

Fire Management Plan
Fire Management Program
Lacreek National Wildlife Refuge

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US Fish and Wildlife Service
Department of the Interior
Denver, Colorado

FIRE MANAGEMENT PLAN
LACREEK NATIONAL WILDLIFE REFUGE
1999

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Environmental Assessment - Habitat Management Plan

I. INTRODUCTION

A. Purpose and Need

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.

The Service permits the use of fire as a management tool as described in the Service Manual, Part 621 - Fire Management; however, certain requirements are also identified as well. The purpose of this plan is to provide a detailed program of action that provides direction to managers as they implement the Refuge's fire management program and to meet the Service's requirement that a Fire Management Plan be completed for all areas with burnable vegetation.

Lacreek National Wildlife Refuge has one satellite refuge, Bear Butte NWR. The 592 acre unit is an easement refuge (no fee title acres) that is administered by the State of South Dakota Parks Department as Bear Butte State Park. The Service has no cooperative fire agreements for this Refuge. Fire protection is provided by the volunteer fire departments (VFD) from Sturgis, Newell, Whitewood, and Belle Fourche, SD. These VFD's have established cooperative fire agreements with South Dakota State Forestry Department. Service policy exempts refuges with no fee title lands from the requirement that an approved fire management plan be in place. Therefore, this plan will only address the fire management program at Lacreek National Wildlife Refuge.

B. Description of Refuge

1. Location

Lacreek National Wildlife Refuge (Refuge) is located in the Lake Creek Valley in southern Bennett County on the northern edge of the Nebraska

Sandhills, in south-western South Dakota (Figure 1). The refuge covers 16,410 acres and is the only refuge in South Dakota headquartered west of the Missouri River (Figure 2).

The Refuge was established on August 26, 1935, by Executive Order No. 7160 under authority of the Migratory Bird Conservation Act, as a “breeding ground for migratory birds, and other wildlife”. The Brown Ranch was added by fee title on September 2, 1971, under the authority of the Migratory Bird Conservation Act of February 18, 1929, as amended. The Little White River Recreation Area was donated to the government in 1937, but was not accepted due to encumbrances on the title. The title conflict was finally resolved in 1981 when the title was accepted under the authority of the Refuge Recreation Act of September 28, 1962 (USC 460k). The refuge provides an important migration stop-over for many species of waterfowl as well as meeting habitat requirements for a variety of other migratory and non-migratory wildlife. Lacreek also provides upland nesting habitat for a variety of waterfowl and other migratory birds. The refuge has twelve impoundments that provide pairing and brood habitat.

Figure 1: Vicinity Map - Lacreek National Wildlife Refuge

Figure 2: Lacreek National Wildlife Refuge

2. Climate

The climate in Bennett County is semi-arid and is characterized by hot summers and cold winters. Average annual precipitation is 16.6 inches, with about 80% falling during the growing season. Summer temperatures average 80-90°F with highs above 100°F for short periods. Daylight winter temperatures average 10-35°F with occasional lows below -30°F. Prevailing winds are out of the south-west in the summer and north-west in the winter. Winds average about 11 mph, but have been noted as high as 50 mph in any month of the year. The growing season is approximately 130 days. The last spring frosts are in mid to late May and the first killing frosts are in September.

3. Topography and Soils

Most of the refuge is located in the Mosher-Minitare-Loup Association. The topography is nearly level, somewhat poorly drained to poorly drained, deep loamy soils and soils with a claypan; on stream valleys, terraces, and basins. The sandhills portion of the refuge is in the Valentine Association: The sandhill topography is rolling to choppy hills, excessively drained, deep, sandy soils with nearly level sub-irrigated meadows in the Lake Creek Valley. Approximately 640 acres on the northwest end of the refuge is in Keith-Rosebud Association: The topography is nearly level to gently sloping, well-drained, deep, silty soils and moderately deep, loamy soils on uplands. Twenty-nine different soil types and twelve different range sites are found on the refuge.

4. Hydrographic Features

The refuge includes 15 miles of dikes impounding over 5,000 acres of shallow flooded marsh and open water. The primary water sources are Lake Creek, Cedar Creek, Elm Creek, and several smaller spring-fed creeks that flow from the sandhills. A change in management direction from maintaining open water impoundments to managed moist soil units will change the character of the wetlands.

5. Wildlife

Invertebrate Populations: Invertebrate populations are vital to breeding and migrating waterfowl and shorebirds that use the refuge. Little is known about the population dynamics or ecology of the various species on the refuge, except that carp reduce the invertebrate population by destroying habitat. No recent studies have been conducted on which populations are represented at the Refuge. Due to the important role of invertebrates in the life cycle of a variety of wildlife species, management

planning must consider potential impacts to these populations.

Fish: A variety of fish species are found at the Refuge. Northern pike, saugeye, large-mouth bass, black crappie, perch, bluegill, pumpkinseed, bullhead, carp and a variety of minnows including plains topminnow, pearl dace and the endangered red-belly dace are found in Refuge waters. Rainbow trout are stocked in the Trout Ponds on the south west end of the refuge. Great-blue herons, white pelicans, double-crested cormorants, American bitterns, and grebes all fish in the refuge waters. Selected pools (Pools 3,4,7,10, the Trout Ponds, and the Little White River Recreation Area) are open to public fishing.

Reptiles and Amphibians: Informal surveys and observations have noted salamanders, garter snakes, racers, rattlesnakes, bullsnakes, leopard frogs, painted turtles and snapping turtles.

Birds: Over 258 species of birds have been recorded at the Refuge since 1959. The full range of passerine and other birds common to the plains states are found on the refuge at some time during the year. The refuge serves as an important migration stopover. Fifty-one species of waterfowl, pelicans, cormorants, herons and ibises use the refuge for migration and/or nesting. During the spring and fall migrations waterfowl numbers have peaked at 29,000 ducks and 28,000 geese. Approximately 160 trumpeter swans winter at The Refuge.

Many raptor species use the refuge. Eighteen species of hawks and eight species of owls have been documented at the Refuge. Of those, four species of hawks and three species of owls nest on the refuge. Golden eagles, bald eagles, red-tailed hawks, Swainsons hawks, northern harrier, American kestrel, great-horned owls, western burrowing owls and short-eared owls are some of the more common species seen on the refuge.

Shorebirds are very common during the migration periods in the spring and fall. Forty-four species of rails, plovers, turnstones, sandpipers, stilts and gulls have been documented on the refuge. Of those, 16 species nest at the Refuge.

Three species of non-migratory birds are found at the Refuge. Ring-necked pheasants, though an introduced species, have a stable population. Sharp-tailed grouse are commonly seen throughout the winter months, and northern bobwhite quail are seen occasionally.

A complete bird list for Lacreek NWR is attached.
(Appendix A)

Mammals: A variety of mammals inhabit the refuge. Coyotes, cottontail rabbits, field mice, shrews, voles, weasels, ground squirrels, prairie dogs, badger, mink, beaver, muskrats, skunk, raccoon, white-tailed deer, mule deer and antelope as well as many other species have been observed on the refuge. Refuge grasslands and marshes are important for all of these species for forage and cover (Appendix B).

6. Threatened and Endangered Species

The following Federally and State listed endangered and threatened species have been documented at the Refuge.

Federally listed: Whooping cranes - occasional use, peregrine falcons - occasional use, bald eagles - regular winter use. The loggerhead shrike, a candidate for federal listing, is observed regularly throughout the spring and fall and has been recorded as nesting at the Refuge.

State listed: Western burrowing owl - regular spring/summer use, prairie merlin - occasional use, red-belly dace - regular use all year.

The Refuge will implement its fire management program within the constraints of the Endangered Species Act of 1973, as amended, and Service policy which requires that State threatened and endangered species and Federal candidate species be incorporated into planning activities. The Refuge will take appropriate action to identify and protect from adverse effect any rare, threatened, or endangered species located within the Refuge.

7. Cultural Resources

One cultural resource inventory was completed in 1978. Nothing was found during that study. Two historic sites were recorded in 1999; the headquarters buildings and a bridge. Since that time, several cultural resource surveys were conducted on selected sites in conjunction with construction and borrow sites. These surveys revealed some arrowheads and chips. A cultural overview was completed for the Refuge in 1999 as part of the CCP planning process. That study states that artifacts have been reported from the surface of the uplands and the historic remains associated with the CCC and with earlier homesteading activities can also be expected.

8. Land Use, Values, and Improvements

With the exception of two state managed areas, adjacent land ownership to the Refuge is mostly private, and the local economy is primarily farming and ranching. Private structures, farm equipment, and grazing/hay/cropland are the primary values at risk. Wooden utility poles and junction boxes, fences, windmills, public use facilities, and gates are also located on or near the Refuge.

The Refuge supports a variety of recreational uses. Public hunting is allowed for white-tailed deer, ring-necked pheasant and sharp-tailed grouse. Public fishing is allowed on selected pools, special restrictions apply. Bird watching is a favored activity throughout the year. Many visitors come in the winter to see wintering trumpeter swans. Other visitors enjoy seeing migrating waterfowl, shorebirds and neotropical migrants as well as broods of ducks and geese in the spring. Recreation on the Little White River Recreation Area includes swimming, boating, water skiing, picnicking, and camping, as well as the uses mentioned above.

9. Socio-Political Climate

Bennett County, spread over approximately 1,161 square miles, is sparsely populated. As of 1990, the county census was estimated at 3,200. Most people live in or near the town of Martin, a population of approximately 1,100 people, that is located 12 miles NW of the refuge. Approximately one-third of the county is American Indian trust land. The main income is from dryland farming and beef cattle production. Private landowners in this area are aware and supportive of prescribed burning on the Refuge.

C. **Habitat Types**

Table 1: Habitat Types

| Habitat Type | Acres |
|--------------------------|--------|
| Native Grasslands | 4,560 |
| Tame Grasslands | 5,500 |
| Restored Grasslands | 880 |
| Shrub and Tree Plantings | 70 |
| Wetlands | 5,400 |
| Total | 16,410 |

Lacreek National Wildlife Refuge is within the geographic area known as the Northern Great Plains and is classified vegetatively as mixed grasslands.

The Refuge lies in the Lake Creek Valley that separates the Nebraska Sandhills on the south from the mid to short grass prairies of the Great Plains physiographic province to the north. The uplands are composed of native grasses, restored/introduced grasslands, and non-commercial wood lots and shelter belts.

Native Grasslands: Uplands on Lacreek NWR cover approximately 11,000 acres. There are approximately 4,560 acres of native grasses, of which 3,726 acres are in the sandhills. Big bluestem, little bluestem, sand bluestem, prairie sandreed, switchgrass, Indiangrass, Canada wildrye, June grass, sand dropseed, western wheatgrass, salt grass, etc. and numerous native forbs have all been noted on refuge grassland transects. Many unwanted species are encroaching on Refuge grasslands. Kentucky bluegrass and crested wheatgrass are both poor cover for ground-nesting birds. Certain areas of the refuge have varying amounts of these species and management must head toward a goal of reducing or eliminating these species.

Exotic Grasslands: Approximately 6,400 acres of restored/introduced grasslands are found on the refuge. Smooth brome is the primary exotic grass with some acreages planted to alfalfa. These fields provide good cover as long as management includes occasional burning, grazing, or haying to reduce litter and stimulate growth of the brome. The alfalfa fields are hayed yearly to remove excess vegetation and prevent litter buildup. Plans are for these fields to be re-planted to native vegetation. Funding limitations have moved back the planned date for planting this cover.

Shrub and Tree Plantings: The refuge has several tree plantings. Currently there are eleven tree plantings throughout the refuge. Many of these are near buildings and Refuge headquarters. The young plantings are weeded every year to improve tree survival. As the trees grow, taller grass is allowed to grow between the rows as cover and to reduce infestation by weeds.

Wetland Vegetation: There is substantial emergent and submergent vegetation in the pools at The Refuge. Cattail, bulrush, wild rice, arrowhead and smartweed abound, as well as sago pondweed, coontail and duckweed. The refuge is currently in a marsh renovation program to improve water quality and aquatic plant and insect growth for waterfowl production that has decreased due to a carp infestation. All of the pools that have undergone renovation (Pools 1,2,3,4,5,7 and 8) have increased submergent vegetation and better water clarity. We expect the same response from the pools that are left (Pools 6,6e,9,10 and 11).

Endangered Plants: No known endangered or threatened plants have been found on the Refuge. Surveys have been conducted to search for the endangered prairie fringed orchid and blowout penstemon in appropriate habitat since 1994. Potential habitat exists, but no plants have been located.

Noxious Plants: Canada thistle is the primary noxious plant found on the refuge.

The refuge currently uses mechanical, biological, and chemical control measures. Mechanical control involves mowing and tillage in selected areas. Mechanical control is used as a temporary measure. Biological control involves the release of the stem-mining weevil, seed-head weevil, and gallfly. Releases were made in 1989 and 1993, with additional bio-agent releases in 1994, 1996 and 1997. These agents are released in areas that are difficult to spray, such as lowlands that are too wet to support a vehicle. In some areas, where the agents have been released, we have observed a significant reduction in the number of thistle plants. Chemical control involves the use of approved restricted-use herbicides.

A complete plant list of Lacreek NWR is attached (Appendix B).

D. Historical/Ecological Role of Fire

Fire, whether set or caused by lightning, has been a part of the prairie ecosystem for thousands of years. Grassland species of the northern great plains evolved under periodic disturbance and defoliation from buffalo and fire. This periodic disturbance kept the grasslands healthy for thousands of years and is needed to keep them healthy today. It has been one way that the prairie ecosystem has been continually maintained and restored. The Refuge is located in the mixed-grass ecosystem, a geographical area which has been subjected to the effects of fire for centuries. Fire frequency on the prairie grasslands ranges from 5-10 years to 10-20 years.

