescribed fire operations. PMS 310-1 recognizes the ability of cooperating agencies at the local level to jointly define certification and qualification standards for wildland fire suppression. Under that authority, local wildland fire suppression forces will meet the standards established for their agency or department. All personnel participating in prescribed fire management activities must meet Service fitness and training standards.

Fire cooperators will assist the Refuge with the following tasks:

1. Provide assistance in detection and suppression of wildfires as defined in cooperative agreements and memorandums of understanding.
2. Assist, as needed, in the investigation of suspicious fires.
3. Assist in training and participate in appropriate Rural Volunteer Fire Department sponsored training.
4. Complete Pre-attack Assessment of buildings and structures in

The following fire departments have current cooperative agreements with the Upper Souris NWR: (Appendix D)

1. Carpio Rural Fire District, Carpio, North Dakota
2. Lansford Rural Fire District, Lansford North Dakota
3. Mohall Rural Fire District, Mohall, North Dakota
4. Tolley Rural Fire Department, Tolley, North Dakota

G. Personnel

Only qualified employees meeting the fitness and training requirements of assigned positions will be dispatched to fires. Employees not meeting requirements may assist in support capacities, but will not be permitted on the fireline. The FWS Fire Management Handbook will be referred to for specific policy guidance on qualification standards. The following minimum fire qualification levels will be target goals to be maintained on Upper Souris NWR.

Table 2 - Minimum Fire Management Positions

Position	Number Needed
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Initial Attack Incident Commander (ICT5)	1
Engine Operator (ENOP)	2
Firefighter (FFT2)	2
Burn Boss (RXB3)	1

In addition to collateral duty fire personnel, if the Refuge needs to maintain a seasonal engine crew during the fire season, the members will be qualified at the FFT2 level for fire suppression.

Additional firefighters may be temporarily positioned at the Refuge or if seasonal fire crews exist, appointments may be extended using severity or emergency pre-suppression funding when very high or extreme fire conditions warrant.

Fire crews from neighboring J. Clark Salyer NWR and Des Lacs NWR may be available for assistance for prescribed fire activities and wildfire suppression.

H. Normal Unit Strength

In addition to each refuge collateral duty firefighter maintaining and responsible for their personal protective gear and equipment as required, the refuge will maintain a supply cache capable of outfitting six additional firefighters. Appendix E lists items required per each firefighter.

VIII. WILDLAND FIRE PROGRAM

A. Fire Prevention

1. General

Since 1980, a minimum of 13 wildfires have been recorded on the Refuge, of which at least 46% were human-caused. Human-caused fires have the potential to be the most damaging because they typically occur at a time of year (generally fall and spring) when fuels are cured, fire behavior is explosive, fuel loading is high, and fewer initial attack resources are available. The season of burning in surrounding agricultural fields occurs in spring and fall, and has potential to cause wildfires. In addition, Refuge staff have responded to at least 2 wildfires (under Cooperative Agreements) on private lands. Upper Souris NWR is also subject to train-caused wildfires, as the Soo Line Railroad passes near or through the refuge for 3.5 miles.

In general, the public and visitors to the Refuge are aware of fire prevention and have an ingrained fear of prairie fires. As a reminder,

the Refuge will focus on placing fire prevention information and hints on Refuge kiosks, as well as installing signs in and around public use areas indicating "No Fireworks Allowed" before the July 4th holiday. The Refuge will also post special warnings/notices, media news releases, area closures, and increase patrols during periods of very high or extreme fire danger as part of step-up preparations. Equipment and/or public use restrictions may also be made when needed.

An additional fire prevention measure is the annual fall mowing of refuge roads and trails, this project requires about 2 weeks of labor by heavy equipment operators. The Refuge also completes weekly mowing of parking areas and public use areas on the Refuge to prevent visitor vehicles use from starting fires, this project consumes a large portion of our summer work force's schedule. In some instances, farming cooperators are used to hay firebreaks and roads and trails on the Refuge. This method removes fine grass fuels at no cost to the Service, other than administration of the haying program.

2. Fuels Management

Because of the absence of fire from the prairie due to human intervention, and the productivity of the Great Plains, excessive fuel loading of extremely flammable fuels exist on much of the lands on the Refuge. Habitats can be damaged by wildfire on land having excessive fuel loading, because of the potential to burn deeply into the organic soil layer, damaging soil structure, roots and rhizomes and the biotic soil community. Fuels management must be undertaken to ensure catastrophic events don't occur. The Refuge will use prescribed burns at strategic times when fire behavior is moderate in an effort to remove excessive fuels from refuge and district lands, but at the same time maintaining minimal impact to the resources.

B. Fire Behavior Potential

See previous sections.

C. Fire Preparedness

1. General

The Refuge Operations Specialist is responsible for coordinating preparedness actions. Specific duties are assigned in the Step Up Plan. The fire season runs from April 1 through October 30. The fire season as calculated by FMIS data analysis is 130 days long, specifically the wildfire season is from April 11 to July 9 and from September 18 through October 27. The prescribed fire season is from

April 1 through June 19 and from August 29 to October 17.

2. Training and Physical Fitness

Annual Refresher Training

All personnel involved in Fire Management activities are required to participate in annual fire management refresher training in order to be qualified for fire management activities in that calendar year. Refresher training will concentrate on local conditions and factors, the Standard Fire Orders, LCES, 18 Situations, and Common Dominators. NWCG courses Standards for Survival, Lessons Learned, Look Up, Look Down, Look Around, and others meet the firefighter safety requirement; but, efforts will be made to vary the training and use all or portions of other NWCG courses to cover the required topics. Fire shelter use and deployment under adverse conditions, if possible, must be included as part of the annual refresher.

Physical Fitness

All personnel involved in fire management activities will meet the fitness standards established by the Service and Region. At this point in time, firefighters participating in wildfire suppression must achieve and maintain an Arduous rating. Firefighters participating in Prescribed Burns must achieve and maintain a Moderate rating. Information found in Appendix K provides specific instructions to administer the tests, a health screening questionnaire to aid in assessing personal health and fitness of employees prior to taking the test, an informed consent form, and safety considerations. A trained and qualified American Red Cross First Responder (or equivalent) who can recognize symptoms of physical distress and appropriate first aid procedures must be on site during the test.

Wildland fire fitness tests shall not be administered to anyone who has obvious physical conditions or known heart problems that would place them at risk. All individuals are required to complete a pre-test physical activity readiness questionnaire prior to taking a physical fitness test. They must read and sign the Par-Q health screening questionnaire, an informed consent form (Appendix K). If an employee cannot answer NO to all the questions in the PAR-Q health screening questionnaire, or is over 40 years of age, unaccustomed to vigorous exercise, and testing to achieve a Moderate or Light rating, the test administrator will recommend a physical examination. As noted below, all individuals over 40 years of age must receive an annual physical prior to physical testing.

Physical Examinations

All individuals involved in arduous fire management activities over the age 40 or newly hired are required to complete an annual physical fitness examination. Standard forms and procedures required by the Service will be used and followed. The cost of examination will be born by the Service and the results sent to the Region Personnel Department.

3. Equipment

Engines are the primary initial attack resource on the Refuge because of the predominance of fine fuels, and relatively good vehicle access to most lands. Hand crews and portable pumps are generally not utilized in fast moving grassland prairie fires. Residual burning into heavy duff layers does not usually occur, but may occur under severe drought conditions. Earth-moving equipment is available but not recommended for use due to resource damage concerns. A complete inventory of primary (dedicated) and secondary fire equipment is contained in Appendix F. Primary equipment is that equipment which is essential to firefighting and prescribed burning operations and maintained and used for that purpose exclusively. Secondary equipment is that equipment purchased with either Refuge Operations and Maintenance funds or fire suppression funds, and with uses for both fire and non-fire refuge operations. All maintenance of primary fire equipment is funded out of fire funds. The maintenance of secondary equipment is charged to fire or refuge operations depending on use.

All firefighters are issued the required personal protective equipment. All primary engines are equipped with hand tools, firing devices, and water handling equipment. Chainsaws and portable pumps are also available on each engine.

D. Step-up Plan

Drought Indicators and Other Impacts on Station Activities

As indicated previously, periods of drought can greatly impact fire behavior and resistance to suppression. For that reason the North Dakota Rangeland Fire Danger Index, Palmer Drought Index, and the Keetch-Byram Drought Index will be monitored at a minimum on a weekly bases throughout the year. All are available on the Internet at <http://ndc.fws.gov>. The Refuge fire staff can also contact the North Dakota Dispatch Center (701-768-2552) during periods of high fire danger to track indices and anticipate possible fire activity.

A severe drought is indicated by one or more of the following:

KBDI drought indices	600 +
Palmer drought index	Severe
1000 hour fuel moisture	8 - 12 %
Energy Release Component	45-60
Burning Index	55 +

Preparedness actions have been identified in the Step-Up Plan to respond to unusual conditions associated with drought and other factors (See following section).

Large scale fire suppression activities occurring in various parts of the country can have an impact on local fire management activities. For example, resources may be limited to implement prescribed fire activities because the closest available resources may be assigned to fire suppression duties or Refuge personnel may be involved as well. Regional drought conditions may also tie-up local resources that would normally be able to assist with Refuge fire management activities. It may be necessary to go out of Region to get the resources needed to staff the Refuge engine during periods of extreme drought or high fire danger.

The Refuge is in the Northern Rockies Area. During National and Regional Planning Levels IV and V, it is necessary to receive approval from the Regional Fire Management Officer and the concurrence of the Northern Rockies Area Coordination Group to conduct prescribed burns during PL IV and the National Coordination Group during PL V.

Step-up Plan

The Refuge Operations Specialist in conjunction with the Refuge Manager and Zone FMO will monitor current and predicted fire weather reports and take appropriate actions as listed in the following Fire Step Up Plan.