Historic records describe huge prairie fires started by lightning or humans. Reports of early accounts by explorers viewed wild prairie fires as a feeling of danger, a risk, and a spectacle. Lightning-set fires were common in the United States and Canada, however, fires set by native peoples were the type mentioned most often in historical journals, diaries and various other accounts. So often in fact, the subject of historical fire in the northern grassland plains is incontestable — it was there and native people used it for a variety of reasons (Gleason 1988). Throughout the area, the Sioux Indians set fire to the prairie to assist in killing buffalo and to provide lush new growth to attract buffalo.

Managing natural areas is one of the primary objectives of the Fish and Wildlife Service. The maintenance of ecosystems and their dynamic processes helps ensure a functional natural environment. A natural processes, fire constitutes one of the greatest influences on the ecosystem. Fire may have a severe short term effect while it yields long term positive effects. Fire may expose the soil, kill or reduce vigor in some plants, invigorate some grass plants and woody shrubs, and quickly cycle mineral nutrients from organic to inorganic states by converting surface mulch, plant litter and standing growth to ash.

Research within the past few decades has shown that fire has been an important natural component of many grassland communities. Fire has been used inconsistently to manage native and tame grasslands in the Northern Great Plains

of the north-central U.S. and south-central Canada, particularly the grasslands found in prairies, plains, agricultural land retirement programs, and moist soil sites. This has happened for three primary reasons: (1) the reduction of American Indian use of fire after 1875, (2) fire suppression and land use changes that put increasingly more acres under annual tillage since about the same time, and (3) a growing resistance to the use of fire since about 1940 (Higgins, et al 1986).

E. Refuge Fire History

During the period 1969 through 1999, 8 wildfires have been recorded in SACS. The reported human and lightning caused fires occurred during the summer months (July 10 - September 7). The break down by cause can be found in Table 2.

Table 2: Wildfires by Cause - 1969-1999

| Cause | Number | Acres | |
|---------------|--------|--------|-------|
| | | Agency | Total |
| Lightning | 5 | 14.1 | 125.1 |
| Trash | 1 | 0.0 | 80.0 |
| Burning Dump | 1 | 0.6 | 0.6 |
| Other-Unknown | 1 | 0.7 | 0.7 |
| Total | 8 | 15.4 | 206.4 |

The Refuge has used prescribed fire periodically to manage resources and reduce fuel loadings. Over the past 30 years, the Refuge has conducted 26 burns for a total of 3,453 acres. This is an average of less than one burn per year. Recently, the Refuge has initiated an aggressive prescribed burn program and is planning to increase the use prescribed fire to manage Service lands. A complete recorded fire history for the past 30 years can be found in Appendix C.

II. POLICY COMPLIANCE - GOALS AND OBJECTIVES

A. Compliance with Service Policy

U.S. Fish and Wildlife Service Fire Management Handbook and the Departmental Manual, Part 621, requires all refuges with burnable vegetation complete a fire management plan. This plan provides fire management guidelines for the Refuge.

B. NEPA Compliance

This plan meets the requirements established by the National Environmental Protection Act (NEPA). An Environmental Assessment for the Upland Management Plan (1994) was submitted for review. A copy of the Environmental Assessment and FONSI are attached. Regulations published in the Federal Register (62FR2375) January 16, 1997, categorically excludes prescribed fire when conducted in accordance with local and State ordinances and laws. Wildfire suppression and prescribed fire operations are both categorically excluded, as outlined in 516 DM2 Appendix 1. Copies of this plan will be circulated to cooperators and other interested parties.

C. Authorities Citation

Authority and guidance for implementing this plan are found in:

1. 42 Stat. 857;16 U.S.C. 594, Protection Act of September 20, 1922. Authorizes the Secretary of the Interior to protect, from fire lands under the jurisdiction of the Department directly or in cooperation with other Federal agencies, states, or owners of timber
2. 47 Stat. 417; 31 U.S.C. 315, Economy Act of June 30, 1932. Authorized contracts for services with other Federal Agencies.
3. 69 Stat.66.67;42 U.S.C. 1856, 1856 a and b, Reciprocal Fire Protection Act of May 27, 1955. Authorizes reciprocal fire protection agreements with any fire organization for mutual aid with or without reimbursement and allows for emergency assistance in the vicinity of agency facilities in extinguishing fires when no agreement exists.
4. 16 U.S.C. 668 dd-668 ee, National Wildlife Refuge System Administrative Act of 1966, as amended.
5. 88Stat. 143; 42 U.S.C. 5121, Disaster Relief Act of May 22, 1974. Authorizes Federal agencies to assist state and local governments during emergency or major disaster by direction of the President.
6. 88 Stat. 1535; 15 U.S.C. 2201, Federal Fire Prevention and Control Act of October 29, 1974
7. Pub. L. 95-244, as amended by Pub. L. 97-258, September 13, 1982. 96 Stat. 1003 31 U.S.C. 6301-6308, Federal Grants and Cooperative Act of 1977.

8. 96 Stat.837, Supplemental Appropriation Act of September 10, 1982
9. Pub. L. 100-428, as amended by Pub. L. 101-11, April,1989, Wildfire Assistance Act of 1989
10. Department of Interior Departmental Manual, Part 620 DM, Wildland Fire Management (April 10, 1998)

D. Other Regulatory Guidelines

Fire Management activities within the Refuge will be implemented accordance with the following regulations and directions:

- # Departmental Manual Part 519 (519DM)
- # Code of Federal Regulations (36CFR 800)
- # The Archaeological Resources Protection Act of 1979
- # The Archaeology and Historical Preservation Act of 1974, as amended
- # National Historic Preservation Act of 1966
- # The Endangered Species Act of 1973, as amended
- # The Provisions of the Clean Air Act, as amended 1990

E. Enabling Legislation and Purpose of Refuge (Mission Statement)

The area now known as Lacreek NWR was acquired in three stages (See Section I.B.1). The original refuge consisting of 9,362 acres was originally acquired pursuant to President Franklin D. Roosevelt’s Executive Order 7160 in 1935. Initially it was called the Lacreek Migratory Waterfowl Refuge. As outlined in the Refuge’s enabling legislation, the primary purposes of the refuge were:

Executive Order No. 7160, August 26, 1935. “... reserved and set apart... as a refuge and breeding ground for migratory birds and other wildlife.” 16 USC § 715d (Migratory Bird Conservation Act) “... for use as an inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 USC 460k - 460k-4 “ ... for public recreation for recreational development adjacent to conservation areas in existence (the Secretary) may accept and usedonations of real property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors when such covenants are deemed by the Secretary to be compatible with the purposes of the wildlife refuge.

F. Overview of Planning Documents

At present, the Refuge is still using the Master Plan which has very little reference to fire management. A Habitat Management Plan was completed in 1994 which called for the use of fire to achieve resource management objectives. The CCP planning process has begun in 1997, but the plan is not scheduled for completion until December 2000.

G. Habitat Management Goals and Objectives

The process of developing a Comprehensive Conservation Plan (CCP) for the Refuge has begun (1999). Part of this process is to develop goals and objectives to guide the management of the area over the course of the next several years. Although the CCP is in the early stages of development, the draft goals and objectives will be referred to in this document because, when adopted, they provide the latest direction to managers and will be used as a basis for other habitat management planning documents.

Habitat/Wildland Goal: Preserve, restore and enhance the natural diversity of the indigenous flora and the wetlands and water resources of the mixed-grass prairie and sandhill prairie ecotone.

Habitat/Wildland Objectives

- # Perpetuate wetland plant communities that are dominated by primary succession species (annuals) through high levels of disturbance through fire, mowing, disking and grazing.
- # Develop procedures to improve water quality to create and maintain 700 acres of submergent aquatic beds on the old refuge.
- # Increase the acreage dominated by emergent vegetation to approximately 2,350 acres. Reduce perennial stands of bulrush, phragmites, or cattail consistent with natural substrate.
- # Maintain 1,300 acres of seasonal wetland, composed of no more than 250 acres of perennial vegetation stands of reed canary grass, cattail, phragmites, or other species.
- # Maintain the approximate 200 acres of natural Lake Creek flood plain wetlands in concert with grassland management practices.
- # Continue to manage the remaining 2,255 acres of the Brown Ranch

wetlands and conduct appropriate wetland management activities on remaining acreage with diversifying spring and late summer/fall treatment. Grassland management practices should maintain natural species composition in good to excellent condition as described by Kaul, 1975. Grassland management practices should provide sufficient residual cover to attract grassland nesting birds and provide for nesting success.

- # The upland area should be renovated to promote tall/dense native grassland communities of which a minimum of 50% should be in undisturbed cover annually for nesting and winter wildlife use.
- # Maintain and restore the estimated 1,810 acres of Sandhill Grasslands so that the species composition resembles those described by Kaul, 1975. A minimum of 50% should be in undisturbed cover annually for nesting and winter wildlife use.
- # Replace the existing cropland with Dakota grassland species through a phased in effort culminating no later than 10 years from plan completion.
- # Maintain roost trees near wintering waterfowl areas for bald eagle roost habitat.

Wildlife Goal: Preserve, restore and enhance the ecological diversity and abundance of migratory birds and other indigenous species, with emphasis on trumpeter swans, other waterfowl, colonial nesting migratory birds, threatened species and other grassland dependent bird species.

Wildlife Objectives:

- # Provide sufficient wetland availability, productivity, and grassland cover to support a breeding population of 1,800 pairs annually. Provide sufficient migration attractiveness to support peak fall and spring migration populations of 50,000 birds.
- # Restore/maintain upland grasslands, meadow grasslands, and sandhill grasslands in order to provide habitat for grassland neotropicals.

III. REFUGE FIRE MANAGEMENT OBJECTIVES

A. Introduction

- B. In addition to the vision provided by the *Draft* CCP, the following considerations influenced the development of the Refuge's fire management goals and objectives. Various sections of this plan will establish that:

Fire is an essential natural part of the Refuge's native biotic communities.

Uncontrolled wildfire has the potential for negative impacts on and off the Refuge.

Positive or negative effects of prescribed fire on vegetation, wildlife, and cultural resources depend on burning conditions and species involved.

Use of "minimum tool" concept is known to minimize environmental damage.

Rapid rates of spread and fire suppression response time pose significant suppression problems that increase the likelihood of escape onto adjacent lands.

Fire Management Goals

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).

The primary fire management goals are:

1. Protect life, property, and other resources from wildfire.
2. Protect from fire important scientific, cultural, public campgrounds, recreational areas, and key visitor and administrative facilities.
3. Use prescribed fire as a tool to accomplish Refuge habitat management objectives by maintaining a diversity of plant communities and there by enhancing vegetation for wildlife benefits.
4. Restore fire as a natural ecological process.
5. Minimize the cost and impact of suppression activities.

C. General Fire Management Objectives

1. Restore and perpetuate native wildlife species, by maintaining a diversity of native plant communities.
2. Maintain natural fire as a ecosystem process to the maximum extent feasible through the use of appropriate management response.
3. Improve the vertical structure of the vegetation to provide optimum nesting cover for migratory birds and resident wildlife species.
4. To provide an opportunity for public education and interpretation of how prescribed fire can be used to manage wildlife habitat.
5. Safely suppress all wildfires using strategies and tactics appropriate to safety considerations, values at risk, and in accordance with Service policy.
6. Prevent human-caused wildfires.

7. Use prescribed fire as appropriate within or near Refuge development zones, wildfire sensitive resources, and boundary areas to reduce the risk from wildfire damage.
8. Maintain prairie by retarding the invasion of woody species and noxious weeds.
9. Educate the public regarding the role of prescribed fire within the Refuge.

IV. FIRE MANAGEMENT STRATEGIES

A. Implementation Strategies

The following will be employed to meet fire management objectives:

1. Suppress all wildfires in a safe and cost effective manner consistent with resources and values at risk. Use of minimum impact suppression tactics will be used when possible.
2. Conduct all fire management programs in a manner consistent with applicable laws, policies, and regulations.
3. Utilize prescribed fire as a tool for hazard fuel reduction and meeting resource management objectives. As much as possible, hazard fuel reduction prescribed fires will be used only when they compliment resource management objectives. Resource management prescribed fire will be used to accomplish specific objectives established for individual units.
4. Initiate cost effective fire monitoring which will inform managers if objectives are being met. Monitoring information will also be used to refine prescribed fire plans to better meet objectives.
5. Due to low numbers of personnel, low amounts of equipment, and the Refuge's proximity to towns, local fire agencies (volunteer fire

departments) will be utilized for initial attack on wildfires. Memorandums of Understanding (MOU) with local fire agencies will be maintained to provide for cooperative suppression actions.

B. Limits to Implementation Strategies

1. With the exception of life threatening situations, heavy equipment (bulldozers, discs, plows, and graders) will only be used in fire suppression with approval of the Refuge Manager.
2. Prescribed burning in areas where threatened, endangered, and candidate species exist will not be conducted if the prescribed fire is detrimental to the species or any adverse impacts cannot be mitigated. Section 7 clearances will be secured when appropriate.
3. Limit disturbance to the soil by minimizing mechanical fire breaks to control wildfires and when preparing for prescribed burns.
4. To the greatest extent possible, hazard fuel reduction prescribed burns will be used only when they can compliment resource management objectives.
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.

C. Appropriate Management Response

Using the Appropriate Management Response concept, suppress all wildfires consistent with values at risk. Strategies employing a range of suppression options depending on the situation will be used. Minimum impact suppression tactics (MIST) will be used, 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. | <ol style="list-style-type: none"> 1. Holding at natural and man-made barriers. 2. Burning out. 3. Observe and patrol. |
| <ol style="list-style-type: none"> 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. | <ol style="list-style-type: none"> 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. |
| <ol style="list-style-type: none"> 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. | <ol style="list-style-type: none"> 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. |

V. FIRE MANAGEMENT UNITS

Based on fuel types, response capabilities, accessibility, and expected fire behavior, the Refuge will be divided into two Fire Management Units (Figure 3).

Table 4: Fire Management Units

| Fire Management Unit | Acres |
|-----------------------------|--------------|
| Sandhills Unit | 3,726 |
| Headquarters Unit | 12,684 |

Figure 3: Fire Management Units

A. **Sandhills Unit**

The Sandhills Unit primarily lies to the south of Lake Creek. The sandhill topography is rolling to choppy hills, excessively drained, deep, sandy soils with nearly level sub-irrigated meadows in the Lake Creek Valley. Due to the lack of access and the sandy soils, direct attack using engines may be difficult.

1. Primary Fuel and Expected Fire Behavior

NFFL Fuel Model 1 is the most abundant fuel found on the unit and is largely represented as NFDRS Fuel Model L (perennials), with some classified as NFDRS Fuel Model A (annuals). Fire spread in this fuel type is governed by fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one third of the area.

2. Fuel Loading and Unusual Fire Behavior

Fuel loading for this unit falls within the normal range. See the Headquarters Unit for a discussion on unusual fire behavior.

3. Unit Fire Objectives

- a. Ensure the safety of Service staff and the visiting public.
- b. Minimize the damage of fire and fire suppression efforts on refuge resources by using Minimum Impact Suppression Tactics
- c. Prevent fires from escaping refuge boundaries onto adjacent private lands.
- d. Utilize prescribed fire when it will be useful in achieving refuge wildlife and habitat objectives. On average, treat 200 acres annually.

- e. Respond to wildfires in a cost effective manner consistent with the values at risk.

4. Impacts on Neighboring Lands

Lacreek NWR's fire management program has limited potential to impact lands adjacent to the refuge. The lands surrounding the Refuge are either privately or state owned. Private land borders the refuge on three sides. Land use on the north and east sides is highly fragmented and is primarily used for agricultural purposes. Because these lands are in private ownership, agricultural economics prevent these lands from being left idle and unproductive economically. Therefore, adjoining grasslands are used for either grazing, haying, or small grain crop production resulting in low fuel loadings in the spring and fall. This type of land use considerably reduces the potential for any significant negative effects to neighboring lands resulting from prescribed fire escaping the refuge. Lands adjoining the refuge on the south side of the refuge in the Sandhills Unit are privately owned native grasslands. These lands consist of FM Type 1 and 3 fuels, typically have moderate fuel loadings, and are used primarily for grazing. A prescribed fire escape or wildfire in the Sandhills Unit could cause significant negative impacts on landowners in the sandhills due to rapid rates of spread and limited access. The state-owned Todd Game Production Area borders the refuge on the northwest and west end of the refuge (Brown Ranch). Land owned by the state consists primarily of FM Type 1 and 3 fuels which is similar to those on the refuge.

Wildfire ignitions on adjacent private lands are typically contained before they reach the refuge due to relatively light fuels. However, prior to greenup in the spring when refuge grasslands and marshlands have dry cured fuels, a fire that reaches the refuge from private land will spread rapidly. After greenup the potential for spread onto the refuge is reduced. Historically, wildfires that have been initiated on private lands have had minimal effects on the refuge, except for the sandhills. A wildfire ignition on the refuge has a higher potential for moving onto adjacent lands, especially if it occurs when the small grain crops and cool season grasses have cured. County and Refuge gravel roads fragment the landscape on the north, east, and west sides and reduce potential fire spread on and off of the refuge.

The Refuge has mutual aid agreements with two local volunteer fire departments (VFD) from Martin (MOU# 14-48-64540-01-K001) and

Tuthill (MOU# 14-48-64540-01-K002). The agreements stipulate these VFDs will provide suppression efforts to wildfires occurring on the refuge. The agreements further stipulate that Lacreek NWR will provide initial attack on wildfires occurring on the refuge and on adjacent private lands. Although, we do not have specific mutual aid agreements with Vetal and Batesland VFDs, these departments usually respond as well. In most instances, additional wildfire resources are available from the Rosebud BIA fire program. Minimum response time for outside wildfire resources has been estimated at 30-45 minutes, should a wildfire occur on the refuge.

A potential impact to local residents is the smoke produced from a prescribed or wildfire on the refuge. This is particularly true of burns in riparian or wetland habitat, which have the heaviest fuel loads.

5. Unit Strategies

All wildfire fires will be attacked aggressively. All fires on the Refuge have the potential to escape into adjacent private land and cause damage to crops, pasture or improvements. For that reason all fires must immediately sized up by the responding Refuge fire personnel and a decision made as to whether the responding initial attack team can contain and control the fire. If there is any doubt, then assistance should immediately be requested from local fire departments or interagency resources.

6. Unit Tactics

- a. Fires will be attacked using engines when possible. Roads, wetlands, and cropland field borders will be used where possible as primary control lines, anchor points, escape routes and safety zones.
- b. Backfires will be used from roads or other barriers when it is safe and effective to do so.
- c. Burnouts will be used to strengthen primary control lines when it is safe and effective to do so.

- d. Approved fire retardant chemicals may be deployed by either air or ground forces when their use will be effective in containment, control or facility protection.

7 Limits to Strategy and Tactics

- a. The use of dozer or plow lines will not be permitted on Service lands except to protect life or improvements such as buildings or bridges, and only with the approval of the Project Manager or his acting.
- b. Hand line construction which causes soil disturbance is to be avoided.

B. Headquarters Unit

Table 5: Fuel Models - Headquarters Unit

| NFFL Fuel Model | Acres |
|---|-------|
| Fuel Model 1 - Short Grass | 3,000 |
| Fuel Model 2 - Timber with Grass Understory | 70 |
| Fuel Model 3 - Tall Grass | 9,614 |

1. Primary Fuels

NFFL Fuel Model 3 is the predominant fuel in the upland area and in marshes and other wetlands. About 200 acres of upland DNC are included.

NFFL Fuel Model 1 is present in the upland area.

NFFL Fuel Model 2 is present on only about 70 acres and consists of shrub plantings and shelterbelts in scattered locations around the refuge. These consist of rows of planted Russian olive, caragana, green ash, and other species interspersed with open strips of grass.

2.

Expected Fire Behavior

NFFL Fuel Model 3 is characterized as NFDRS Fuel Model N. This fuel model is primarily marshlands and some Dense Nesting Cover (DNC). Fires in this fuel model produce the most intensity of the grass group and display high rates of spread under the influence of wind. Wind may drive the fire into the upper heights of the grass and across standing water. Stands are tall, averaging about three feet. Cattails and rushes or cultivated grains that have not been harvested are included in this fuel model.

NFFL Fuel Model 1 is found on the unit and is largely represented as NFDRS Fuel Model L (perennials), with some classified as NFDRS Fuel Model A (annuals). Fire spread in this fuel type is governed by fine, very porous, and continuous herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through the cured grass and associated material. Very little shrub or timber is present, generally less than one third of the area.

Fuel Model 2 is characterized as NFDRS Fuel Model T. Fire spread in this fuel type is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous materials, in addition to litter and dead-down stemwood from the open shrub or timber overstory, contribute to the fire intensity. Open shrub lands that cover one-third to two-thirds of the area. Such areas with shrub stands may include clumps that generate higher intensities and may produce firebrands.

Fire behavior is dependent on many factors. Some of the most important influences are relative humidity, air temperatures, fuel type, fuel moisture, windspeed, slope, aspect, time of day, and season. On site predictions of estimated fire behavior can be made with the above inputs through the use of nomograms and other prediction models developed for the purpose. The various prediction systems provide outputs of Rate of Spread, Fireline Intensity, Heat Per Unit Area, and Flame Length. Other indicators such as the Keetch-Byram Index or Palmer Drought Index can help determine if extra personnel and funding are required for a potential hazardous fire season. At the present time the Refuge does not have a weather station, therefore, the necessary data has not been collected to accurately determine a fire weather history. Until such time as the Refuge purchases and installs a weather station and catalogues site specific data in WIMS,

the National Weather Service in Sioux Falls at www.crh.noaa.gov/fsd/forprod.htm will be used to determine potential fire behavior and trends necessary to properly manage the fire suppression program.

3. Fuel Status

Fuel loadings in stands of cattails, DNC, and on reseeded tall grass lands (Model 3) are much heavier than normal. Less robust tame grass plots can have heavier than normal loadings as well. Loading depends on the frequency of fire or the effects of other management actions on an area.

4. Unexpected Fire Behavior

Weather changes can happen rapidly and can play a major role in fire suppression activities. Weather patterns such as cold fronts, inversions, and thunderstorms can effect suppression efforts of an escaped fire and need to be monitored during the fire season. Also yearly and season weather patterns can change and can have a major effect on fuel loadings and moisture. Severe weather such as tornados and hail storms can change the amount of fuel in a given area making it difficult to control suppression. In addition, severe weather may also provide a source for fire in the event of lightning and live electrical lines. Although these cases are not common staff will be alert and will monitor weather conditions which may cause havoc for fire suppression.

5. Impacts on neighboring Lands

See section V - A.4.

6. Unit Fire Objectives

- a. Ensure the safety of Service staff and the visiting public.
- b. Minimize the damage of fire and fire suppression efforts on refuge resources by using Minimum Impact Suppression Tactics

- c. Prevent fires from escaping refuge boundaries onto adjacent private lands.
- d. Utilize prescribed fire when it will be useful in achieving refuge wildlife and habitat objectives. On average, treat 1,500 acres annually.
- e. Respond to wildfires in a cost effective manner consistent with the values at risk.

7. Unit Strategies

All wildfire fires will be managed using the appropriate management response based on fire behavior and values at risk. Fires on the Unit have the potential to escape into adjacent private land and cause damage to crops, pasture or improvements. However, interior roads and wetlands can be used to contain a fire to a predetermined area. All fires must be immediately sized up by the responding Refuge fire personnel and a decision made as to whether the responding initial attack team can contain and control the fire. If there is any doubt, then assistance should immediately be requested from local fire departments or interagency resources.

8. Unit Tactics:

- a. Fires will be attacked using engines. Roads, wetlands, and cropland field borders will be used where possible as primary control lines, anchor points, escape routes and safety zones.
- b. Backfires will be used from roads or other barriers when it is safe and effective to do so.
- c. Burnouts will be used to strengthen primary control lines when it is safe and effective to do so.
- d. Approved fire retardant chemicals may be deployed by either air or ground forces when their use will be effective in containment, control or facility protection.

9. Limits to Strategy and Tactics

- a. The use of dozer or plow lines will not be permitted on Service lands except to protect life or improvements such as buildings or bridges, and only with the approval of the Project Manager or his acting.
- b. Hand line construction which causes soil disturbance is to be avoided.

C. Fire Effects

Effects of Topography on Fire: Boundaries for the Refuge were established along jurisdictional lines rather than geographic features. Many of the boundary lines for Refuge fire management units are conducive to fire spreading onto private land due to topography or the lack of fuel breaks.

Effects of Fire on Soils: Soil erosion resulting from suppression or prescribed fire is generally not a problem in the Headquarters Unit. Occasionally, a neighbor may use disc lines as a fire suppression tactic. The use of a disc line is not permitted on Refuge lands without the permission of the Refuge Manager or his/her designee due to noxious weed invasion and soil erosion. Mowing and wet lines will be used whenever possible, especially in the Sandhills Unit which has highly erodible soils to prevent erosion.

Effects of Fire on Insects: Fire can cause an immediate decreases in insect populations (except ants, other underground species, and flying insects), followed by a gradual increase in numbers as the vegetation recovers. The insects eventually reach a population level higher than adjacent areas, then decline to near present levels as vegetation and soil litter stabilize (Higgins et al. 1989).

Effects of Fire on Amphibians and Reptiles: No federally listed reptiles or amphibians have been observed in the Refuge, but management of a diverse prairie ecosystem which includes using prescribed fire, should provide habitat for any that might be found and help maintain current non-listed populations.

Effects of Fire on Birds: Bird species evolving with fire may show fire adapted behavior and response, whereas other species exposed infrequently to fire in their

evolutionary history may be severely inhibited by it (Best 1979, Kruse and Higgins 1990). Research conducted in North Dakota concluded diversity of nesting birds was higher, nesting success increased, and vegetation diversity increased after burning (Kirsch 1972 and Kruse 1988). Kruse and Piehl (1986) found that burning during the nesting season did not eliminate production for the year and many active nests can survive the fire.

Effects of Fire on Mammals: The direct impacts of fire on mammals include disturbance or infrequent mortality of individuals, particularly slow moving and/or sedentary species. Fire in the mixed grass prairie can favor mammals. Information concerning the effects of fire on wildlife can be reviewed in *The Effects of Fire in the Northern Great Plains*, prepared by Higgins, Kruse, and Piehl 1989.

Effects of Fire on Endangered Species: Fire is a natural and essential part of the Refuge's ecosystems. Native wildlife evolved with fire and have developed means of tolerating and/or benefitting from fires. However, the sensitive nature of some of the endangered species require that their habitats be protected from large wildfires especially where adjacent habitat is lacking. Prescribed burning in areas where threatened, endangered, and candidate species exist will be conducted if the prescribed fire is not detrimental to the species or when any adverse impacts can be mitigated. When any management activity is suspected to have any impact on these species a Section 7 consultation will be undertaken.

Effects of Fire on Vegetation: One of the cheapest and most effective way of improving and restoring native vegetation is by using fire. Selective suppression or promotion of a particular species depends on the date of the fire in relation to the phenology of the particular species (Wilson and Stubbendieck 1997, Higgins et al. 1986). Large wildfires could have negative effects on certain grass species depending on the time of year and drought conditions. Prescribed fires, appropriately timed, will be used to manage Refuge grasslands. Additional information concerning effects on vegetation and other natural resources can be accessed on the Internet at <http://www.fire.org/per/tools.cgi>.

VI. FIRE SEASON

A. Refuge Fire Frequency

The Refuge has a low occurrence of wildfire. There have only been 8 recorded fires during the period 1969-1999. Of those, 5 were lightning cause. The largest

reported fire was 80 acres and occurred outside the Refuge boundary.

B. Fire Season

Based on existing data, the wildfire season starts in mid-July after the grasses are cured and extends to mid-September. The Prescribed fire season runs from mid-March to the middle of May.