Table 3: UPPER SOURIS NWR FIRE STEP UP PLAN

PREPAREDNESS ACTIONS	RANGELAND FIRE INDEX ¹				
	L	M	H	VH	EX
REFUGE STAFF COLLATERAL DUTY FIREFIGHTERS					
* Carry PPE while on duty				X	X
* May be assigned to an engine at a station or patrol				X	X
* May work weekends and/or tours of duty may be extended				X	X
FIRE EQUIPMENT					
* Type 6x engines in ready status at all times	X	X	X	X	X
* Type 3 engine (water tender)	2	2	2	2	2
FIRE PREVENTION ACTIVITIES					
* Post "No Fire" signs at public use areas as needed				X	X
* May restrict vehicles to paved/gravel parking areas and may close select trails and public use areas				X	X
MISCELLANEOUS EMERGENCY PREPAREDNESS ACTIONS					
* Increase one staffing class if lightning activity is probable (If refuge personnel are available)			X	X	X
* Preposition FWS and Interagency resources				X	X
* Notify North Dakota Zone Dispatch of staffing class and status				X	X
All components of the plan may not be met at times when resources are assigned to ongoing fires ³					

Notes:

¹L = low, M = medium, H = high, VH = very high, EX = extreme

²Ready status is unmanned, but filled (except in winter) and ready to respond.

³Resources assigned to fires may prevent some staffing actions - IC should use common sense in determining whether to fill behind dispatched resources.

E. Emergency Presuppression and Severity Funding

Severity funding is different from Emergency Presuppression funding. Emergency Presuppression funds are used to fund activities during short-term weather events and increased human activity that increase the fire danger beyond what is normal. Severity funding is requested to prepare for abnormally extreme fire potential caused by unusual climate or weather events such as extended drought. Severity funds and emergency presuppression funds may be used to rent or preposition additional initial attack equipment, augment existing fire suppression personnel, and meet other requirements of the Step-up Plan.

Emergency Presuppression and Severity funds will be requested in accordance with the guidance provided in the Service's Fire Management Planning Handbook. As a general guide, Severity funding will be requested if a severe drought is indicated by a Palmer Drought Index reading of -4.0 or less or a Keetch-Byram Drought Index of 600 or greater and a long-range forecast calling for below average precipitation and/or above average temperatures. Drought Indices can be located at: <http://www.boi.noaa.gov/fwweb/fwoutlook.htm>

F. Detection

The Refuge relies on neighbors, visitors, and cooperators to detect and report fires. In addition, the Step Up Plan can provide for increased patrols by Refuge personnel during periods of very high to extreme fire danger.

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

G. Pre-attack Plan

Pre-attack planning data will be compiled by Refuge staff. Pre-attack plans will be in each engine. Final pre-attack plans will include:

- 1. Response map**
roads, fences, and gates

- fire stations
- airports
- water sources (type and flow)
- mutual aid zones/fire cooperator districts

2. Hazard/Risk map

- potential values at risk zones (high, medium, low)
- hazard potential zones (high, medium, low)

3. Natural and Cultural Resources map

- sensitive zones
- non-sensitive zones
- restricted vehicle access areas

4. Structure Protection Assessments

5. Closure/Evacuation procedures

H. Fire Suppression

1. General

Upper Souris NWR is a full suppression area. All wildland fires will be managed using the appropriate management response concept. All suppression efforts will be directed towards safeguarding life and property while protecting Refuge resources and external private land and development from harm.

The Refuge relies on mutual aid resources to suppress certain wildfires. The National Interagency Incident Management System (NIIMS) Wildland and Prescribed Fire Qualification Subsystem Guide, PMS 310-1 identifies minimum qualification standards for interagency wildland and prescribed fire operations and the ability of cooperating agencies at the local level to jointly define certification and qualification standards for wildland fire suppression. Under that authority, local wildland fire suppression forces will meet the standards established for their agency or department.

Mutual aid resources will report to the Incident Commander (IC) and receive their assignment and will be the first priority for release.

2. Reporting

All fires occurring within or adjacent to the Refuge will be immediately reported to the Refuge headquarters and/or the Project Leader. The refuge staff member receiving the report will be responsible for initiating the Refuge Fire Dispatch Plan, providing a Fire Dispatcher, and notifying the Project Leader of the current situation and potential for escalation of the incident. The following guidelines have been established for fires occurring on or adjacent to the Refuge:

- ! IC's will place all resource orders through the dispatcher, and will specify what is needed, and when and where it is needed.
- ! The Fire Dispatcher is responsible for monitoring and recording the radio traffic of Refuge firefighters and the coordinating the filling and delivery of resource orders initiated by the IC including orders for engines, aircraft, tools, supplies, and meals.
- ! The Dispatcher will promptly determine if the resource orders can be filled or procured locally and notify the IC.
- ! If a resource order can not be filled locally, e.g., a helitack crew, the Dispatcher will place the order with the North Dakota Interagency Dispatch Center located at J. Clark Salyer NWR.
- ! The Fire Dispatcher will stay on duty until all Refuge resources return or until released by the Incident Commander.
- ! The Zone FMO or acting will be notified and kept abreast of the fire situation.

3. Initial Attack

All fires on the Refuge will be supervised whenever possible by a qualified Incident Commander. If a qualified IC is not available, one will be ordered. Until the arrival of a qualified IC, the highest qualified red-carded person will assume the duties of the IC. The IC will be responsible for all aspects of the management of the fire, and will select the appropriate suppression strategies and tactics.

Minimum impact suppression tactics will be used whenever possible. Dozers, plows, discs, or graders will not be used inside the Refuge boundaries for fire suppression without direct approval of the Refuge Manager.

The Incident Commander is responsible for the safety, deployment, and supervision of assigned engines and crews. Each engine will have a qualified Engine Boss (ENGB) or Engine Operator (ENOP) who will serve as the supervisor of the engine and crew. The ENGB or ENOP will be responsible for receiving assignments from the Incident Commander, selecting appropriate tactics, and supervising the crew in the completion of assignment(s). Most importantly, the ENGB or ENOP is responsible for insuring the safety of assigned crew members.

4. Escaped Fires/Extended Attack

The Incident Commander will notify the Zone FMO whenever it appears a fire will escape initial attack efforts, escape Service lands, or when fire complexity will exceed the existing capabilities. The Zone FMO will be responsible for coordinating extended attack actions including:

- ! Assisting the Refuge Manager with the completion of WFSA (Wildland Fire Situation Analysis)
- ! Assignment or ordering of appropriate additional resources
- ! Drafting the Delegation of Authority, if needed
- ! Briefing the Project Leader of the situation

I. Mop up Standards and Emergency Stabilization and Rehabilitation

The IC will be responsible for mop-up and mitigation of suppression actions taken on Refuge fires. The mop-up standards established in the Fireline Handbook will be followed. Refuge fires will be patrolled or monitored until declared out.

Prior to releasing all firefighters from a wildland fire the following actions will be taken:

- G All trash will be removed.
- G Firelines will be refilled and waterbars added if needed.

- G Hazardous trees and snags cut and the stumps cut flush.
- G Disked firelines should be compacted as soon as possible to preserve the living root stock of natives grasses.
- G Overturned sod resulting from plowing must be rolled back with a grader or by hand and compacted to preserve native grass root stock.

Other emergency stabilization and emergency rehabilitation measures may be taken in accordance with Chapter 5 of the Fire Management Handbook. Briefly:

Emergency stabilization is the use of appropriate emergency stabilization techniques in order to protect public safety and stabilize and prevent further degradation of cultural and natural resources in the perimeter of the burned area and downstream impact areas from erosion and invasion of undesirable species. The Incident Commander may initiate Emergency Stabilization actions before the fire is demobilized, as delegated by the Agency Administrator, but completing emergency stabilization activities may be completed after the fire is declared out.

Rehabilitation is the use of appropriate rehabilitation techniques to improve natural resources as stipulated in approved refuge management plans and the repair or replacement of minor facilities damaged by the fire. Total "rehabilitation" of a burned area is not within the scope of the Emergency Rehabilitation funding. Emergency Rehabilitation funding can be use to begin the rehabilitation process if other funding is committed to continue the rehabilitation throughout the life of the project (beyond the initial 3 years of Emergency Rehabilitation funding). Major facilities are repaired or replaced through supplemental appropriations of other funding.

Because of the emergency nature of the fire event, the emergency stabilization section of the Emergency Stabilization and Rehabilitation Plan (ESR Plan) must be developed expeditiously and is frequently developed by a local unit or designated burned area ESR team. The rehabilitation section of the ESR Plan is not considered an emergency, and is developed as other refuge land use plans. The refuge manager is responsible for preparing all ESR Plans. In order to be funded, ESR Plans must meet resource management objectives and be approved by the Project Leader and the Regional Director.

J. Records and Reports

The Zone FMO will complete all situation reports as soon as practical. The Incident Commander will complete the DI-1202 fire report within 3 days. The Zone FMO will review all DI-1202's for completeness and accuracy, and input data into the FMIS database within 10 days

The IC will further advise the Zone FMO of all expenses incurred and/or items lost or destroyed on the fire so that appropriate measures can be taken to track and replace supplies and equipment as needed.

OF-288's will be used to report all fire time, including hazard and premium pay, charged against the suppression account.

IX. PRESCRIBED FIRE MANAGEMENT

Fire, whether caused by lightning or native Americans, was a major natural process in the Northern Great Plains prior to European settlement and the resulting intensive fire suppression. The Refuge has been intermittently using management ignited prescribed fire as a management tool since the early 1970's. The Refuge uses prescribed fire as a tool in two management areas: resource management and hazard fuels reduction.