VII. FIRE MANAGEMENT RESPONSIBILITIES

A. Refuge Staff Responsibilities

All fire management duties on the Refuge are collateral duties. The Project Manager is responsible for planning and implementation of an effective and safest possible fire management program at the Refuge. The Project Manager is also ultimately responsible for all fire management decisions related to both wildfire and prescribed fire in the Refuge. The fire job responsibilities in the Fireline Handbook and the ones described for the positions below are to be fulfilled. A listing of staff and their qualifications can be found in Appendix D.

1. Refuge Manager

- ! Responsible for the overall management of the refuge including fire management.
- ! Insures fire management policies observed
- ! Fosters effective cooperative relations within the refuge, cooperating fire organizations, and adjoining land owners.
- ! Within budgetary restraints, insures sufficient collateral duty firefighters meeting Service standards are available for initial attack.
- ! Supervises the collateral duty fire staff.
- ! Approves individual prescribed fire plans.
- ! Serves as collateral duty firefighter, as qualified.

2. Biologist

- ! Responsible for planning and coordinating preparedness activities

including:

- # The Refuge fire training program.
- # Physical fitness testing and Interagency Fire Qualification System (IFQS) data entry.
- # Coordinating with cooperative agencies on a regional level. Revising cooperative agreements as necessary.
- # Insuring the Step-up Plan is followed.
- ! Prepares annual Firebase budget request and manages and tracks use of Firebase account.
- ! Responsible for coordinating prescribed fire activities including:
 - # Reviewing proposed annual prescribed fire program to meet resource management objectives.
 - # Writing prescribed burn plans
 - # Completing daily validation that prescribed fires are under prescription and meet all other Service policy requirements.
- ! Maintains liaison with Regional Fire Management Coordinator and Cooperators.
- ! Maintains fire records, reviews completed DI-1202's for accuracy and submits them to the Zone FMO, and annually reviews and updates as necessary the Fire Management Plan.
- ! Serves as collateral duty firefighter, as qualified.
- ! Serves as Prescribed Fire Burn Boss, as qualified

3. Maintenance Worker

- ! Maintains engine(s) in a state of readiness.
- ! Supervises and trains assigned engine crew, as qualified.
- ! Serves as collateral duty firefighter, as qualified.

4. Refuge Operations Specialist

- ! Supervises and trains assigned engine crew, as qualified.
- ! Serves as collateral duty firefighter, as qualified.

5. Administrative Officer

- !
- ! Serves as Dispatcher
- ! Completes all necessary administrative documents associated with fire management activities

6. Biological Technician

- !
- ! Prepares units for prescribed burns
- ! Serves as collateral duty firefighter, as qualified

7. Seasonal and Collateral Duty Firefighters

- !
- ! Responsible for their own fire records, equipment, and physical conditioning.
- ! Qualifies annually by completing the appropriate fitness test between March 15-30, or within 2 weeks of EOD date.
- ! Maintains assigned fire equipment in ready state and using all safety gear assigned.
- ! Assists the Biologist maintain accurate fire records.
- ! Serves as collateral duty firefighter, as qualified

8. Wildfire Incident Commander (as assigned)

- !
- ! The Incident Commander (IC) is responsible for the safe and efficient suppression of the assigned wildfire.
- ! Fulfills the duties described for the IC in the Fireline Handbook.
- ! Notifies the Project Manager or Dispatcher of all resource needs and situational updates, including the need for extended attack.
- ! Ensures wildfire behavior is monitored and required data is collected.
- ! Ensures personnel are qualified for the job they are performing.
- ! Identifies and protects endangered and threatened species and sensitive areas according to the Fire Management Plan.

- ! Utilizes minimum impact tactics to the fullest extent possible.
- ! Ensures fire is staffed or monitored until declared out.
- ! Ensures that the fire site is fully rehabilitated or that management is notified that rehabilitation is required.
- ! Submits completed DI-1202 (wildfire report), Crew time sheets, a listing of any other fire related expenditures or losses to the Project Manager, and completes taskbooks within 3 days of fire being declared out.

9. Prescribed Burn Boss (as assigned)

- ! Writes or reviews prescribed burn prescriptions for assigned blocks.
- ! Implements approved prescribed burn plans.
- ! Assist with the administration, monitoring, and evaluation of prescribed burns.
- ! Submits completed DI-1202 (wildfire report), Crew time sheets, a listing of any other fire related expenditures or losses to Administrative Officer, and completes taskbooks within 3 days of fire being declared out.

B. Fire Cooperator Involvement and Standards

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 suppression of wildfires as defined in cooperative

agreements and memorandums of understanding. Memorandum of Understanding (MOU) with Martin Volunteer Fire Department (#14-48-0006-96-2003) and Tuthill Volunteer Fire Department (#14-48-0006-96-2004) can be found in Appendix E.

2. Assist, as needed, in the investigation of suspicious fires.

VIII. EQUIPMENT AND STAFFING NEEDS

A. Normal Unit Strength

Engines are the primary initial attack resource on the Refuge because of the predominance of fine fuels and access roads. Tables containing equipment and supplies inventories can be found in Appendix F.

B. Personnel

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.

A listing of positions needed to fully implement the fire management program are found in Table 6.

Table 6: Fire Positions

| Position | Wildfire | RX Fire |
|-----------------------------|-----------------|----------------|
| Incident Commander (ICT4) | 1 | |
| Engine Boss (ENGB) | 1 | 1 |
| Engine Operator (ENOP) | 1 | 1 |
| Fire Fighters (FFT2) | 2 | 4 |
| Prescribed Burn Boss (RXB3) | | 1 |

Note: An individual can fill more than one position

IX. PREPAREDNESS

A. Staffing

Only qualified employees meeting the fitness and training requirements (red carded) of assigned positions will be dispatched to fires (Appendix G). Other personnel not meeting requirements may be used in support activities but will not be permitted on the fire line. The Service Fire Management Handbook and Wildland Qualification Subsystem Guides (Wildfire and Prescribed Fire) should be referenced for specific policies and qualifications.

B. Pre-season Readiness Activities

The Refuge Manager and Refuge Biologist are responsible for coordinating preparedness planning. The Refuge Biologist will implement the plan.

Table 7: Annual Refuge Fire Management Activities

| ACTIVITY | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--|---|---|---|---|---|---|---|---|---|----|----|----|
| Update Interagency Fire Agreements/AOP's | x | | | | | | | | | | | |
| Winterize Fire Management Equipment | | | | | | | | | | x | | |
| Inventory Fire Engine and Cache | | | x | | | | | | | | | |
| Complete Training Analysis | x | | | | | | | | | | | |
| Annual Refresher Training | | | x | | | | | | | | | |
| Annual Fitness Testing | | | x | | | | | | | | | |
| Pre-Season Engine Preparation | | | x | | | | | | | | | |
| Weigh Engines to verify GVW Compliance | | | x | | | | | | | | | |

| | | | | | | | | | | | | | |
|--|--|--|---|--|--|--|--|--|--|--|--|--|---|
| Prescribed Fire Plan Preparation | | | x | | | | | | | | | | |
| Review and Update Fire Management Plan | | | | | | | | | | | | | x |
| Prepare Pre-season Risk Analysis | | | x | | | | | | | | | | |

Activities should be completed prior to the end of the month that is indicated.

Annual Refresher Training

All personnel involved in Fire Management activities are required to participate in 8 hours of fire management refresher training annually 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 H 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 H). 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.

C. 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 South 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. 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 Rocky Mountain 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 Rocky Mountain Area Coordination Group to conduct prescribed burns during PL IV and the National Coordination Group during PL V.

D. Step-Up plan

Until such time as the Refuge gets a weather station and inputs data into WIMS, a Step-up Plan based on a Burning Index or other fire behavior element will not be developed. The Step-up plan will be based on the South Dakota Rangeland Fire Danger Index and the Keetch-Byram Drought Index (Appendix I). The Refuge staff can also contact the Ft. Niobrara National Wildlife Refuge (402-376-3789) during periods of high fire danger to track indices and anticipate possible fire activity.

E. Severity and Emergency Presuppression 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 increases 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 or strong windstorms. 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/fwxweb/fwoutlook.htm>

X. WILDFIRE PROGRAM

A. Special Safety Concerns and Firefighter Safety

Safety of Service employees and cooperators involved in fire management activities is of primary concern. Only trained and qualified employees will be assigned to fire management duties. All fire management personnel will be issued appropriate personal protective equipment and will be trained in its proper use. No Service employee, contractor or cooperator will be purposely exposed to life threatening conditions or situations except when necessary to save the life of another person.

The primary threat to firefighter safety is from fast moving, wind-driven wildfires that can quickly over take and trap firefighters. Due to terrain, soil conditions, and the location of various wetlands and water courses, it may be difficult for an engine to out-run a fast moving fire. It is important that firefighter practice LCES **at all times!** Spot weather forecasts should be requested early-on during initial attack to gain insight into the possibility of shifting winds from thunderstorms approaching fronts, and other weather related phenomena.

The Goals and Objectives of the Refuge Safety will be incorporated into all aspects of fire management. The Fire Management Plan will provide direction to accomplish safety objectives listed below during wildfire suppression actions and prescribed fire activities.

- # provide safe working conditions for employees
- # provide safe environments for the visiting
- # protect and insure safety of government equipment
- # define equipment available and
- # identify responsibilities
- # identify sources of
- # provide documentation
- # promote a healthy safety attitude

Smoke from wildfires and prescribed fires is a recognized health concern for firefighters. Smoke from wildfires is a recognized health concern for firefighters. Incident Commanders and Prescribed Burn Bosses must plan to minimize exposure to heavy smoke by incorporating the recommendations outlined in the publication Health Hazards of Smoke (Sharkey 1997).

B. **Prevention Program**

A low number of wildfires occurring at the Refuge or threatening Service lands are caused by human activities, therefore, a fire prevention plan will not be developed at this time. In consideration of the threat and impacts of unwanted wildland fire the following actions are being taken.

Lacreek NWR currently allows overnight camping and campfires on the Little White River Recreation Area. The following regulations are currently in effect regarding campfires on the Refuge: (1) campfires must be attended at all times; (2) use of campfires is forbidden during State and/or County burn bans; and (3) campfires are required to be in designated fire rings.

As a reminder to the public and visitors, the Refuge will do the following:

- # Signing
- # Public contacts via press releases and verbal contacts
- # Contacts with adjoining private landowners
- # Closures of the Refuge when necessary
- # Implementation and following of State regulations and restrictions
- # Enforcement of regulations and prosecution of violators
- # Employee training and awareness.

Two other fire prevention measures are the multi-annual mowing of public use roads and the annual mowing of fire breaks.

C. Detection

The Refuge relies on neighbors, visitors, cooperators, and staff to detect and report fires. In addition, patrols by refuge personnel are increased during periods of very high and 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.

D. Fire Reporting and Dispatching

All fires occurring within or adjacent to (within two miles) of the Refuge that are observed by Refuge staff will be reported to Refuge headquarters. The person receiving the report will be responsible for implementing the Fire Dispatch Plan (Appendix J) and assume duties of Fire Dispatcher.

Requests for assistance by cooperators on fires not threatening the Refuge must be made to the Biologist or designee. Only qualified and properly equipped resources will be dispatched off of the Refuge.

For local fires, the Fire Dispatcher will stay on duty until:

- # Refuge resources return
- # Relieved by another dispatcher
- # Advised by IC that he/she can leave.

The Fire Dispatcher will be responsible for coordinating the filling and delivery of any resource orders made by the IC including engines, aircraft, tools, supplies, and meals. The IC will place all resource orders through the Dispatcher, and specify what is needed, when it is needed, and where it is needed. 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, the Dispatcher will place the order with the Zone FMO or the Custer Dispatch Center.

The Fire Dispatcher will not be required to stay on duty if the fire occurs outside Refuge radio coverage. However, the dispatcher must notify the Bennett County Sheriff's Office dispatcher and/or Martin or Tuthill Fire Department when he/she leaves and leave a telephone number where he/she can be reached.

E. Fire Suppression

All fires will be managed using the appropriate management response concept. All suppression efforts will be directed towards safeguarding life and property while protecting the Refuge's resources and external private land and development from harm.

All fires occurring on the Refuge and staffed with Service employees will be supervised by a qualified incident commander (IC). If a qualified IC is not available, one will be ordered through the Zone FMO or the Custer Dispatch Center. Until the IC arrives, the highest qualified firefighter will assume the duties of the IC until relieved by a qualified IC or the fire is suppressed. The IC will be responsible for:

- # Providing a size-up of the fire to dispatch as soon as possible
- # Determine the resources needed for the fire
- # Advising dispatch of resource needs on the fire.
- # Briefing firefighters on weather, expected fire behavior,

communications, escape routes, and safety zones.

- # Managing all aspects of the incident until relieved or the fire is suppressed

The IC will receive general suppression strategy from the Fire Management Plan, but appropriate tactics used to suppress the fire will be up to the IC to implement. Minimum impact suppression tactics should be used whenever possible. The use of earth moving equipment for suppression activities (dozers, graders, plows) on the Refuge will not be permitted without the approval of the Refuge Manager.

Upon arriving at the scene, all resources, including mutual aid resources, will report to the IC (either in person or by radio) prior to deploying to the fire. Mutual aid forces will be first priority for release from the fire. Procedures outlined in the dispatch section and elsewhere in this plan will be used to acquire Service and Interagency fire personnel and resources.

F. Escaped Fires/Extended Attack

The IC will notify the Dispatcher or Refuge Manager, will in turn 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 capabilities of command or operational forces. The Zone FMO will coordinate extended attack operations including:

- # Assisting the Refuge Manager complete the WFSA (Wildland Fire Situation Analysis) (Appendix K).
- # Assisting the Refuge Manager complete the Delegation of Authority (Appendix K), if needed
- # Assignment or ordering of appropriate resources through the Custer Interagency Dispatch Center.

G. 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 Overtured 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:

- G **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.
- G **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.
- G 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.

XI. PRESCRIBED FIRE PROGRAM

A. Program Overview

The Refuge uses prescribed fire as a tool in two management areas - resource management and hazardous fuel reduction. Resource management prescribed burning is used to restore, create, and/or maintain a diversity of plant communities in order to restore and perpetuate native plant and wildlife species. The Refuge may use hazard fuel reduction prescribed burns within or near Refuge development zones, sensitive resources, and boundary area to reduce the risk from wildfire damage. To the greatest extent possible, hazard reduction prescribed fires will only be used when they compliment resource management objectives.

B. Prescribed Fire Goals and Objectives

1. The goals of resource management prescribed fire are:

- # Restoration of native grass species
- # Reduction /control of non-native species (smooth brome)
- # Control of woody invasions into grasslands and moist soil management units (willows)
- # Periodic reduction of dense cattail growth in wetlands
- # Aid in control of noxious weeds (Canada thistle and phragmites)
- # Assist the Refuge farming program by burning small grain stubble and burning for site preparation of grass seeding projects
- # Maintain/rejuvenate nesting cover for waterfowl and other native birds
- # Preserve and/or stimulate endangered species habitat.

Achieving many of the goals will require repeated burn cycles for an indefinite length of time. Burn frequency will vary from annually to 15 years dependent on management objectives, historic fire frequency, and funding.

2. Prescribed Fire Objectives

Utilize prescribed fire when it will be useful in achieving refuge wildlife and habitat objectives. On average, treat 1,500 acres annually.

Restore 200 acres to native grasses annually (The acreage indicated in this objective is included in the first objective, but listed here to identify a specific target).

Reduce accumulations of hazardous fuel on 200 acres annually.

C. Limits

The use of earth moving equipment for line building activities (dozers, graders, plows) on the Refuge will not be permitted without the approval of the Refuge Manager.

Prescribed burns will not be conducted with the Keetch-Byram Drought Index exceeds 600 or the Palmer Drought Index is in the “extreme drought” (greater than -4).

The Refuge will not ignite prescribed fires when adjacent counties or the State of South Dakota has instituted burning bans

Multiple burns will not be conducted when adequate staffing is not available to adequately respond to an escape.

All actions taken will be in accordance with Service policy.

D. Potential Impacts of Prescribed Fire Program to Visitors, Users, and Local Communities

The Refuge’s use of prescribed fire causes mixed reactions from its many users and neighbors. For the most part, the local communities of Martin and Tuthill favor prescription burning on the refuge. However, prescribed burning can create anxiety for residents living adjacent to or near a prescribed burn who know that even under controlled conditions prescribed fires can still escape and threaten their property. Local cooperators realize the benefits of fire, but also see prescribed fire as a ‘waste of grass’ that could otherwise have been used for grazing and/or hay production. Fall prescribed burns can reduce the amount of habitat available for sportsmen, i.e., hunting. The local businessmen may believe there is a potential that burning will reduce wildlife numbers which may in turn reduce the visitation rates of hunters and negatively impact the local economy. Spring prescribed burns can burn over bird nests and cause ill feelings

for some recreational users (wildlife watcher, hunters, etc.) In addition, prescribed burning negatively impacts air quality which can affect those using the refuge and those living or traveling adjacent to its borders. Smoke can reduce visibility making travel hazardous and can have serious health effects.

Most of these potential impacts are short term. One of the refuge's primary concerns during firing activities is for visitor safety and smoke management mitigation. Prescription parameters will be established in each burn plan to identify and minimize potential fire and smoke hazards. Efforts will be made to notify the public regarding planned prescribed fire activities on the refuge. Fire related news releases will be submitted to the Bennett County newspaper. The public may also be notified of planned ignitions via the local radio station (KSDZ in Gordon, NE). The Bennett County Sheriff's office and potentially affected landowners shall be notified prior to any prescribed ignition. The Refuge will not allow any visitors or cooperators into any burn units during firing operations. Sensitive areas will be identified. Burning will occur only when weather conditions are conducive for adequate smoke dispersal. In addition, smoke management signs "Caution Smoke Ahead" will be set up on roads to alert passers by of potential reduced visibility due to smoke.

E. Burn Season

The normal prescribed fire burning season is bimodal with the first period beginning in late winter/early spring after snow melt is completed and ending in late May when vegetative green-up has advanced substantially. The second period begins in August after plant maturity has occurred and extends into early winter when average temperatures have fallen and snow has increased soil, duff and fuel moisture levels.

F. Complexity

The prescribed fire program on the Headquarters Fire Management Unit is not particularly complicated. Single fuel types typically predominate across large portions of the unit. Large portions of wetland tracts are often wet or are covered with open water. Most burns will be conducted in single fuel types, with roads, water or fallow crop fields providing a physical barrier to buttress the fire line.

The Sandhill Unit offers a higher degree of complexity due to limited access, the lack of roads, continuous fuels on neighboring lands, etc. Unique holding methods may be needed, as well as larger number of burn team members and

holding forces. Fires escaping from Refuge lands into neighboring private property would be viewed very negatively by local residents and could adversely impact the prescribed fire program for the entire refuge.

Complexity for each burn will be determined using the Region 6 Complexity Analysis guide (Appendix L).

G. Planning

Prescribed burns can be conducted at any time of year depending on resource objectives and prescription. The Refuge Manager is responsible for supervising the development of resource management objectives for individual units. The Refuge staff will 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 the desired objectives.

Throughout the year the Refuge Biologist will be monitoring habitat and wildlife populations on Service lands. When it becomes apparent that fire would be an appropriate tool to employ in a certain situation, he will use the information to develop the annual plan. After reviewing the proposal, the Refuge Manager will decide whether to proceed with a planning effort. Guidance provided in the Fire Management Handbook (621 FWM 3) will be adhered to in all prescribed burning activities on the Refuge.

As indicated, an Annual Burning Plan will be prepared according to the Region 6 format and will contain more specific information on areas proposed for burning. Fire prescriptions will be prepared for every planned habitat burn in accordance with established Service and Regional procedures.

Contingency Planning will be included in each prescribed fire plan. Prescribed fire contingency planning shall include the following: If a slop-over occurs, the prescribed burn boss will be notified **immediately** of the situation, ignition will cease and information will be communicated so that a reasonable response can be made to contain the incident. If minor slopovers occur and can be readily controlled, they will be extinguished and ignition activities will resume upon the burn boss' discretion. Slopover initial attack will be done by one engine on the appropriate side or by the assigned engine on patrol. Ignition crews will remain at

their ignition sites and monitor the prescribed fire. The primary control technique will be direct attack on any slop-over onto private land. If direct attack fails or is not feasible, existing roads and/or natural breaks will be utilized for control. The burn boss will be responsible for evaluating control attack options.

A fire will be declared a wildfire in any event the prescribed burn exceeds the prescription, if containment is not possible within 30 minutes utilizing existing on site resources, requires additional resources, or threatens to escape initial attack on private lands. **The protection of life and property (homes and out buildings) shall be the first priority, should an escape occur.**

The Burn Boss will serve as initial attack incident commander on escaped fires. The Incident Commander (IC) will determine the need for additional resources. Contingency forces include additional refuge personnel, local Volunteer Fire Departments (Martin, Tuthill, and Vetal), and Rosebud BIA. If needed, outside resources can be requested through the Bennett County Sheriff's Dispatch via state radio communications or cell phone (911 or 605-685-6515). If refuge radios (low band) are used and no cell phone is available, contact refuge headquarters and have a member of the staff call the Bennett County Sheriff's office. It is estimated the response time for available VFD's is 30-45 minutes. The IC will coordinate communications with incoming resources via state radio.

The Bennett County Sheriff's office will be notified the morning of the burn prior to ignition. If VFD's are needed for contingency, a minimum of 2-3 type 6 engines will be requested from the VFD's to help contain an escape. The Burn Boss (IC) will monitor the situation to determine if additional contingency forces are required based on fuels and fire behavior.

At the earliest possible time, but no less than 60 days prior to the expected burn date, the prescribed fire plan for each burn should be completed and presented to the Project Manager. The burn plan will document objectives and the plan of action for achieving them. The plan must also address all training, personnel, equipment, and other requirements as specified in the Service Fire Management Handbook. Burn plans can be written by anyone but must be reviewed by a qualified burn boss prior to implementation. The plan is then sent to the Zone Fire Management Officer for review. When the plans are returned after the FMO review, the Refuge Manager will make changes to the plan as necessary based upon FMO comments, then approve the plan.

Through out the year, the Biologist and Zone Fire Management Officer will

conduct informal reviews of the Refuge's fire management activities. As part of the process, all prescribed fires will be reviewed to insure that adequate support is available to conduct planned burns and that habitat management objectives were achieved. Written notes attached to the burn plan and the notes will be used to plan the next year's fire management activities.

Multiple prescribed fires may be initiated at the same time within the Refuge. A qualified Prescribed Fire Manager will coordinate multiple burns. Depending on the complexity of the burns, the Prescribed Fire Manager need not be on scene but must be readily available by phone. The maximum number of simultaneous burns will depend upon the cumulative impacts of smoke on sensitive targets and the availability of the prescribed equipment and personnel.

The Refuge may also assist private landowners with prescribed burning to improve the value of their land as wildlife habitat. A Wildlife Extension Agreement with a written provision for the use of prescribed fire must be approved prior to implementing burns on private lands. Such assistance is subject to guidance provided within the Fire Management Handbook, private lands program policies, Region 6 Fire Management Guidelines, and funding and staffing restraints.

H. Preparation and Implementation

Preparation of prescribed burn units will be handled on an individual basis with site preparation standards identified in the burn plan for that unit.

Preparation of fire breaks or other site work may begin at any time after a decision has been made to conduct a burn in a specific area. There may be activities that are more easily accomplished in winter when the ground is frozen or when other related refuge operational activities make it convenient to do the work. The Project Manager will assign qualified individuals to conduct the work.

Staff who are to work on the burn should be notified of the burn schedule at least a four weeks prior to the burn to ensure that they plan their work and leave accordingly.

The week prior to the burn, all engines, tools, supplies and other items should be checked to assure that things are ready and in working order. On the day prior to the burn date, the Burn Boss should inspect tools and equipment to be used so that

unexpected shortages do not show up on the burn day and delay or prevent the planned burning activity.

The public will also be notified in advance of any scheduled burn.

I. Monitoring and Evaluation

The Region 6 Monitoring Guidelines will be used during prescribed fire activities to monitor the various values (Appendix M). After each prescribed burn a permanent record will be made for filing which will include all pertinent information about the burn, including the objectives, post burn aspect, weather, fire behavior, etc.

J. Reporting and Documentation

Individual prescribed burn plans will be the primary document used to record prescribed fire information. Burn plans document personnel, costs, fire behavior, weather, and burn critique information. Prescribed burns will also be recorded on Individual Fire Report (DI-1202) and submitted to the Zone Fire Management Officer within 10 days of the fire being declared out.

XII. ADDITIONAL OPERATIONAL ELEMENTS

A. Public Safety

Firefighter and public safety will always take precedence over property and resource protection during any fire management activity. Firefighter safety was covered previously. This section will deal with public safety.

Fire fronts in grass fuel models move rapidly and are dangerous. However, most of the grass units on the Refuge are small; therefore, entrapment by public users is not considered to be a big threat. A larger threat is neighbors who initiate their own suppression actions without proper training, equipment, or communication. The Refuge staff will attempt to keep the fire scene clear of people except for Service firefighters and cooperating volunteer fire departments.

Smoke from a Refuge fire could impair visibility on roads and become a hazard. During wildfires, the IC is responsible for managing traffic hazards from smoke.

Smoke from prescribed fires is included in the prescribed burn plan and is the responsibility of the burn boss. Actions to reduce the hazards associated with smoke include: use of road guards and pilot car, signing, altering ignition techniques and sequence, halting ignition, suppressing the fire, and use of local law enforcement as traffic control.

Wildfires which might escape Service lands and spread to inhabited private property are also a concern. The IC is responsible for warning and evacuating the public from potentially dangerous situations. Additionally, the Refuge will use prescribed fire and other management techniques to manage hazard fuels in high risk areas.

B. Public Information and Education

Informing the public is an important aspect of fire suppression, fire prevention, prescribed fire, and the Service mission. Information and education are critical to gaining public support for the Refuge's fire management programs. There are several different aspects to this task.

1. Wildfire Suppression

During wildfire suppression, the IC is in charge of dispersal of information to the press and or public. The IC may delegate this responsibility if needed.

2. Prescribed Fire

Informing the public is a vital component of the prescribed fire program. During and immediately after, the Burn Boss will be responsible for this aspect of the program. This aspect of the operation may be delegated, as appropriate.

Areas that have been burned will present opportunities for the public to actually see the effects of fires, and offer staff members an opportunity to explain the purpose of the burns to the public. The following will be used to promote the prescribed fire program to the public:

- # Talks in local schools
- # Attendance at local volunteer fire department meetings
- # Including the prescribed fire message in Refuge interpretive publications and materials
- # Personal contacts with bystanders during prescribed burns
- # Follow prescriptions in burn plans to prevent escapes
- # Developing a quantitative fire effects monitoring program and sharing the results with the public.

C. Records and Reports

Following the suppression of a wildfire or the completion of a prescribed burn, the IC and Burn Boss will;

- # Complete a DI-1202 Fire Report
- # Include a list of all expenses and/or items lost or expended on the incident and list personnel assignments on the DI-1202
- # Complete a Crew Time Reports for all personnel assigned to the wildfire or prescribed fire
- # submit the documents to the Biologist within 3 days of the fire being declared out.

The Refuge Manager will send all data to the Zone FMO to be entered into the FMIS database within 10 days after the fire is declared out.

D. Fire Critique and Review Process

1. Fire Management Plan Review

The Fire Management Plan will be reviewed annually to ensure the fire program advances and evolves with the Service's and the Refuge's mission. The plan will also be reviewed following completion of the CCP process and new habitat management plans

2. Wildfire Review

Wildfires will be critiqued by the IC and the results documented in the DI-1202. The Regional Fire Management Coordinator and/or Zone FMO will conduct formal critiques in the event of:

- # Significant injury, accident, or fatality
- # Significant property or resource damage
- # Significant safety concerns are raised
- # An extended attack is necessary.