A. Resource Management Prescribed Fire

Resource management prescribed fire is used to renovate, restore, create, or maintain diverse native plant communities for the purpose of restoring and perpetuating indigenous wildlife. Goals of the resource management prescribed fire program:

- ! restoration of native prairie community
- ! reduction/control of exotic vegetation, primarily Kentucky bluegrass, smooth brome, quackgrass and leafy spurge
- ! control of woody vegetation invasion of grasslands, primarily western snowberry and silverberry
- ! assist other Refuge habitat management programs, such as

nativegrass reseeding, Dense Nesting Cover establishment and maintenance

! maintenance of planted nesting cover for upland nesting birds

Based on monitoring of prescribed burning at Lostwood NWR (40 miles west of Upper Souris NWR) it is necessary to apply multiple prescribed burns to an area over a 12-15 year period to achieve many of the above goals. This scenario requires up to 5 burns with 2-4 years of rest between burns. The timing of burns vary according to specific objectives desired. Burning is usually conducted in late April through mid-June and mid-July through October.

Program Objective: Treat 1,250 acres of upland and marshland habitats per year in order to accomplish resource management goals.

B. Hazard Fuels Reduction Prescribed Fire

The Refuge hazard fuel reduction program proposes to use prescribed fire within or near structural/wildland interface areas, wildfire sensitive resources, and refuge boundary areas to reduce the risk from wildfire damage. Other areas not within the above descriptions but with heavy fuel loadings also fall into this program. Refuge boundary zone burn units are selected based on values at risk on adjacent land, probability for wildfire escape from Refuge land, and fuels. Fuels in hazard fuel sites typically contain many years of accumulated grass, shrub and tree litter and high densities of live shrubs. The large volume of litter and shrub component causes complex control problems during suppression actions, because of potential high rate of spread and flame lengths that prevent direct attack of a headfire. High litter loadings allow wildfires to carry even during the growing season. To the greatest extent possible, hazard fuel burns will only be used when they can compliment resource management objectives. Other methods are also used to reduce fuel loads, such as mechanical (mowing, haying or discing) or biological (grazing).

Goals of Hazard Fuel Reduction Prescribed Fire program include:

! maintain dead fuel loadings of less than 3 tons/acre in hazardous fuel zones

! maintain woody shrub vegetative component to #25-50% canopy coverage density

! prevent hazardous fuel accumulations from endangering life,
property and wildlife resources

Objectives of Hazard Fuel Reduction Prescribed Fire program are:

! reduce dead fuel loadings (litter) of 2-3 tons per acre by
approximately 75% or better

! reduce canopy coverage density of shrub vegetation component
by 50%

! treat approximately 1,250 acres per year

! burn units once every 4-7 years depending on fuel
accumulations and resource management considerations. The timing
of burns vary according to specific objectives desired. Burning is
usually conducted in late April through mid-June and mid-July through
October.

C. Planning

The Refuge Manager is responsible for supervising the development of resource management objectives for the Refuge. With the lack of a Refuge Biologist on staff, Upper Souris NWR will request biologist's from neighboring refuges to provide assistance in selection of the appropriate management tool needed to meet objectives. Prescribed fire is just one of a combination of tools available. If needed, the Zone FMO or regional prescribed fire specialist will be consulted for assistance in accomplishing desired objectives. Prescribed burn plans are prepared that document objectives and the plan of action for achieving them. Elements of each burn plan will meet all training, personnel, equipment, and other requirements as specified in the FWS Fire Management Handbook (621 FW 3, Section 2.2). Prescribed fires will be planned to minimize the risk of escape and/or to mitigate necessary risks and provide an adequate contingency plan for suppressing the fire should an escape occur. Burn plans can be written by any qualified burn boss. Burn plans will be submitted for review by the Zone FMO and approved by the Project Leader prior to the planned burn day. Prescribed burns that are of a complex nature will be forwarded on to the Regional Prescribed Fire Specialist for review and approval.

Prescribed Burn Plans will address contingency planning. Some of the

elements to be considered and actions to be taken include:

If a prescribed fire escapes, the following actions will be taken:

- A. If a fire burns outside the specified perimeter limits, and cannot be contained by on-site resources, the fire will then become a wildfire.
- B. All prescribed firing operations will cease.
- C. Available holding forces will perform initial attack.
- D. The refuge fire dispatch plan will be put into operation.
- E. The burn boss or individual with the highest wildfire suppression qualifications will assume the role of incident commander until relieved.

The refuge staff, summer work crew, volunteers and detailed fire staff from nearby refuges will be responsible for prescribed fire preparations including equipment maintenance and firebreak preparation.

Prescribed burn units may require preparation including; mowed lines, disced lines and black lines. Public relations must be considered and will be addressed as needed. Preparation for burns will be handled on an individual basis and will be identified in the prescribed burn plan for that unit. The Refuge Manager will prioritize the units to be burned on the Refuge if conflicts exist.

Prescribed burns may be conducted at any time of the year, depending on objectives and prescription. The typical management ignited prescribed burn season for upland grassland units is April 1 through October 30. Timing of burning individual units is based on objectives. Burning in wetlands to reduce emergent vegetation may also occur during the late fall or winter. Burning blacklines to be used as control lines for future burn units may also be conducted in fall and winter.

Each prescribed burn unit requires an open burning permit from the North Dakota Department of Environmental Health. Conditions and restrictions imposed on open burning by the State of North Dakota are contained in Appendix G. Upper Souris NWR is within the Northern Rockies Interagency Fire Coordination Area. When the Northern Rockies Area is in fire danger preparedness level V and/or the National Preparedness Level is IV or V, specific project approval must be obtained from the Northern Rockies Geographical Area Coordination Group to conduct prescribed burning operations. When the North Dakota Rangeland Fire Danger Index is in the Very High or Extreme category, verbal permission must be obtained from the local rural fire

protection district chief and the North Dakota State Health Department. Multiple units may be burned at the same time within the Refuge. The maximum number of simultaneous burns will depend on the availability of personnel, equipment and the cumulative impacts of smoke on sensitive targets. The Zone FMO or other qualified Prescribed Fire Manager will be available to coordinate the management of simultaneous burns. It is not required that the Prescribed Fire Manager be on-site during the burns but he/she must be in contact with each burn project. Sufficient suppression forces must be available for each burn in the event of an escape.

The Refuge may assist private entities with limited prescribed burning, although requests have been turned down due to limited staff and refuge priorities. There is limited possibility to assist others in implementing prescribed burning in the area at this time. The Refuge does not have enough staff to complete planned burns for both resource and hazard fuel reduction and therefore cannot undertake other burning projects. If a project is undertaken, it must be covered under a Wildlife Extension Agreement (WEA) which addresses prescribed fire specifically.

D. Training

The Refuge will at minimum meet policy requirements of the Service prescribed fire qualification system. The Project Leader will be responsible for ensuring Refuge personnel maintain qualifications necessary to implement the fire program. The Refuge Operations Specialist will maintain records and assist the Refuge Manager with developing training plans for employees. The Refuge will maintain a minimum target goal of one staff member qualified at the Prescribed Burn Boss III (RXB3) level. Additional training will be obtained for Refuge employees in the area of fire effects and monitoring in prairie ecosystems in order to implement emerging Service ecosystem management strategies.

E. Complexity

Prescribed burns in the Refuge vary from low to high complexity. Complexity is determined by such factors as fuels/fire behavior, objectives, resources at risk, ignition techniques, and potential for escape, as well as several other factors. The Prescribed Fire

Complexity Rating System Guide is found in Appendix H. The majority of burns on the complex are rated as low complexity, with only a few rating out as moderate complexity. The complexity may rate out as high complexity burns when aerial ignition and/or extensive personnel/equipment are required.

The average number of personnel required to conduct a burn on the Refuge is 5-8. Most burns are structured with a burn boss (RXB3), often serving as ignition specialist (IGNS), two engine bosses (ENGB) or engine operators (ENOP) and 2-4 firefighters (FFT2), using 2-4 light engines for holding. However, several burn plans involving large acre burns have ranked high enough in complexity that an RXB2 burn boss was required. Wetliners are often used with additional wildfire suppression resources when available.

F. Monitoring and Evaluation

Current monitoring and evaluation of prescribed burns is very limited due to funding and staffing limitations. Burn prescriptions and timing are based on past research and experience. Pre-burn evaluation is, at a minimum, limited to photo points or general photos, qualitative evaluation of fuel conditions, vegetation phenology and composition. In some units, cover density and frequency data have been scientifically collected on transects, and some point counts on nesting birds completed. Burn day evaluations document temperature, relative humidity, windspeed, fine fuel moisture, rate of spread, flame length, smoke dispersal, and general observations of fuel reduction. Post burn evaluation varies by unit and is limited by staff and funding. Density and frequency measurements may be made in selected units the following growing season, along with photo points or general photos, and qualitative estimates of vegetation response.

Regional fire monitoring protocols have been adopted in full by the Refuge (Appendix I). This will allow the Refuge to quantitatively monitor changes to Service resources through full implementation of the fire program. If the resource management prescribed fire program proposed by this Fire Management Plan is fully funded outside fire funding, a more quantitative monitoring program will be implemented. The FTE increase proposed in this plan will be used to establish vegetation transects in each of the habitat types being prescribed-burned throughout the Refuge. Wildlife surveys to measure response

will also be conducted. Plant species composition and percent cover will be the primary information used to determine if burn objectives are being met and to monitor long term vegetation responses.

G. Prescribed Fire Impacts

Environmental and social impacts of the prescribed fire program have been discussed in previous sections of this Fire Management Plan.

Escaped prescribed burns pose a threat to adjacent life and property, but proper planning and prescriptions, qualified personnel, and contingency planning will mitigate this threat. Temporary air quality impacts from smoke may occur, but are mitigated by the burning of light fuel types, by limiting fires to one burning period with little residual burning, and by consultation with state air quality personnel.