3. Prescribed Burn Review

Prescribed fires will be critiqued by the burn boss and documented in the prescribed burn plan. The Regional Fire Management Coordinator and/or Zone FMO will conduct formal critiques in the event of:

- # Significant injury, accident, or fatality
- # An escaped prescribed fire occurs
- # Significant safety concerns are raised
- # Smoke management problems occur.

XIII. 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. All fire management activities will be in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended.

One cultural resource inventory was completed in 1978. Nothing was found during that study. Two historic sites were recorded in 1999; the headquarters building and a bridge. A cultural overview was completed for the Refuge in 1999 as part of the CCP planning process. That study states that artifacts have been reported from the surface of the uplands and the historic remains associated with the CCC and with earlier homesteading

activities can also be expected.

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 South 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 Refuge Manager to the Regional Archeologist.

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

XIV. AIR QUALITY AND SMOKE MANAGEMENT GUIDELINES

The management of smoke is incorporated into the 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 residents. 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 generate low volumes of smoke for short duration (4-5 hours).

The Refuge's fire management activities which result in the discharge of pollutants (smoke, carbon monoxide, particulate, 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.

Smoke from wildfires and prescribed fires is a recognized health concern for firefighters. Prescribed burn bosses and wildfire incident commanders must plan to minimize

exposure to heavy smoke to 1 hour or less, at which time the employee should be rotated to a smoke free area (USDA Forest Service, Missoula Technology and Development Center). The use of respirators is not recommended.

XV. FIRE RESEARCH AND MONITORING

Fire behavior data will be collected on all fires occurring at the Refuge. Long-term monitoring will comply with accepted scientific methods and will be funded from sources other than Fire. These data, along with information gathered through research studies, will be used to improve the effectiveness of the fire management program. The Refuge will continue to encourage fire related research on Service lands where research operations will not conflict with resource management objectives.

XVI. CONSULTATION AND COORDINATION

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

General program consultation and coordination will be sought from the Zone FMO, the Regional Fire Management Coordinator, Regional Prescribed Fire Specialist, and National Interagency Fire Center (NIFC).

Copies of this Fire Management Plan will be sent to the following parties for comment:

Volunteer Fire Departments, Bennett County, SD
Martin VFD
Tuthill VFD

State of South Dakota
Department of Game, Fish and Parks

US Fish & Wildlife Service
Regional Office - Region 6
Regional Fire Management Coordinator

Prescribed Fire Specialist
Zone FMO, North and South Dakota
Ecological Service - Pierre

The following were consulted in the development of this plan.

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Attachment: Environmental Assessment for Upland Management

**Environmental Assessment for
Upland Management
at Lacreek NWR, Martin, SD
April 30, 1994**

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I. Purpose and Need for Action

A. Introduction

This environmental assessment is prepared to evaluate the alternatives for management of upland areas on Lacreek National Wildlife Refuge (NWR) in Bennett County, South Dakota to provide optimum wildlife habitat for migratory birds and other wildlife species. Lacreek NWR is located in southwest South Dakota and is the only refuge in South Dakota headquartered west of the Missouri River. The original refuge, consisting of 9,362 acres, more or less, was established by executive order #7160 on 8/25/35 to further the purposes of the Migratory Bird Conservation Act as a refuge and breeding ground for migratory birds and other wildlife. The Brown Ranch Addition, consisting of 6662 acres, more or less, was acquired under the authority of the Migratory Bird Conservation Act of 1929 on 9/2/71 as an inviolate sanctuary for migratory birds or as a refuge for wildlife. Clear title was received for the 223 acre Little White River Recreation Area under the authority of the Refuge Recreation Act (76 Stat. 653, as amended, 16 USC 460k) in 1981, and the 160 acre Charles Emley inholding was purchased in 1985 by authority of the Migratory Bird Conservation Act. The refuge provides an important migration stop-over for many species of waterfowl as well as meeting habitat requirements for a variety of other migratory and non-migratory wildlife. Lacreek also provides upland nesting habitat for a variety of waterfowl and other migratory birds. The refuge has twelve impoundments that provide pairing and brood habitat.

B. Purpose of Action

To evaluate upland habitat management alternatives to fulfill the purposes of Lacreek National Wildlife Refuge as established by the enabling legislation. Refuge management plans include goals, objectives, and strategies to develop and maintain optimum upland habitat for threatened and endangered species, the reproduction and maintenance of migratory birds and other wildlife, and to provide for a natural diversity and abundance of flora and fauna. Objectives include: habitat and protection for bald eagles, peregrine falcons, and occasional whooping cranes; production of 20,000 ducks, 1500 Canada geese, and 20 trumpeter swans annually; to conserve and protect representative wildlife species, including neotropical migrants, migratory and resident upland birds, raptors, mule and white-tailed deer, furbearers, and predators; and to provide compatible quality wildlife oriented recreation.

C. Need for Action

To implement the management strategies that will achieve the goals that have been developed for Lacreek National Wildlife Refuge. The uplands of Lacreek National Wildlife refuge are a complex of native and manipulated grasslands, and former croplands. In the early years of the refuge, considerable farming was done to provide crops for wildlife feed. Failed farming practices also left some fields that were listed to reduce severe soil erosion. The listed fields were planted to tame grasses, such as crested wheatgrass to provide quick vegetative cover, and most reverted farm fields were planted to crested wheatgrass and brome as farming for crops was reduced. Also prior to acquisition of the Brown Ranch property, non-native cool-season species, such as brome and Kentucky bluegrass, were introduced on the native grass meadows to provide early spring grazing for the ranching operation. Many of the listed and tame grass fields still exist today. While brome and bluegrass can provide good nesting cover if managed properly, crested wheatgrass is marginal, but native warm-season species are more productive on selected sites where restoration can be efficiently accomplished. With the continental population of ducks declining (USDI, 1994), Lacreek NWR has more potential habitat available than ducks to use it; therefore, we need to restore our native grasslands and improve our tame grass tracts in order to attract and retain nesting species.

The refuge management plan directs active upland management to improve and maintain habitat for waterfowl production and maintenance under the concept that management objectives that provide for waterfowl, will also provide for endemic threatened and endangered species and a natural diversity of other migratory and non-migratory species. That is, if the refuge achieves all of its habitat objectives for waterfowl, the habitat requirements for other species that use the refuge are also met. No other species have been identified that require additional upland management strategies beyond that required for waterfowl, except wood lot management for an increasing population of wood ducks, migratory raptors, and neotropical migrants.

II. Management Alternatives

Several alternative actions for management of refuge upland habitats can be taken to achieve the purposes, goals, and objectives of the refuge. The following alternatives are provided for further analysis and review:

Prescribed Multiple Action Alternative - This alternative is the management strategy currently in progress and is based on the Holistic Resource Management (HRM) Model (Savory, 1988) and uses all of the management strategies listed below, including the no management alternative in the form of rest. Management decisions regarding the selection of the various treatment options are based on information developed from biological monitoring. Each upland unit is considered separately, but the application of treatment(s) is based on the overall health of the whole in terms of species composition and habitat diversity for waterfowl nesting habitat. Although all upland units are subjected to a management treatment each year, rest is also considered a treatment, and many units are in rest in any given year. Only upland management activities that are beneficial and compatible with the primary purposes of the refuge will be implemented. This is the preferred alternative, and requires no administrative action to implement.

All of the management strategies of this alternative are as follows:

Noxious Weed Control - Weed control includes the current practices to control Canada thistle: the release of biological agents such as the stem-mining weevil (*Ceutorhyncus litura*), seedhead weevil (*Larinus planus*), gallfly (*Urophora cardui*), and other compatible biological agents that may become available; mechanical and cultural operations such as tillage and hand-chopping; and chemical application of selected approved herbicides.

Wood Lot Management - Some wood lots and shelter belts were acquired with the property and others have been developed and managed to provide windbreak protection for residences and administrative sites, provide protection to reduce wind erosion, and to provide perching and cover habitat for raptors, herons, passerines, and resident species. Managing shelter belts and wood lots involves planting, weed control, trimming, moving, and retaining standing dead trees for cavity nesting birds. Wood lots and shelterbelts on the refuge, combined with shelterbelts on private property all over western South Dakota, have created habitat for the expansion of many species of neotropical migrants that did not occur here historically and may have impacted historical migrants and endemic species. But this area is no longer the treeless prairie that it was historically and the removal of wood lots and shelterbelts on the refuge would not recreate sufficient treeless prairie habitat to significantly improve habitat conditions for the historic prairie species.

Cropland Management - This strategy involves active management for cooperative permittee and force account farming to provide grain crops for artificial

feeding and depredation control. Farming occurs on less than 500 acres with several fields located strategically on refuge land based on the movements of birds and proper farming soil types. The refuge maintains a restored trumpeter swan population and must provide artificial feeding during the winter to insure survival. The trumpeter swan has been determined as a species of special recognition due to its international significance. The refuge is located in an area with an active agriculture community and is surrounded on the north by high value grain crops. Depredation crops on the refuge are used as lure crops to reduce depredation damage by migratory birds on the adjacent private lands.

Prescribed Burning - Prairie ecosystems have evolved with naturally caused fire, but natural fires are not always optimally beneficial due to timing and plant condition. Prescribed burning uses fire within planned parameters as to season, time of day, fuel and soil moisture, wind speed direction, stage of growth, plant species, and amount of litter, to achieve the desired beneficial impacts on the grassland, while minimizing the most detrimental impacts. Fire has certain management benefits such as reducing mulch to improve vigor for desired plants, stressing undesirable plants, recycling minerals in the dead plants back to the soil. For example, late winter, early spring burning removes cover and blackens the earth to increase soil warming that will provide early spring green up for the benefit of wildlife in selected sites, while late spring burning will stress undesirable cool-season species to improve conditions for desired warm-season species. Fire also increases local habitat diversity by creating a mosaic of different species that increases interspersions and edge.

The drawbacks to burning include total habitat destruction during the burn and loss of individual animals that will die in the fire, temporary loss of habitat until the habitat recovers, the short time-frame available in the spring to conduct the prescribed burns with a minimum of habitat loss, the limited potential during the short time-frame for weather conditions that meet the prescriptions, the limited number of prescribed burns that can be conducted during the short time-frame, the limited amount of habitat that can be manipulated during any given season due to the constraints previously mentioned, the potential for disastrous wildfires from escaped prescribed burns in areas of vast continuous grasslands where it may be 20 or more miles to a natural fire break such as a road or stream, the loss of animal reproduction that will result when prescribed burns are conducted during the late spring and summer, and the loss of winter habitat for resident wildlife that will result from fall burns after the growing season.

Haying or Mowing - This strategy involves the use of haying or mowing to manage refuge grasslands. Haying usually involves the use of haying permittees to cut and harvest refuge grasses for hay on selected sites on the refuge.

Haying selected sites removes mulch that suppresses grass vigor, but does not return minerals to the soil as prescribed burning does. Mowing is the same as haying except that the cut material is left on the ground as litter. The litter will accumulate as mulch and will eventually result in the loss of vigor by the impacted grasses. Mowing is usually used to prevent noxious weeds from going to seed as an interim measure until more effective noxious weed control can be implemented, or to reduce the competition of annual weeds on developing grass and forb plantings being managed to provide dense nesting cover.

Grazing as a Management Tool - Managing grasslands with grazing involves the use of domestic cattle to provide a prescribed impact on selected grassland units that will benefit refuge grasslands as a whole. The current method is high intensity - short duration grazing that is part of the concept of Holistic Resource Management (HRM) as originally developed by Allan Savory and currently sponsored by the Center for Holistic Resource Management in Albuquerque, NM. HRM should not be envisioned solely as grazing system, because, contrary to popular belief, it is a comprehensive planning model that displays all of the alternatives and potential impacts currently known to land management, including rest and technology, for consideration during land management planning. Grassland units are monitored annually to determine density, vigor, and species composition.

Management strategies, or treatments, under the concept of HRM are based entirely on current grassland conditions to achieve a desire goal and landscape description. As implemented for refuge use, HRM provides treatments to maintain and sustain selected native or tame grasslands, while providing other treatments to change the species composition and diversity in other units. Although all upland units are subjected to a management treatment each year, one needs to remember that rest is also a treatment, and that all units are not grazed every year (less than 35% of refuge grasslands are grazed each year). As a grazing treatment, HRM places a high concentration of cattle on a specified area (paddock or unit) at a prescribed stock density (intensity) for a prescribed period of time (duration). To maintain existing grasslands, the grasses are consumed using high intensity - short duration grazing. This means that sufficient cattle are used to graze virtually all the grass plants in a unit within a time frame of 15 days or less. This grazing stimulates the grass plants and increases vigor, but prevents overgrazing, because the cattle are removed from the unit before the grass plants can regrow sufficiently to be grazed again. These grassland units are allowed to fully recover and go to seed before being grazed again, usually only once per season.

Some grassland units are being managed to change the species composition to reduce certain tame grasses and to provide tall dense cover for waterfowl using

tall warm-season native grasses. Prescribed overgrazing is used to change the species composition of a grassland. Overgrazing, grazing a plant repeatedly without allowing it time to recover, will seriously stress all plants and reduce their vigor by depleting root reserves. Overgrazing, applied in the spring, is used to suppress cool-season exotics such as Kentucky bluegrass, smooth brome, and crested wheatgrass, to favor desired warm-season species, such as switchgrass, big and little bluestems, Indiangrass, etc. that green up later in the season. Rest allows plants to mature and provides mulch for nesting habitat.

During grazing, the grassland is also subjected to animal impact. Animal impact includes hoof action resulting from trampling, walking, running, and herding, urinating and dunging. Properly timed, animal impact is beneficial to the grassland community. To germinate, grass seeds need a firm seed bed that can bring moisture to the surface by capillary action. The seeds need to be incorporated into the soil at a very shallow depth, and the seeds should be covered with litter to retain surface moisture. Hoof action accomplishes each of these requirements by breaking the surface and incorporating the seeds, compacting the soil surface, and crushing dead grass material to produce litter. Urinating and dunging recycles nutrients and minerals back into the soil. While season-long grazing is detrimental to the long-term health of a grassland, short-duration grazing allows the grassland to fully recover by the end of the growing season to provide dense cover for wildlife over the winter and nesting cover for the next spring.