Negative public opinion for the prescribed fire program will be addressed through proactive public information and education efforts. See Section XIV for specific actions.

H. Reporting and Documentation

Individual prescribed burn plans are the primary document used to record prescribed fire information. Burn plans document objectives, methods, personnel, costs, fire behavior, weather, State air quality requirements, and monitoring and burn critique information. Each prescribed burn is also documented on an Individual Fire Report (DI-1202) form when a burn is completed and submitted to the FMO for SACS database entry within 10 days of burn unit completion.

X. WILDLAND FIRE USE FOR RESOURCE BENEFIT

Wildland fire use for resource benefit will not be utilized as a management tool on the Refuge at the present time. **All wildfires will be suppressed.** Wildland fire use for resource benefit will not be used for the following reasons:

4. Proximity of adjacent private lands increases probability of escape to private lands.

5. Fuel types promote rapid rates of spread and erratic fire behavior that may not be easily controlled.
3. Wildfires are generally limited to one burning period under normal conditions.
4. Conflicting land uses such as haying, grazing and farming on Service lands and adjacent private lands.
5. Wildfire planning has not been completed.

XI. AIR QUALITY / SMOKE MANAGEMENT GUIDELINES

Visibility and clean air are primary natural resource values. The protection of these resources is given full consideration in fire management planning and operations. In addition, smoke can have serious health and safety effects that must be considered during the planning and approval process.

Particulates in smoke from prescribed fire can impair visibility and affect human health. The amount and nature of smoke produced depends upon the size of the burn, general moisture conditions at the time of the burn, and the characteristics of species burned (Ward and Hardy 1991). The higher the moisture content of the vegetation, the more smoke is produced. Most of smoke is carbon dioxide and water. Harmful chemicals from vegetative fires include carbon monoxide, particulate matter, acrolein, formaldehyde, and benzene, but these are produced in very small quantities (Prescribed Fire and Fire Effects Working Team 1985). Carbon dioxide is also produced but no more than what would occur in the normal vegetation decomposition process. Smoke effect can be mitigated by burning with suitable winds and unstable atmospheric conditions that loft and dissipate most ground level smoke (Prescribed Fire and Fire Effects Working Team 1985).

Because of the above considerations, management of smoke is incorporated into planning of prescribed fires, and to the extent possible, in suppression of wildfires. Sensitive areas are identified and precautions are taken to safeguard visitors and local neighbors. Smoke dispersal is a consideration in determining whether or not a prescribed burn is within prescription. Generally the fine grass fuels and small burn size (100-1000 acres) generate low volumes of smoke for short durations (4-6 hours).

Upper Souris NWR fire management activities which result in the discharge

of pollutants (smoke, carbon monoxide, particulates, and other pollutants from fires) are subject to and must comply with all applicable Federal, State, and local air pollution control requirements as specified by Section 118 of the Clean Air Act, as amended 1990. The North Dakota State Department of Health, Environmental Health Section implements the requirements of the Clean Air Act. Permits to open burn are required under the authority of the North Dakota Air Pollution Control Rules (Article 33-15, North Dakota Administrative Code). Written requests are submitted by the Refuge to the Department of Environmental Health annually for each planned prescribed burn. Requests identify acres, location, and purpose of the burn. The State grants approvals in letter form and also notifies local and district Environmental Health Practitioners. Appendix I is a copy of the state of North Dakota Conditions/Restrictions Applicable to an Approval to Open Burn. Smoke complaints are also investigated by the State Department of Environmental Health. Refuge personnel also take special care to notify neighbors, fire departments, and local law enforcement agencies on the day burns are conducted. These actions are specific requirements of individual burn plans.

Smoke from wildfires and prescribed fires is a recognized health concern for firefighters. Prescribed Burn Bosses and Incident commanders must plan to minimize exposure to heavy smoke by incorporating the recommendations outlined in the publication Health Hazards of Smoke (Sharkey 1997). The use of respirators is not recommended since they are unable to restrict carbon monoxide intake, potentially a serious problem.

XII. FIRE RESEARCH AND MONITORING

Effects of fire on plant and animal populations need to be better understood. Through applied research and careful application of fire, data collected can provide managers with a better understanding of the natural ecological effects of fire, and the information needed to refine prescriptions to meet resource objectives.

With the lack of a Refuge Biologist on staff, Upper Souris NWR will request biologist's from neighboring refuges to provide assistance in selection of the appropriate fire research and monitoring. The following fire research is urgently needed at Upper Souris NWR:

! Relationships among prescribed burning, food resources, and population dynamics of breeding passerines endemic to northern mixed grass prairie.

! Ecological monitoring of upland biotic communities at Upper Souris NWR:

1) habitat associations of breeding birds: bird distribution and abundance under different prescribed burning scenarios (alternative models - adaptive resource management)

2) presence and distribution of other fauna and potential impacts of prescribed burning

3) long-term change in dominance and frequency of common flora in major upland plant communities associated with habitat management treatments

4) occurrence and dominance of noxious weeds especially leafy spurge

5) measure long-term change (since ca. 1900) in woody cover

Monitoring will comply with accepted scientific methods. This data, along with information gathered through research studies, will be used to improve the effectiveness of the fire management program, not only in the Refuge but region- wide.

XIII. PUBLIC SAFETY

Firefighter and public safety (Life Safety) will always take precedence over property and resource protection during any fire management activity. Firefighter safety is covered in Section VIII. This section will deal with public safety.

The greatest threat to public safety from Refuge wildfires are entrapment by extremely fast moving or change of direction of fire fronts or fingers. Of particular concern are visitors or hunters who may be present in the area of the fire, or neighbors who initiate their own suppression actions without proper training, equipment, or communication. Refuge staff will attempt to keep the fire scene clear of people except for Service firefighters, cooperating volunteer fire departments and any resources requested from cooperators. Fire resources, upon detection of the general public encroaching upon a fire scene will notify the IC of the situation for resolution based on the actual situation. Law enforcement assistance may be requested if the situation so warrants. Road closures and airspace restrictions will be requested through the proper channels as the situation dictates. Prescribed burn units are generally closed to the public during burning operations, but they may be adjacent to public access roads such as county and township roads. In that case, roads may be temporarily posted closed to protect the public.

Smoke from a wildfire or prescribed burn can impair visibility on roads and become a hazard. During wildfires, the Incident Commander is responsible for managing traffic hazards from smoke, particularly smoke that drifts into a roadway causing dangerously reduced visibility. The fire dispatcher will notify the appropriate County Sheriff's office or North Dakota Highway Patrol whenever the Incident Commander believes that smoke may be causing a safety hazard. The Sheriff's Office can assess the situation and take action as needed. Smoke from prescribed fires is part of the burn prescription and is the responsibility of the burn boss. Actions to manage smoke include: use of road guards and pilot car, signing, altering ignition techniques and sequence, halting ignition, and suppressing the prescribed burn.

A final concern is for fires which might escape Service lands and spread to private property which may be inhabited. The following steps will be taken to minimize this threat:

! The development of a professional and skilled fire management organization capable of safely suppressing wildfires and conducting prescribed fires.

! The development of fire prevention programs.

- ! The utilization of pre-suppression fire breaks.

- ! The development of a hazard fuel management program.

- ! Improving interagency coordination and cooperation including keeping local officials briefed on the potential for escape.

XIV. PUBLIC INFORMATION AND EDUCATION

Informing and educating the public is an important part of fire suppression, fire prevention, prescribed fire, and the Fish and Wildlife Service mission. Information and education is critical to gaining public support of prescribed fire program, fire suppression and fire prevention. Public information and education tasks in the fire program fall under two areas. These are:

A. Wildfire Suppression

The Incident Commander is in charge of disseminating fire information to the press and/or public on wildland fires. The Incident Commander may request assistance with these tasks if needed, and delegate the task to a public information officer if necessary.

B. Prescribed Fire

In order for the public to accept the prescribed fire program, they must be exposed to the results of prescribed burning on the land, and an explanation of the processes at work. The following general actions will be used to promote the prescribed fire program to the public:

- ! adhering to prescribed burn plan prescriptions
- ! press releases, and on-site stories by news media
- ! attendance at local volunteer fire department meetings
- ! inclusion of the prescribed fire message in interpretive materials and brochures
- ! personal contact with local citizens during or after prescribed burns

XV. CULTURAL RESOURCES

Fire Management activities at the Refuge will be implemented in accordance with the regulations and directions governing the protection of cultural resources as outline in Departmental Manual Part 519, Code of Federal Regulations (36 CFR 800), the Archeological Resources Protection Act of 1979, as amended, and the Archeological and Historic Preservation Act of 1974. Smoke from wildfires is a recognized health concern for firefighters. Incident commanders must plan to minimize exposure to heavy smoke by incorporating the recommendations outlined in the publication Health Hazards of Smoke (Sharkey 1997).

Cultural resources are scattered throughout the Refuge as the area was heavily used by Native Americans. Historical records indicate that the last inhabitants of the area before European settlement were the southern Assiniboine tribes (Denig 1961) who now reside in Canada. Many "tipi ring" sites are

Approximately twenty percent of the Refuge has received an archeological terrain assessment. The U.S. Army Corps of Engineers, completed a Cultural Resource investigation involving approximately 3,300 acres of land surrounding and just below Lake Darling on the Souris River extending from

the shoreline up to an elevation of 1,620 feet above mean sea level. This and other investigations resulted in discovering and/or updating of 146 sites of which 8 have been determined eligible.

Currently wildfires are suppressed. However, historical evidence demonstrates that natural and artificial fires were regular events in the mixed grass prairie. In recent years, fire suppression has resulted in a steady buildup of grassland and riparian fuel loads, colonization of disturbed soils by invading plant species, and natural vegetative growth, increasing the chances of an uncontrolled wildfire that could potentially endanger the Refuge's cultural resources as well as surrounding private property. Although over 20 years of fire ecology research allows ecologists to predict impacts on biotic communities, the possible impacts of prescribed burning (and wildfires) on archeological resources are not well known. Research conducted in North Dakota indicated that fire-related impacts to buried artifacts are negligible, but effects on surface-exposed artifacts will be significant, depending on artifact type and size (Seabloom et al 1991).

Impacts to archeological 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 archeological and cultural resources:

- ! Files and records of cultural resources should be consulted by the staff when planning prescribed burns, developing pre-attack plans, and performing other preparedness actions. The potential for adverse impacts to cultural resources will be evaluated prior to prescribed burning and in the selection of fire suppression strategies during wildfires.

- ! The Regional Archeologist will be contacted during the development phase of the burn plan writing process when cultural resources are suspected or known to exist in the project area.

- ! The North Dakota State Historic Preservation Officer (SHPO) will be contacted by the Regional Archeologist when it is known a planned management action may impact archeological or cultural resources. The SHPO has 30-days to respond. The Refuge will follow any programmatic archeological/cultural resources management plan that may be implemented in the future.

- ! Low impact wildfire suppression tactics (cold-trailing, use of foam/wet-water/water, use of natural and manmade barriers, change in vegetation, mowing, etc.) will be used to the fullest extent possible. Line construction for prescribed fire activities will follow the same principle. Maps indicating the known location of significant cultural resources will be consulted prior to laying out burn units, and whenever possible, before constructing fireline to halt the spread of a wildfire.

- ! Prescriptions for management ignited prescribed fires will take into account the presence of known cultural sites. Cooler fires with short residence time will be used in areas containing known cultural sites, whenever possible.

- ! Known surface sites will be marked, protected, and excluded from the burn, if possible. Foam will not be used in areas known to harbor surface artifacts.

- ! The use of mechanize equipment within the refuge must be approved by the Refuge Manager on a fire by fire basis, and the use these resources will be considered in the approval process for any planned management actions. When the use of heavy equipment is authorized, its use will be monitored.

- ! The location of sites discovered as the result of fire management activities will be reported by the ROS to the Regional Archeologist.

- ! Rehabilitation plans will address cultural resources and will be reviewed by the Regional Archeologist.

XVI. FIRE CRITIQUES AND PLAN REVIEW

The Fire Management Plan will be reviewed periodically to ensure the fire program advances and evolves with the FWS and the Refuge's mission. It is the intention of the Refuge to continue to make advances in fire management so that staff and resources and the public are afforded the best available protection. Accomplishment of this goal will require periodic review of the FMP and fire management operations as described below.

A. Wildfire Critiques

The Incident Commander will conduct a critique for each wildfire within 3 days of the fire being declared out. The critiques of most fires will be short and informal. The Zone FMO or Project leader will conduct formal fire critiques if:

1. A prescribed fire was reclassified as wildfire.
2. Significant smoke management problems occurred.
3. There were significant safety concerns voiced.

A Regional Level Review will be conducted if:

1. Refuge staff crosses the refuge's boundary into another jurisdiction.
2. A fire results in adverse media attention.
3. A fire involves a fatality, serious injury, or significant property damage.
4. A fire results in controversy involving another agency.

The Zone FMO may pass the results of critiques along to the Refuge Manager and/or Regional Fire Management Coordinator when appropriate.

B. Prescribed Fire Critique

Prescribed fires will be critiqued by the burn boss and documented in

the prescribed burn plan in Section VIII. The Zone FMO will conduct formal prescribed fire critiques if:

1. There was a significant fire related injury/accident.
(In conjunction with the Regional Fire Mgmt. Coordinator)
2. There was significant property or resource damage.
(In conjunction with the Regional Fire Mgmt. Coordinator)
3. The prescribed fire was declared a wildfire for any reason.
4. There were significant safety concerns voiced.
5. Significant smoke management problems occurred

C. Fire Season and Annual Plan Review

Refuge staff will meet annually to review prevention, preparedness, suppression, and prescribed fire operations during the prior fire season, and develop strategies for improving these operations in the future. A listing of recommended actions, staff members responsible for implementation, and implementation time frames will be developed.

XVII. CONSULTATION AND COORDINATION

All fire management program activities will be implemented in cooperation and coordination with the State of North Dakota, North Dakota Department of Environmental Health, and rural fire protection districts. Other agencies and organizations will be consulted with as needed.

This Fire Management Plan was developed following Service policy as outlined in the Fire Management Handbook. General program consultation and coordination will be sought from the Zone FMO, the Regional Fire Management Coordinator, Regional Prescribed Fire Specialist, and the National Interagency Fire Center (NIFC).

The following were consulted in the development of this plan:

William Leenhouts, Prescribed Fire Guru, USFWS NIFC
Rhoda Lewis, Regional Archeologist, USFWS Region6
Brian McManus, Zone FMO, J. Clark Salyer NWR

XVIII. REFERENCES AND BIBLIOGRAPHY

ANDERSON, B.A. 1983. Archaeological Considerations for Park and Wilderness Fire Management Planning. Paper presented at Wilderness Fire Symposium at the University of Montana, Missoula. Unpublished. 13pp

ANDERSON, H.E. 1982. Aids to Determining Fuel Models for Estimating Fire Behavior. USDA Forest Service. 22 p. Ogden, Utah

BLUEMLE, J. P. 1977. The face of North Dakota: the geologic story. North Dakota Geol. Surv. Educ. Ser. 11. 73pp.

DENIG, E. T. 1961. Five Indian tribes of the upper Missouri. Univ. Oklahoma Press, Norman. 217pp.

HESTER, J.J. 1989. Archeological Sites Protection and Preservation Notebook Technical Notes. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. 6pp.

HIGGINS, K. F. 1986. Interpretation and compendium of historical fire accounts in the Northern Great Plains. U.S. Fish Wildl. Serv. Resour. Publ. 161. 39pp.

HIGGINS, K. F., A. D. KRUSE, AND J. L. PIEHL. 1989. Prescribed burning guidelines in the northern great plains. South Dakota State Univ. Ext. Circ. 760. 36pp.

JENSEN, R. E. 1972. Climate of North Dakota. Natl. Weather Serv., North Dakota State Univ., Fargo. 48pp.

KANTRUD, H. A., G. L. KRAPU, AND G. A. SWANSON. 1989. Prairie basin wetlands of the Dakotas: a community profile. U.S. Fish Wildl. Serv. Biol. Rep. 85(7.28). 111pp.

KRAENZEL, C. F. 1966. The Great Plains in transition. Univ. Oklahoma Press, Norman. 428pp.

MURPHY, R. K. 1993. History, nesting biology, and predation ecology of raptors in the Missouri Coteau of northwestern North Dakota. Ph.D. Dissertation, Montana State University, Bozeman. 212pp.

PRESCRIBED FIRE AND FIRE EFFECTS WORKING TEAM. 1985. Smoke management guide. Natl. Wildfire Coord. Group., Guide No. 420-1. 28pp.

SAUER, C. O. 1950. Grassland climax, fire, and man. *J. Range Manage.* 3:16-21.

SEABLOOM, R.W., et al 1991. Effects of Prairie Fire on Archeological Artifacts. *Park Science* Volume 11-Number 1. 3pp.

SHARKEY, BRIAN ed. 1997. Health hazards of smoke: recommendations of the April 1997 Consensus Conference. Tech. Rep 9751-2836-MTDC. USDA Forest Service. Missoula Technology and Development Center. Missoula, Montana. p 4-5.

U.S. Department of Agriculture, Forest Service. 1994. Health hazards of smoke. Missoula Tech. Devel. Center, Missoula, MT (Fall issue). 8pp.

U.S. FISH AND WILDL. SERV. 1981. Mammals of Upper Souris National Wildlife Refuge, U.S. Fish Wildl. Serv., refuge leaflet publ.

U.S. FISH AND WILDL. SERV. 1993. Souris Loop Birds, U.S. Fish Wildl. Serv., refuge leaflet publ.

VOGL, R. J. 1974. Effects of fire on grasslands. Pages 139-194 in T. T. Kozlowski and C. E. Ahlgren, eds. *Fire and ecosystems*. Academic Press, New York.

WARD, D. E., AND C. C. HARDY. 1991. Smoke emissions from wildland fires. *Environ. Int.* 17:117-134.

WHEELER, G. C., AND J. WHEELER. 1966. The amphibians and reptiles of North Dakota. Univ. North Dakota Press, Grand Forks. 104pp.

WRIGHT, H. A., AND A. W. BAILEY. 1982. *Fire ecology*. J. Wiley and Sons, NY 501pp.

APPENDICES

A. Upper Souris National Wildlife Refuge Goals (RMIS 1997, unapproved)

MISSION

Protect, restore and manage representative habitats of the Souris River ecosystem to provide biodiversity and life requirements of migratory birds, endangered and threatened species and other wildlife and to provide quality opportunities for outdoor recreation, interpretation and environmental education.

Goal 1

WILDLIFE and HABITAT DIVERSITY: protect, restore and manage Souris River basin habitats to provide life requirements for migratory birds, indigenous listed and candidate endangered and threatened flora and fauna, and other wildlife.

Goal 2

WATER MANAGEMENT: Protect and manage available Souris River water to provide wetland habitat requirements of fish and wildlife on Upper Souris and J. Clark Salyer Refuges.

Goal 3

ENVIRONMENTAL EDUCATION: Develop public appreciation and understanding of plant and animal communities and resource issues within the Souris River ecosystem.

Goal 4

WILDLIFE-DEPENDENT RECREATION and INTERPRETATION: Provide quality opportunities for visitors to understand, observe and enjoy wildlife and native habitats of the Souris River ecosystem.