Flood-Irrigation to Provide Brood Ponds - This strategy is only applicable to the Brown Ranch Meadows and involves the application of surface water to create artificial wetlands and brood waters using the natural depressions and abandoned natural stream channels in the existing topography. The water is to be diverted from Lake Creek, and ditches and check dams will be used to spread the water. The abandoned stream channels are the result many stream course changes that occurred in the evolution of the area. Some wet areas occur naturally in the spring due to the high water table in this sub-irrigated area; however, artificial irrigation is necessary to maintain the wetlands for brood use later in the summer. These artificial wetlands create habitat for aquatic plants and invertebrates that, in turn, provide a high protein food source for duck broods. These artificial wetlands are dependent on irrigation water diverted from Lake Creek. The water rights to divert from Lake Creek are currently in litigation due to complaints by adjacent landowners. The potential exists to damage adjacent private lands and modifications to the irrigation system are being made to address this concern. The use of artificial wetlands is being addressed in this upland environmental assessment because the area reverts to upland when the irrigation system is not in use.

Enhanced Management Alternative - This alternative uses the same management strategies as the Multiple Prescribed Action Alternative above, but improves the biological monitoring of management decisions and provides better data to make more informed decisions. This alternative would provide staff and funds to conduct an adequate biological monitoring program. Currently, management decisions are based on minimal data because the station does not have a biologist and biological monitoring must compete with administrative and maintenance work demands for limited staff time. Most of the field work is conducted by temporary employees. This alternative would be preferred if staff and funding can be made available.

Minimum Management Alternative - This alternative reduces labor intensive management and will allow refuge uplands to evolve with a minimum of applied management. This alternative uses the management strategies described above with the exception of wood lot maintenance, croplands, and flood irrigation. Shelter belts and wood lots would not be maintained. Since the refuge is located in an area that was historically a treeless prairie, except along protected streams, the diversity and abundance of trees on most of the refuge would decline over time. As the trees decline, the diversity and abundance of neo-tropical migrants that has developed with the introduction of trees, will also decline. Croplands would be restored to grass. Restoring the croplands to grass would be labor and cost intensive initially, because the cropland fields would have to be planted to grass and managed to control weeds until the grasses were restored. Past experience indicates that grass plantings require 5-7 years to become fully established in this area due to the average annual rainfall of 16 inches. Abandonment of croplands would lead to weed infestations. The elimination of flood-irrigation on the Brown Ranch Meadows would allow the meadows to function naturally, except with grassland management treatments to maintain vigor, as a sub-irrigated meadow. Small Type I wetlands would occur during the early spring and during wet years when the high water table, or significant precipitation events create pools of surface water. Dense grass cover would prevail during the summer after the wetlands dry out. The grasslands would provide good habitat for upland and big game, but waterfowl production would respond to natural spring water conditions and brood survival to flight will suffer because the temporary spring wetlands would dry up before the ducklings could find other suitable habitat. Refuge pair count data show that the Brown Ranch had 310 duck pairs during the wet spring of 1993, when natural precipitation produced early spring habitat conditions similar to flood-irrigated conditions, but production to flight stage fell to zero as the brood waters dried up during the

summer. By comparison, duck pairs declined to 84 during the dry spring of 1994 (1994 production not available at the time of this writing).

No Management Alternative - Refuge upland habitats would lie in perpetual rest without the influence of man, except for perimeter security, emergency wildfire control and other actions as may be necessary to protect adjacent private lands. Under this alternative no improvement or increase in native grass species would be expected and tame grasses would remain in abundance in the areas they currently occupy. All grasses would decline in vigor as the mulch cover increases. The dense mulch would provide good nesting cover for a time until the living grass cover significantly declines in density. The dense mulch layer will also provide optimum rodent habitat and the increase in rodents will attract and increase duck nest predators such as snakes, skunks, and coyotes. Waterfowl production will eventually decline. The no management alternative also eliminates noxious weed control, unless mandated. The reduced vigor of the grass cover will increase the potential for the expansion of noxious weeds to the decline of plant diversity and complaints by refuge neighbors and the local and state weed boards can be expected.

Shelter belts and wood lots would not be maintained and since the refuge is located in an area that was historically a treeless prairie, the diversity and abundance of trees on the refuge would decline over time. As the trees decline, the diversity and abundance of neo-tropical migrants that has developed with the introduction of trees on the refuge, adjacent farms, and western South Dakota regionally, will decline on the refuge due to loss of habitat. The loss of habitat on the refuge would not have a major impact on neotropical migrants regionally.

III. Affected Environment

A. Location

Lacreek National Wildlife Refuge is located in the Lake Creek Valley in southern Bennett County on the northern edge of the Nebraska Sandhills, in south-western South Dakota. The refuge covers 16,410 acres. The refuge includes 15 miles of dikes impounding nearly 5,000 acres of shallow flooded marsh and open water. The uplands are composed of approximately 4,560 acres of native grasses, 5,500 acres of

restored/introduced grasslands, 490 acres of croplands, and 70 acres of non-commercial wood lots and shelter belts. The grasslands occur on rolling uplands, seasonally flooded sub-irrigated meadows, and the choppy sandhills. The primary water sources are Lake Creek, Cedar Creek, Elm Creek, and several smaller spring-fed creeks that flow from the sandhills.

B. Climate

The climate in Bennett County is semi-arid and is characterized by hot summers and cold winters. Average annual precipitation is 16.6 inches, with about 80% falling during the growing season. Summer temperatures average 80-90°F with highs above 100°F for short periods. Daylight winter temperatures average 10-35°F with occasional lows below -30°F. Prevailing winds are out of the south-west in the summer and north-west in the winter. Winds average about 11 mph, but have been noted as high as 50 mph in any month of the year. The growing season is approximately 130 days. The last spring frosts are in mid to late May and the first killing frosts are in September.

C. Geology

Lacreek National Wildlife Refuge lies in the Lake Creek Valley that separates the Nebraska Sandhills on the south from the mid to short grass prairies of the Great Plains physiographic province to the north.

D. Soils

Most of the refuge is located in the Mosher-Minitare-Loup Association. The topography is nearly level, somewhat poorly drained to poorly drained, deep loamy soils and soils with a claypan; on stream valleys, terraces, and basins. The sandhills portion of the refuge is in the Valentine Association: The sandhill topography is rolling to choppy hills, excessively drained, deep, sandy soils with nearly level sub-irrigated meadows in the Lake Creek Valley. Approximately 640 acres on the northwest end of the refuge is in Keith-Rosebud Association: The topography is nearly level to gently sloping, well-drained, deep, silty soils and moderately deep, loamy soils on uplands. Twenty-nine different soil types and twelve different range sites are found on the refuge.

E. Water Resources

Lacreek Refuge lies in the Lake Creek Valley. The main water source is ground water and Lake Creek that flows through the refuge. The Little White River feeds the Little White River Recreation Area Reservoir on the north end of the refuge. Two smaller creeks, Elm Creek and Cedar Creek also feed into the refuge from springs in the adjacent sandhills. There are four un-named springs that also provide water on the refuge as well as many other small springs and seeps that flow out of the sandhills. The refuge currently has a water right for the four un-named springs and Cedar and Elm Creeks. We are seeking a water right to divert water out of Lake Creek to flood irrigate portions of the refuge. This process is currently in litigation due to protest by adjoining landowners.

F. Vegetation

Native Grasslands:

Uplands on Lacreek NWR cover approximately 10,272 acres. There are approximately 4,560 acres of native grasses, of which 3,726 acres are in the sandhills. Big bluestem, little bluestem, sand bluestem, prairie sandreed, switchgrass, Indiangrass, Canadian wildrye, June grass, sand dropseed, western wheatgrass, salt grass, etc. and numerous native forbs have all been noted on refuge grassland transects. Many unwanted species are encroaching on refuge grasslands. Kentucky bluegrass and crested wheatgrass are both poor cover for ground-nesting birds. Certain areas of the refuge have varying amounts of these species and management must head toward a goal of reducing or eliminating these species.

Tame Grasslands:

5,500 acres of restored/introduced grasslands are found on the refuge. Smooth brome grass is the primary tame grass with some acreages planted to alfalfa. These fields seem to provide good cover as long as management includes occasional burning, grazing, or haying to reduce litter and stimulate growth of the brome. The alfalfa fields are hayed yearly to remove excess vegetation and prevent litter buildup. Plans are for these fields to be re-planted to native vegetation. Funding limitations have moved back the planned date for planting this cover.

Shrub and Tree Plantings:

The refuge has several tree plantings. Currently there are eleven tree plantings throughout the refuge. Many of these are near buildings and refuge headquarters. The young plantings are weeded every year to improve tree survival. As the trees grow, taller grass is allowed to grow between the rows as cover and to reduce infestation by weeds.

Wetland Vegetation:

There is substantial emergent and submergent vegetation in the pools at Lacreek. Cattail, bulrush, wild rice, arrowhead and smartweed abound, as well as sago pondweed, coontail and duckweed. The refuge is currently in a marsh renovation program to improve water quality and aquatic plant and insect growth for waterfowl production that has decreased due to a carp infestation. All of the pools that have undergone renovation (Pools 1,2,3,4,5,7 and 8) have increased submergent vegetation and better water clarity. We expect the same response from the pools that are left (Pools 6,6e,9,10 and 11).

Endangered Plants:

No known endangered or threatened plants have been found on Lacreek Refuge. Surveys were conducted to search for the endangered prairie fringed orchid and blowout penstemon in appropriate habitat during the summer of 1994. Potential habitat exists, but none were found.

Noxious Plants:

Canada thistle is the primary noxious plant found on the refuge. The refuge currently uses mechanical, biological, and chemical control measures. Mechanical control involves mowing and tillage in selected areas. Mechanical control is used as a temporary measure. Biological control involves the release of the stem-mining weevil, seed-head weevil, and gallfly. Releases were made in 1989 and 1993, with additional bio-agent releases in 1994. Currently, these agents are released in areas that are difficult to spray, such as lowlands that are too wet to support a vehicle. In some areas, where the agents were released in 1989, we have seen a significant reduction in the number of thistle plants. Chemical control involves the use of approved restricted-use herbicides.

G. Wildlife

Endangered Species:

The following Federally and State listed endangered and threatened species have been documented at Lacreek NWR.

Federally listed: Whooping cranes - occasional use, peregrine falcons - occasional use, bald eagles - regular winter use.

State listed: Western burrowing owl - regular spring/summer use. prairie merlin - occasional use, plains topminnow, pearl dace, red-belly dace - regular use all year. The loggerhead shrike, a candidate for federal listing, is seen regularly throughout the spring and fall and has been recorded as nesting at Lacreek.

Invertebrate Populations:

Invertebrate populations are vital to the breeding and migrating waterfowl that use the refuge. Little is known about the population dynamics or ecology of the various species on the refuge, except that carp reduce the invertebrate population by destroying habitat. No recent studies have been conducted on which populations are represented at Lacreek. Invertebrates are vital to nesting hens and ducklings as a source of protein. Due to the important role of invertebrates in the life cycle of a variety of wildlife species, management planning must consider potential impacts to these populations.

Fish:

A variety of fish species are found at Lacreek. Northern pike, saugeye, large-mouth bass, black crappie, perch, bluegill, pumpkinseed, bullhead, carp and a variety of minnows including endangered plains topminnow, pearl dace and red-belly dace are all found in refuge waters. Rainbow trout are stocked in trout ponds on the south end of the refuge. Great-blue herons, white pelicans, double-crested cormorants, American bitterns, and grebes all fish in the refuge waters. Selected pools (Pools 3,4,7,10, the trout ponds, and the Little White River Recreation Area) are open to public fishing.

Reptiles and Amphibians:

Informal surveys and observations have noted salamanders, garter snakes, racers, rattlesnakes, bullsnakes, leopard frogs, painted turtles and snapping turtles. No comprehensive study of these species has been conducted in recent years.

Birds:

Over 258 species of birds have been recorded at Lacreek NWR since 1959. The full range of passerine and other birds common to the plains states are found on the refuge at some time during the year. The refuge serves as an important migration stopover. Fifty-one species of waterfowl, pelicans, cormorants, herons and ibises use the refuge for migration and/or nesting. During the spring and fall migrations waterfowl numbers have peaked at 29,000 ducks and 28,000 geese. Approximately 160 trumpeter swans winter at Lacreek.

In 1994, the refuge is implementing monitoring surveys for neotropical migrants. This will give us a better idea on what species use the refuge and population trends for these species. To date casual observations have been the only method of monitoring neotropical migrants. This new monitoring is the first step in being able to improve management for a variety of species.

Many raptor species use the refuge. Eighteen species of hawks and eight species of owls have been documented at Lacreek. Of those, four species of hawks and three species of owls nest on the refuge. Golden eagles, bald eagles, red-tailed hawks, Swainsons hawks, northern harrier, American kestrel, great-horned owls, western burrowing owls and short-eared owls are some of the more common species seen on the refuge.

Shorebirds are very common during the migration periods in the spring and fall. Forty-four species of rails, plovers, turnstones, sandpipers, stilts and gulls have been documented on the refuge. Of those, 16 species nest at Lacreek.

Three species of non-migratory birds are found at Lacreek. Ring-necked pheasants, though an introduced species, have a stable population. Sharp-tailed grouse are commonly seen throughout the winter months, and northern bobwhite quail are seen occasionally.

Mammals:

A variety of mammals use the refuge. Coyotes, cottontail rabbits, field mice, shrews, voles, weasels, ground squirrels, prairie dogs, badger, mink, beaver, muskrats, skunk, raccoon, white-tailed deer, mule deer and antelope as well as many other species have

been seen on the refuge. Refuge grasslands and marshes are important for all of these species for forage and cover.