Goal 5

ENVIRONMENTAL QUALITY: Preserve and enhance environmental quality, wild character and natural beauty of refuge habitats.

APPENDIX B.

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Department of Interior

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UPPER SOURIS NWR - ND

Fish and Wildlife Service

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FIRE DETAIL LIST BY FIRE TYPES FOR 1980 Thru 1998

FIRE TYPES: All Fire Types

CAUSE CODES: All Causes

PEOPLE CODES: All People Codes

CLASS SIZE: All Class Sizes

FIRE UNIT TOTAL ACRES		FIRE TYPE	FIRE NBR	FIRE NAME	DISCOVERY DATE	DECLARED OUT DATE	DURATION DAYS	CLASS SIZE	AGENCY BURNED	ACRES BURNED
YEAR	ID				DATE	OUT DATE	DAYS	SIZE	BURNED	BURNED
1985	62680	48	6252	BAKERS BRG	04-30	04-30	1	C	90.0	90.0
	62680	48	6253	OUTLET REC	04-30	04-30	1	C	15.0	15.0
	62680	48	6254	B,C POOLS	04-30	04-30	1	C	80.0	80.0
	62680	48	6255	KRENZ UNIT	06-05	06-05	1	B	2.0	2.0

FIRE UNIT TOTAL ACRES		FIRE TYPE	FIRE NBR	FIRE NAME	DISCOVERY DATE	DECLARED OUT DATE	DURATION DAYS	CLASS SIZE	AGENCY BURNED	ACRES BURNED
YEAR	ID				DATE	OUT DATE	DAYS	SIZE	BURNED	BURNED
1986	62680	48	6005	FOXHOLM RD	04-24	04-24	1	D	105.0	205.0
	62680	48	6099	TOUR ROUTE	05-13	05-13	1	D	190.0	190.0
	62680	48	6103	GRANOSOUTH	05-13	05-13	1	D	210.0	210.0
	62680	48	6106	GRANONORTH	05-13	05-13	1	D	190.0	190.0
	62680	48	6173	EMER SPILL	10-20	10-20	1	B	2.0	2.0
	62680	48	6174	N DAM 87	10-21	10-21	1	C	43.0	43.0

FIRE UNIT TOTAL ACRES		FIRE TYPE	FIRE NBR	FIRE NAME	DISCOVERY DATE	DECLARED OUT DATE	DURATION DAYS	CLASS SIZE	AGENCY BURNED	ACRES BURNED
YEAR	ID									
1987	62680	21	6004	FEDERAL 4	02-23	02-23	1	B 2.0	2.0	
	62680	11	6009	FEDERAL 1	04-07	04-07	1	E 340.4	349.2	
	62680	48	6108	PENINSULA	04-28	04-28	1	C 42.5	42.5	
	62680	48	6232	B POOL 1	09-23	09-23	1	C 60.0	60.0	
	62680	11	6233	WLDFIRE873	09-23	09-23	1	B 2.5	2.5	
	62680	11	6238	WLDFR 874	10-12	10-13	2	D 290.0	330.0	
	62680	48	6245	CNTRL 877B	10-14	10-14	1	C 80.0	80.0	
	62680	48	6246	CNTRL 877C	10-15	10-15	1	C 20.0	20.0	
	62680	48	6247	CNTROL 873	10-16	10-16	1	D 190.0	190.0	

FIRE UNIT TOTAL ACRES		FIRE TYPE	FIRE NBR	FIRE NAME	DISCOVERY DATE	DECLARED OUT DATE	DURATION DAYS	CLASS SIZE	AGENCY BURNED	ACRES BURNED
YEAR	ID									
1989	62680	48	6036	CNTRL 891	05-02	05-02	1	C 10.0	10.0	

FIRE UNIT TOTAL ACRES		FIRE TYPE	FIRE NBR	FIRE NAME	DISCOVERY DATE	DECLARED OUT DATE	DURATION DAYS	CLASS SIZE	AGENCY BURNED	ACRES BURNED
YEAR	ID									
1990	62680	48	6019	CNTRL 901	04-17	04-17	1	C 10.0	10.0	

FIRE UNIT TOTAL ACRES		FIRE TYPE	FIRE NBR	FIRE NAME	DISCOVERY DATE	DECLARED OUT DATE	DURATION DAYS	CLASS SIZE	AGENCY BURNED	ACRES BURNED
YEAR	ID									
1991	62680	11	6339	BOCKCOULEE	10-17	10-28	12	E 472.0	475.0	

FIRE UNIT TOTAL ACRES		FIRE TYPE	FIRE NBR	FIRE NAME	DISCOVERY DATE	DECLARED OUT DATE	DURATION DAYS	CLASS SIZE	AGENCY BURNED	ACRES BURNED
YEAR	ID									
1991	62680	48	6344	CNTRL911A	04-23	04-23	1	C 30.0	30.0	
	62680	48	6345	CNTRL911B	04-25	04-25	1	C 80.0	80.0	
	62680	48	6346	CNTRL 912	10-02	10-02	1	D 160.0	160.0	

62680	48	6347	CNTRL 911C	10-03	10-03	1	C	55.0	55.0
62680	48	6348	CNTRL 915	10-15	10-15	1	D	160.0	160.0
62680	48	6349	CNTRL 911D	10-11	10-11	1	C	70.0	70.0
62680	48	6350	CNTRL 913	10-16	10-16	1	C	55.0	55.0

FIRE UNIT FIRE FIRE FIRE DISCOVERY DECLARED DURATION CLASS AGENCY ACRES TOTAL ACRES										
YEAR	ID	TYPE	NBR	NAME	DATE	OUT DATE	DAYS	SIZE	BURNED	BURNED
1992	62680	48	6008	CNTRL922A	04-09	04-09	1	B	4.0	4.0
	62680	48	6064	CNTRL921	05-15	05-15	1	C	46.0	46.0
	62680	48	6068	CNTRL923A	04-09	04-09	1	B	1.5	1.5
	62680	11	6152	ECKERT	09-13	09-13	1	B	9.4	9.4
	62680	48	6158	CPOOLBURN	09-28	09-28	1	C	13.1	13.1
	62680	13	6372	EMERSON	04-11	04-12	2	C	30.0	100.0

FIRE UNIT FIRE FIRE FIRE DISCOVERY DECLARED DURATION CLASS AGENCY ACRES TOTAL ACRES										
YEAR	ID	TYPE	NBR	NAME	DATE	OUT DATE	DAYS	SIZE	BURNED	BURNED
1994	62680	48	6849	CNTRL 941A	09-22	09-22	1	C	30.0	30.0
	62680	48	6850	CNTRL 941B	09-29	09-29	1	C	55.0	55.0
	62680	48	6882	CNTRL 942A	10-31	10-31	1	C	40.0	40.0

FIRE UNIT FIRE FIRE FIRE DISCOVERY DECLARED DURATION CLASS AGENCY ACRES TOTAL ACRES										
YEAR	ID	TYPE	NBR	NAME	DATE	OUT DATE	DAYS	SIZE	BURNED	BURNED
1996	62680	21	6276	BUOY LINE	04-17	04-18	2	B	.6	.6
1996	62680	11	6430	NDHTRS1/8E	07-05	07-05	1	B	.5	.5
	62680	48	6431	GMU1-GU4	06-07	06-08	2	E	620.0	620.0

FIRE UNIT FIRE FIRE FIRE DISCOVERY DECLARED DURATION CLASS AGENCY ACRES TOTAL ACRES										
YEAR	ID	TYPE	NBR	NAME	DATE	OUT DATE	DAYS	SIZE	BURNED	BURNED
1997	62680	11	6716	SHONGROVE	07-04	07-04	1	B	1.0	1.5
	62680	16	6821	FOXHOLM#1	10-02	10-03	2	A	.0	1,400.0
	62680	48	6853	ECKERT R 1	06-04	06-05	2	E	320.0	320.0
	62680	48	6854	ECKERT R 2	06-05	06-07	3	E	300.0	300.0

62680 21 6855 BOATFIRE 09-01 09-01 1 A .1 .1

FIRE UNIT		FIRE	FIRE	FIRE	DISCOVERY	DECLARED	DURATION	CLASS	AGENCY ACRES	TOTAL ACRES
YEAR	ID	TYPE	NBR	NAME	DATE	OUT DATE	DAYS	SIZE	BURNED	BURNED
1998	62680	48	6048	98 SLASH	03-31	03-31	1	A	.1	.1
	62680	48	6205	IRON	06-08	06-10	3	B	4.0	4.0
	62680	48	6211	GREENE	06-16	06-17	2	D	150.0	150.0
	62680	48	6279	GRANO	00-00	00-00	0	A	44.0	.0
	62680	48	6280	GRANO-#2	00-00	00-00	0	A	86.0	.0
	62680	11	6292	SIL BDG SE	08-24	08-24	1	B	9.5	9.5

GRAND TOTAL: TOTAL FIRES: 52 AGENCY ACRES BURNED: 4,821.2 TOTAL ACRES BURNED 6,443.5

Appendix C. Fire Management Units

Appendix D. Cooperative Agreements

Appendix G. Open Burn Restrictions (North Dakota State Health Department)

Conditions/Restrictions Applicable to an Approval to Open Burn

Types and Conditions of Materials

1. Oil, rubber and other materials which produce unreasonable amounts of air contaminants
2. The material must be dry enough to burn completely

Burn Procedures

3. The burning may be conducted only when meteorological conditions favor smoke dispersion
4. The burning must be conducted in such a manner to ensure that the fire will not spread to other areas
5. When burning is in progress, winds must be blowing away from any airport or landing strip
6. When the burning is conducted near any highway or public road, it must not be allowed to obstruct traffic
7. The burning may not be conducted in such proximity of any Class I area that the visibility of such area is adversely impacted, as defined in Chapter 33-15-19 of the North Dakota Air Pollution Control Rules.

Supervision and Notification

8. The local/appropriate fire department must be notified prior to burning.
9. Burning activities must be attended and supervised at all times burning is in progress.
10. Burning is prohibited if the index is in the "extreme" category as issued by the National Fire Weather Index.
11. If State or local fire officials determine conditions to be unsafe for open burning, such as high winds, low humidity, or high fire danger, burning is prohibited.

Appendix H. Complex Rating Guide

Prescribed Fire Complexity Worksheet

Using the attached criteria, rate each element on a scale of 1 to 10, then multiply by the weighting factor (shown in parentheses in first column) to determine the weighted subvalues. Add the subvalues to determine the total weighted value which is used to determine the complexity of the prescribed burn.

MANAGEMENT IGNITED PRESCRIBED BURNS:

COMPLEXITY ELEMENT/ (WEIGHTING FACTOR)	RATING VALUE	WEIGHT SUBVALUE	LOW BURN COMPLEXITY	HIGH BURN COMPLEXITY
1. Potential for escape (10)			Very low probability.	High probability.
2. Values at risk (10)			Very little risk to people, property, resources.	Great risk to people, property, resources.
3. Fuels/fire behavior (5)			Mostly uniform and predictable.	Great variability & unpredictability. Prescription includes very low fuel moisture conditions.
4. Fire duration (5)			Fire generally of short duration & require little management.	Fires of long duration & require continuous management.
5. Smoke/air quality (7)			Smoke impacts are low or insignificant.	Smoke sensitive areas frequently affected.
6. Ignition methods (3)			Simple & rarely hazardous.	Highly technical or frequently hazardous.
7. Management team size (3)			Burn requires a few generalized positions.	Burn requires large team of separate, specialized positions.
8. Treatment objectives (7)			Objectives simple & easy to achieve. Prescriptions are broad & encompass safe burning conditions.	Objectives are difficult to achieve. Prescriptions are restrictive or burning conditions are risky.
Total Weighted Value:				

Prepared by (RXBB/FMO)

Date

PRESCRIBED FIRE COMPLEXITY ELEMENT RATING CRITERIA

Complexity elements are used to define the relative complexity of a prescribed fire project. For the 8 complexity elements listed, users assign a complexity score of 0, 1, 3, 5, 7 or 9, based upon the rating criteria described for each numeric score. Even numbers or numbers greater than 9 are not permitted. If a specific prescribed burn does not precisely match the stated criteria in every respect, a station will have to use its best judgment determine which rating is most appropriate. Each prescribed burn does not have to meet all listed rating criteria for a particular numeric score

to qualify for that rating. Each higher rating category includes all the rating criteria listed for the previous categories.

These rating criteria will be used for all management ignited prescribed fires (prescribed burns), regardless of size. The complexity score will be included on the Fire Report (DI-1202) in the "Remarks" section. Post-fire complexity ratings are used to compile a summary complexity score for the normal prescribed fire year, which is used in the FireBase budget analysis for funding and staffing needs.

COMPLEXITY ELEMENTS

1. POTENTIAL FOR ESCAPE:

Score Criteria

[0] No potential for prescribed fire escape. Burn unit surrounded by non-burnable fuel or water.

[1] Little potential of spot fires outside burn unit. If occurring, only one to two totaling no more than 0.25 acre. Spots can be controlled utilizing on-site holding forces.

[3] Potential for multiple spot fires (more than two) outside the burn unit totaling less than 1 acre, but still controllable utilizing on-site holding resources. One or two dangerous fuel concentrations exist near the burn unit perimeter, and are expected to result in limited torching and spotting potential.

[5] Potential for multiple spot fires outside the burn unit totaling more than 1 acre, requiring greater than average holding capability along certain sections of burn perimeter. Additional holding resources may be needed to control if escape occurs. Fuel outside burn unit is continuous, with limited fuel breaks. Engines and heavy equipment are primary suppression tools.

[7] An escaped fire will exceed the capability of the holding resources on site. Additional resources will need to be requested for suppression. Escaped fire will cause implementation of contingency plan.

equipment are primary suppression tools. Probability of Ignition

greater

- [9] Good potential for multiple fire escapes. An escaped fire will exceed the capability of the holding resources on site and additional resources will need to be requested. Escaped fires will cause implementation of contingency plan and prescribed burn will be declared a wildfire. Fuel outside the burn unit is extensive and heavy, making suppression actions difficult. Prescription calls for fireline intensity and fuel moisture in the primary fuel model that are known to cause serious spotting potential. Probability of Ignition greater than 85 percent. Wind speeds at the upper end of prescription.

2. VALUES AT RISK

Score Criteria

- [0] No risk to people, property, cultural and natural resources, either inside the designated burn unit or in the event of fire escape.
- [1] Burn is in an area infrequently visited by people and contains no historic structures, buildings, sensitive biological communities, T&E species, or habitats that could be damaged by prescribed fire. The area adjacent to the burn may contain a few locally significant natural or cultural resources, or structures that could be damaged by fire escapes.
- [3] Burn is in an area occasionally visited by people, and may be adjacent to a primary field unit road. The burn unit contains structures, cultural resources, sensitive biological communities, or T&E habitat that must be protected from fire.
- [5] Burn is in an area that receives moderate use. Public safety is a major concern addressed in the burn unit plan, but still requires a minor commitment of project resources. The unit may contain several significant structures; there may be one or two primary natural or cultural resources (as identified in the station fire management plan) inside or immediately adjacent to the burn unit which must be protected from fire. - OR - the area adjacent to the burn unit contains one or two cultural or natural resources, or structures valued between \$50,000 and \$250,000 that could be threatened by fire escapes.

- [7] Burn is in an area that receives moderate use, and protecting public safety requires a modest commitment of project resources. The burn unit may contain several significant structures, and contain or be immediately adjacent to several sensitive biological communities or habitats (as identified in station fire management plan) that must be protected from fire. - OR - the area adjacent to the burn unit contains three or more cultural or natural resources or developed sites with structures valued between \$250,000 and \$500,000 that could be threatened by fire escapes.
- [9] The burn unit is in an area of concentrated public use, and protecting public safety requires a major commitment of project resources. The unit may contain several major structures (such as residences, historic buildings) and there may be critical natural or cultural resources (such as threatened or endangered species, or major archeological artifacts) inside the burn unit that must be protected from fire. - OR - the area adjacent to the burn unit contains critical natural or cultural resources or developed sites with structures valued at more than \$500,000.

3. FUELS/FIRE BEHAVIOR

Score Criteria

- [1] Fuels are uniform, and fire behavior is easily predicted using the standard fire behavior models and prediction systems (BEHAVE PROGRAM). Terrain is mostly flat, or the slope is uniform.
- [3] Fuels within the primary model vary somewhat in loadings and arrangement, but are still well represented by one of the standard fire behavior fuel models. There may be small areas of secondary fuel types present, mostly away from the burn unit perimeter. The terrain contains low relief, and slope and aspect cause minor variations in fire behavior. The fire behavior variations present no difficulties in carrying out the burn, and the predominant fire behavior still can be predicted easily under most prescription conditions.
- [5] Considerable variation exists within the primary fuel complex. Prescriptions may be based on two fuel models, or may require a customized model in addition to or in place of a standard model. A few areas of unusual fuel concentrations or atypical fuels not well represented

by the prescription-based models may exist on or near the burn unit perimeter. The terrain contains significant relief, but the variations present only minor control problems, and no problems in meeting burn unit objectives. Fire behavior can still be predicted using standard fire behavior prediction systems.

- [7] Major variations in the fuel complex require **two or more** fuel models, and may require several customized models. High fuel concentrations and atypical fuels not well represented by the prescription-based models may be common on or near the burn unit perimeter. The terrain encompasses two or three major vegetative communities through a broad elevational gradient. Variations in slope and aspect have major effects on fuels, fire weather and fuel moisture. The resulting variations in fire behavior may present moderate fire control problems and minor problems in meeting the overall burn unit objectives. Fire behavior cannot be predicted well using standard fire behavior prediction systems without application of adjustment factors.
- [9] The burn unit contains highly variable fuels throughout, making it difficult to utilize standard or customized fuel models. The terrain encompasses more than three major vegetative communities through an elevation gradient so broad that more than one climate zone may be present. Wide variations in slope, aspect and elevation have major effects on fuels, fire weather and fuel moisture. The resulting variations in fire behavior may present major fire control problems and moderate problems in meeting overall burn unit objectives. Fire behavior cannot be predicted well without the aid of local experts (Fire Behavior Analysis).

4. FIRE DURATION

Score Criteria

- [1] Entire burn unit will be burned in one burning period. Some minor residual burning may continue inside the unit, but requires no continued resource commitment. Primarily 1-hour fuels.
- [3] Complete burnout of burn unit requires 1 to 3 days. Some minor residual burning may continue inside the unit, but requires no continued resource commitment. Primarily 10-hour fuels.
- [5] Complete burnout of burn unit requires 2 to 3 days. Significant residual

burning inside the burn perimeter may continue for up to 3 days, requiring small holding crew. Primarily 100-hour fuels.

- [7] Complete burnout of burn unit requires 3 days to 1 week. Significant residual burning inside the burn perimeter may continue up to another week, requiring a holding crew on site during the burning period. Primarily 1,000-hour fuels.
- [9] Complete burnout of burn unit requires more than 1 week. Significant residual burning may continue for up to another 3 weeks along most of the burn unit perimeter, requiring a complete holding crew on site.

5. AIR QUALITY

Score Criteria

- [1] Burn is remote from developments or visitor use areas or is of such small size that smoke impacts are insignificant. No critical targets are present. Critical targets are areas that are unusually sensitive to smoke impacts. These include areas such as airports, highways, air quality non-attainment areas, and hospitals in which health and safety are quickly and severely impacted by even minimal amounts of smoke, targets that already have an air pollution or visibility problem, and any targets where the impact of smoke will be compounded by the presence of emissions from other sources. Burning is outside the non-attainment areas, and RACM/BACM eliminates any impacts to these areas.
- [3] One or more minor developments or visitor use areas may experience noticeably impaired visibility and increased particulate concentrations, but not in excess of secondary Federal standards. The impairment is expected to last no more than 3 days. No critical targets are present. There are no impacts to non-attainment areas.
- [5] Several communities or visitor use areas may experience significantly impaired visibility (as defined in State, county, or field station visibility standard) or particulate concentrations exceeding secondary Federal standards. The impairment is expected to last no more than 1 week. Not more than one health-related complaint is likely to be received from health or medical authorities. No critical targets are present. Smoke trajectory is

important, but broad.

- [7] One town (more than 20,000 people) or one major visitor use area may experience significantly impaired visibility (as defined in a State, county or field station visibility standard) or particulate concentrations exceeding secondary Federal standards. The impairment is expected to last not more than 1 week. One to three critical targets are present. Smoke trajectory is critical. Mixing height and transport wind speed may be important.
- [9] Several towns (each of 20,000 people or more) or several major visitor areas may experience significantly impaired visibility (as defined in State, county or field station visibility standard) or particulate concentrations exceeding secondary Federal standards. The impairment is expected to last more than 1 week. Any impact likely to result in a violation of a primary Federal air quality standard would also qualify. Smoke trajectory, mixing height, and transport wind speed are critical.

6. IGNITION METHODS

Score Criteria

- [1] Burn is ignited using drip torches, fusees, or other simple ground methods. Ignition requires not more than two personnel. Ignition patterns are simple, with no chance for confusion or hazardous situations to develop.
- [3] Burn is ignited using simple ground methods or Terra Torch device (or equivalent). Ignition requires three to four personnel who may work in small teams igniting separate areas simultaneously. Ignition patterns may be complex enough to require detailed planning, but there is only minor chance of confusion. Ignition team is not expected to become involved in hazardous situations.
- [5] Burn is ignited using a combination of ground methods, or both ground and aerial methods. Ignition requires four to six personnel working in teams to ignite separate areas simultaneously. Burn and ignition complexity requires separate position for ignition specialist. Ignition patterns require detailed planning, coordination between teams, and considerable attention to avoid confusion. Ignition teams may be exposed to hazardous situations for short periods.
- [7] Ignition methods are tailored to accomplish different results in different sections of the burn. Burn unit may be composed of several fuel types requiring different ignition techniques and patterns. Ignition team(s) is composed of six to eight personnel, who may ignite separate areas simultaneously. Several ignition specialists may be required for different segments of the burn. Ignition methods require detailed planning and coordination often including an ignition specialist in aerial command post. Ignition teams are frequently exposed to hazardous situations due to fuels, fire line intensity, and complex terrain. Ignition methods or patterns are subject to revision by burn boss to achieve desired results or due to changing conditions.
- [9] Burn requires a combination of complex aerial and ground techniques, often including helitorch, in complex, hazardous terrain and fuels. Ignition team is composed of more than eight personnel. Ignition methods require detailed planning by experts with extensive experience in specialized techniques. Ignition methods are subject to frequent revision

by burn and ignition bosses due to changing or uncertain conditions. Detailed coordination is imperative to avoid placing team members in unacceptably dangerous situations.

7. MANAGEMENT TEAM SIZE

Score Criteria

- [1] Burn team consists of two to three personnel, with the burn boss holding several overhead positions.
- [3] Burn team consists of four to six personnel, including separate positions for Burn Boss and Holding Specialist.
- [5] Burn team consists of seven to nine personnel, including separate positions for Burn Boss, Ignition Specialist, and Holding Specialist.
- [7] Burn team consists of 10-12 personnel, including Burn Boss, Ignition and Holding Specialist, Aircraft Manager (aerial ignitions), and a Fire Weather Observer.
- [9] Burn team consists of more than 12 personnel, including Burn Boss Type I, Holding Boss, Ignition Specialist, Aircraft Manager, Weather Observer, and several ignition and holding foremen.

8. TREATMENT OBJECTIVES

Score Criteria

- [1] Objectives are limited to fuel reduction or maintenance burning and are easily achieved (e.g., removing cured grasses from grasslands or field maintenance). Prescriptions are broad and encompass safe burning conditions.
- [3] Objectives are limited to dead and downed fuel reduction, or simple habitat restoration projects involving minor changes to vegetation. May involve two or three different fuel models. Objectives are easy to achieve

using relatively low-intensity surface fires and simple burning patterns. Range of acceptable results for the burn objectives are broad.

- [5] Objectives include dead and downed fuel, and live fuel reduction burns or change to structure of vegetative/habitat communities. Also include habitat conversion projects requiring changes in the composition of two or more vegetation types. Objectives and results are broad and could be moderately difficult to achieve, and may often require moderate intensity fires involving living fuels. Burning patterns are moderately complex. Flame lengths or scorch heights are critical to meet burn objectives.

- [7] Objectives include living and dead fuels. Include habitat restoration projects requiring changes in the structure and composition of two or more vegetative habitats. Narrow burn parameters (prescription) fire behavior, smoke dispersal, operational constraints, and other burn criteria present a limited opportunity of project success with a single burn. The chance of success is heavily dependent on careful planning and precise timing.

- [9] Objectives include living and dead fuels. Fuel reduction, ecological considerations, and political or operational constraints may be conflicting, requiring careful prioritization of objectives and expert planning. The prescription may require a combination of different fire intensities that makes it difficult to achieve objectives. The prescription criteria and window of opportunity are narrow. Burn objectives are specific, and range of results narrow. Project includes a major change in structure and composition of burn area. The prescription requires burning under risky conditions that could lead to fire escape.

COMPLEXITY LEVEL

PRESCRIBED FIRE

- Level 1** Complex Structure. Prescribed Fire Manager is serving as Incident Commander. Use of multiple forms of ignition, including air operations. All functional positions filled. Prescriptions are restrictive or burning conditions are risky. Multiple burning periods involved.
- Level 2** Complex Structure. Prescribed Burn Boss I assigned as Incident Commander. May involve multiple forms of ignition, including air operations. Individuals designated as Holding Specialist, Ignition Specialist, and Air Support Group Supervisor, Helibase Manager, or other person to direct areal ignition operation. Prescriptions include low fuel moisture conditions or other similar factors that may affect fire behavior. May involve multiple burning periods.
- Level 3** Normal Structure. Prescribed Burn Boss II assigned as Incident Commander. May involve multiple forms of ignition. Individuals may be designated as Holding Specialist, Ignition Specialist, and Air Support Group Supervisor, Helibase Manager, or other person to direct areal ignition operation. Generally ignition does not involve multiple burning periods, may involve more than one fuel type.
- Level 4** Normal Structure. Prescribed Burn Boss II or Prescribed Burn Boss III assigned as Incident Commander. Involves simple ignition methods. The Burn Boss generally serves in more than one capacity. Ignition completed in one day or less. Fires are generally of short duration, involve relatively uniform fuels, and require little management.

APPENDIX I - RECOMMENDED FIRE MONITORING STANDARDS

REGION 6

The following are the recommended standards to be used when planning, implementing, and evaluating prescribed burns. These should be viewed as minimum values to be monitored and the information contained in this check list incorporated into a monitoring record sheet.

Planning and Preparation

Environmental Conditions Prior to the Burn

Photo Points Established

Fuel

Model(s)

Loading (By Size Class)

% Cover (Type/Model)

Continuity

Crown ratio

Depth of Fuel Bed

Other

Air Temperature (Maximum - Minimum to develop trends)

Relative Humidity (Maximum - Minimum to develop trends)

Wind Speed and Direction (Eye-level/20 Foot)

Fuel Moisture

Dead Fuel Moisture (Use of Fuel Sticks and/or Drying Ovens highly recommended)

Live Fuel Moisture (Fuel Models 2,4,5,7,10)

Soil Moisture (Dry, Moist, Wet)

Drought Indicator (Track One or More)

Execution***Environmental Conditions During the Burn***

_____ Date/Time

_____ Air Temperature (Every 30 minutes)

_____ Relative Humidity (Every 30 minutes)

_____ Wind Speed and Direction (Eye Level) (Every 30 minutes)

_____ Cloud Cover

_____ Fuel Moisture (Indicate How Determined: Calculated, Actual)

_____ Dead Fuel Moisture (Using above values, calculate every 30 minutes utilizing Tables and Worksheets, Nomograms, BEHAVE, etc.)

_____ Live Fuel Moisture (Fuel Models 2,4,5,7,10 - Collect immediately prior to the burn and evaluate later)

Fire Behavior

_____ Flame length (Head, Flank, Backing)

_____ Rate of Spread (Forward, Flank, Backing)

_____ Resistance to Control

_____ Spotting Distance

Smoke/Air Quality

_____ Mixing/Dispersion (Good, Fair, Poor)

_____ Trajectory of Column (Surface/Upper Level)

_____ Duration (Active Burning/Smoldering)

_____ Problems

Note: It is recommended that photos be taken to document smoke dispersal.

Post Burn

First Order Fire Effects

- ___ Photo Point
- ___ Percent of Area Burned
- ___ Percent of Fuels Consumed (By Fuel Loading Size Class, when possible)
- ___ Percent of Thatch/Duff Consumed
- ___ Scorch Height
- ___ Mortality

Note: The information in the first two categories will be used to determine the amount of particulate matter produced, and may/will be used by State Air Quality Regulators.

Appendix J. Approval to Open Burn Letter (Example)