H. Recreational Uses

Lacreek supports a variety of recreational uses. Public hunting is allowed for white-tailed deer, ring-necked pheasant and sharp-tailed grouse. Public fishing is allowed on selected pools with special restrictions to manage the fishery in support of waterfowl production. Bird watching is a favored activity throughout the year. Many visitors come in the winter to see wintering trumpeter swans. Other visitors enjoy seeing migrating waterfowl, shorebirds and neotropical migrants as well as broods of ducks and geese in the spring. Recreation on the Little White River Recreation Area includes swimming, boating, water skiing, picnicking, and camping, as well as the uses mentioned above.

I. Cultural, Archaeological and Historical Resources

An inventory was conducted in 1978 on selected sites by the Regional Historic Preservation Officer. No resources were found on the refuge. Since that time, several cultural resource surveys were conducted on selected sites in conjunction with construction and borrow sites. These surveys revealed some artifacts, mostly arrowheads and chips, and are documented in the files.

J. Social and Economic Aspects

Bennett county is sparsely populated. Most people live in or near the town of Martin, a population of about 1,100 people, that is located 16 miles NW of the refuge. Bennett County is approximately 1,161 square miles. About one-third of the county is American Indian trust land. As of the 1990 census the population is estimated at 3,200. The main income is from dryland farming and beef cattle production.

Lacreek refuge has been a popular hunting and fishing area for many local residents. The refuge also hosts school visits each year with environmental education programs as well as going to the schools to give presentations on a variety of wildlife topics. The hotels and businesses in Martin benefit from birdwatchers and hunters staying overnight, buying gas and food, as well as incidentals from a variety of stores in town.

IV. Environmental Consequences

A. General

A variety of tools are available and known to work on renovating or maintaining healthy grasslands. Different techniques can work in conjunction with each other and at different times of the life cycle of the grasses to keep healthy grasslands for the most productive wildlife use. This section will briefly discuss general information about five of the methods for working with grassland communities.

B. Effects of Grazing

Grazing consists of a variety of animal impacts that include consumption, hoof action, urinating and dunging. Consumption involves removal of leaf from grasses and forbs by large herbivores that stimulates the plant to regrow. Hoof action breaks up soil crusting for better moisture absorption, incorporates grass seeds into the soil, and firms the soil surface to improve capillary action that brings moisture to the surface for seedling growth. Trampling of live and dead vegetative material by hoof action and herding also breaks up the vegetation to produce litter and recycles plant nutrients back to the soil. The resulting litter that remains on the soil surface retains soil surface moisture for seed germination and early growth. Urinating and dunging recycles nutrients and minerals back into the soil.

Planned grazing is used to achieve an overall improvement in plant diversity and wildlife habitat condition through use of the beneficial effects of grazing and minimizing the detrimental effects of over-grazing. Short duration grazing methods combined with sufficient rest to allow the grass to fully recover before being grazed again, usually achieves the greatest habitat benefits because they are most similar to the natural grazing pattern under which native grasslands evolved. When repeat grazing is planned for same growing season, planned grazing periods should be shorter in times of fast vegetative growth, and longer during slower growth to allow for sufficient rest. Overgrazing occurs when a grass plant defoliated again before it has time to fully recover from the first graze. During fast growth, the livestock needs to be moved before the grass regrows enough to be bitten again. During slow growth (drought) it takes longer for the grass to recover and so the livestock can stay longer to stretch out the grazing periods to increase the rest time before a unit is grazed again. This planning

procedure is not as critical when a unit is grazed only once during the growing season because adequate rest is assured. On some sites planned overgrazing may be used to accomplish a specific objective such as encouraging a shift in plant composition from monotypic stands of crested wheatgrass or brome to a more diverse grassland community.

Livestock grazing is used to achieve the following effects on refuge grasslands when monitoring and planning indicate it will be the best tool for affecting the needed changes:

- To remove or reduce heavy accumulations of mulch that are beginning to inhibit the regrowth of perennial plants.
- To aid in establishing new seedlings and/or stimulating existing plants to increase seed production.
- To reduce the growth, vigor or spread of undesirable plants.
- To make selected areas more attractive as feeding areas to grazing species of wildlife such as geese and antelope.
- To mimic to the extent possible the pre-settlement grazing influences of native ungulates on refuge grasslands.

This intensive grazing method requires high levels of management by both permittees and refuge staff. Most refuge habitat units are divided into multiple paddocks to shorten the grazing time intervals and achieve sufficient grazing pressure with the number of cattle available. This means additional interior fencing is required to carry out the program.

Undesirable overgrazing is inherent with season-long, long duration, or repeated grazing without sufficient rest. Overgrazing results when a grazed growing plant is re-grazed before the shoots have sufficiently recovered from the previous defoliation. Overgrazing tends to weaken or kill the plant by using up root reserves and can cause distorted plant growth, reduce the plant's root system, slow down nutrient cycling, and expose the soil. Overgrazing is largely a function of the length of time grazing animals are present rather than the number of animals present. The more frequently a plant is grazed during its growing period, without sufficient time to fully recover, the more likely it will be affected by overgrazing. An analogy demonstrates the principle: if one cow walks and grazes across a field from the barn to the water hole every day for a year, a path will appear, but if 360 cows are walked across the same field from the barn to the water on just one day during the year, the grass will be impacted but will recover without a trace in two or three weeks (the rest period), and no path will appear, even though the grazing intensity (360 cow days/ year) was the same.

The presence of large numbers of livestock may discourage the use of habitat by potential ground nesting birds and may occasionally cause nests to be trampled. Presence of livestock may also deter or reduce the effects of certain predators on ground nesting birds. Conversely, it can also increase predation if a hen stays on a nest that remains in a small area of tall grass surrounded by grazed grass. Predators key in on these areas.

Use of grazing recognizes that all grasslands are not in top condition for waterfowl nesting every year. Just as burning temporarily reduces or eliminates nesting from a treated area, proper grazing also has some short term negative effects. Livestock used for grazing are cattle owned by local stockmen. Grazing permits are issued in accordance with the provisions of 5 RM 17.11C. Planning is accomplished by the refuge staff with input from the permittees. Grazing unit maintenance is accomplished by the permittees with appropriate reductions in fees. Grazing fees are established in the Regional Office based on fall beef prices.

C. Effects of Rest

Rest is a term that was coined by the agriculture profession to describe the absence of agricultural practices. Rest, when used as a management tool, is defined as the removal or absence of other management tools, especially those tools that have a significant impact on the structure of vegetation and condition of the soil surface. Used in conjunction with other management tools, rest periods provide plants the opportunity to recover.

Rest can be managed to provide residual standing vegetation for use by wildlife as nesting, roosting, bedding, feeding, fawning, and escape cover. Extended rest reduces the potential for maximum plant growth, but rest can be actively interrupted to maintain vegetative vigor. The trade-off is acceptable to maintain the residual cover desirable for wildlife purposes. Rested areas are as closely monitored as areas being actively manipulated. When monitoring shows a significant decline in vegetative vigor, considerations begin for employment of a manipulative tool. Managed rest is planned and monitored by the refuge staff.

On moist grassland sites the rest period can be longer because the moisture near the ground surface causes the mulch to break down more quickly and be recycled. If the grassland is already in good condition, the units can be rested longer without detriment to plant vigor.

On the drier sites in this part of the Northern Great Plains, long term rest of grasslands, by comparison, tends to result in loss of plant vigor, soil exposure, reduced effectiveness of the mineral and water cycles, and in a slow loss of native species diversity. Standing dead vegetation does not break down due to the dry climate, shades seedlings, and reduces the vigor of new vegetative growth. The centers of bunch grass clones begin die. Fewer new seedlings become established while mature plants become a higher percentage of the plant population. As the older plants die, wider plant spacing develops as seeds fail to be incorporated into the soil with communities of algae, moss, and lichens often occupying the spaces between grasses. These spaces may also be bare ground or covered with a matt of weathered dead vegetation from years past that is not recycled due to the dry soil conditions. Long term rest reduces plant density on the drier soil types and reduces the value of the grassland for waterfowl nesting. Rest can also result in increased use by some species of wildlife that are adapted to the conditions presented by rest. As with the use of any tool, prolonged rest produces changes in community composition and structure.

D. Effects of Fire

Fire probably has the most severe immediate effect on habitat and wildlife of any tool except farming, and yet it can provide some of the most positive effects as well. Both prescribed burning and wildfire expose the soil, may kill or reduce the vigor of some plants, may invigorate some grass plants and woody shrubs, and will quickly cycle mineral nutrients from organic to inorganic states by converting surface mulch, plant litter and standing growth to ash. Depending upon the severity of the burn (i.e., amount of vegetation and soil organic matter consumed by fire), this can be managed in prescribed fire. Exposure of the soil has the potential to increase precipitation run-off and soil erosion, increase the potential for wind erosion, and increase the extremes of soil surface temperature and moisture. Fire usually produces large amounts of smoke and particulates that may have an effect on downwind interests.

Depending upon timing, fire may occasionally kill sedentary species of wildlife, destroy nests and deny the use of the area by wildlife during a period of recovery. There are adverse effects on ground nesting birds if burns are conducted after nesting begins. To the maximum extent possible, burns are timed to avoid the nesting period, though most early spring nesting species will usually renest if their first nest is destroyed by fire. Burning can also open an area to increased wildlife use by attracting grazing species to succulent regrowing plants.

Careful consideration of fire effects must be made to ensure its beneficial effects on the ecosystem outweigh the disadvantages. Prescribed fire is used on Lacreek to reduce

mulch, suppress cool season invader species, improve the vigor of warm-season native species on grasslands, and to remove accumulated litter and mulch in cattail/bulrush marshes. With frequent burning, grass and forb seedling establishment is reduced, trees tend to decline, and moss and algae communities tend to increase. Burning can also reduce soil fertility and organic content if repeated frequently.

Prescribed fire is planned, monitored, and controlled by refuge staff using refuge resources and equipment. The refuge Fire Management Plan and individual unit burn plans are the primary documents guiding actual conduct of prescribed burns. The instructions and directions contained in that document will not be duplicated here.

E. Effects of Flood-Irrigation

Flood-irrigation is the practice of diverting water from a stream and running that water on a meadow with sufficient quantity to cause shallow artificial wetlands to occur in the natural topographic depressions. In the early spring, these shallow waters warm up quickly and produce a plethora of aquatic insects that provides a high protein diet for migrating and pairing waterfowl. Later in the season, these small wetlands, surrounded by tall dense nesting cover, will provide brood water for growing ducklings. Though the water in these depressions will eventually kill the meadow grasses that are submerged, the ponded water produces aquatic plants that provide food for waterfowl directly, and provides habitat for aquatic insects that provide the high protein diet needed by growing ducklings. Applying irrigation water on the meadow year after year does change the species composition of grasses and forbs adjacent to the submerged areas as well. Prairie cord grass develops along the water courses, and smartweed and foxtail will develop in the moist soils. Cattails and bulrushes grow in the wetland basins. Dewatering the meadows after the ducks can find more permanent waters slows down moist plant succession changes and allows the wetland basin soils to dry out like natural Type I wetlands. Natural Type I wetlands are very productive for waterfowl feeding and production, but often dry up too soon for optimum duckling survival to flight stage. Artificial Type I wetlands can be maintained as long as needed.

F. Effects of Wood Lot and Shelterbelt Management

Most of the wood lots on the refuge started as shelterbelts to provide home and livestock areas with wind protection. Some natural reproduction of trees is occurring in some of the older shelterbelts. Management involves protecting dead standing trees for cavity nesting birds, removing down dead trees that present a fire hazard or physical barrier to access, planting new saplings to replace dead trees, controlling weeds,

planting new shelterbelts to replace dying shelterbelts, planting new shelterbelts to provide habitat for resident big game, upland birds, and neotropical migrants, and controlling weeds in new plantings. Shelterbelts on the refuge, along with numerous shelterbelts on farms and ranches across western South Dakota, have changed the prairie ecosystem by providing habitat for neotropical migrants that did not occur here historically, and perhaps to the detriment of some pre-settlement species. However, removing trees from the refuge alone, in an attempt to restore the treeless prairie, would be inadequate to recreate pre-settlement habitat conditions on a broad enough scale to restore the pre-settlement neotropical species composition.

G. Effects of Technology

Technology as considered here includes all the inventions of the human culture including chemicals, fencing, water developments, haying, plowing, reseeding, fertilizing and the implements to accomplish or apply technology. Often, technology is applied to solve problems created by the application of past technology.

Chemical herbicides are very effective in killing some species of plants, but may have dangerous side-effects on both human applicators, non-target plants, and other non-target biological resources, if improperly applied. All pesticides must be reviewed at the regional level and are approved only when other control methods are shown to be ineffective.

Fences are required to retain livestock in areas to be grazed and to exclude them from areas to be rested. Interior fencing is required when grazing is used as a management tool. Fences can be visually intrusive on the landscape and a barrier to both birds and mammals if appropriate consideration is not given to fence type and placement.

Mowing and haying can be used in some situations to knock down or remove dead fine fuels to reduce wildfire danger and to stimulate regrowth of new vegetation. Mowing or haying prior to July 15 can have adverse effects on ground nesting birds. Haying has some residual negative effects on early nesters like northern pintails in the first year following harvest because pintails often initiate nests before significant regrowth of vegetation.

Disking for force account and cooperative farming removes all surface vegetation and exposes the soil to the elements. Except for seeds and invertebrates exposed during tillage, freshly disked soil has little value for wildlife. Tillage is necessary; however, to provide grain and depredation crops to for winter feeding of wildlife and to minimize crop damage on adjacent farm fields.

Harvest machinery causes short-term disturbance to wildlife, but sufficient waste grain normally remains for wildlife use.

Windmills provide stock water for domestic cattle grazing refuge grassland, but also provide free water for wildlife as well.

Motor vehicles, such as 4X4 trucks and ATVs are used for surveys and cause short-term disturbance while in the field. The possibility exists for some vehicle damage to nests and wildlife, even though care is taken to avoid damage.

Technology is used to accomplish refuge objectives when it is considered the most effective and efficient means available after giving full consideration to any and all detrimental impacts.

V. Consultation and Coordination With Others

The management of Lacreek National Wildlife Refuge routinely discusses management practices with federal, state, and local agencies. Grassland management has been discussed over the past years with the Soil Conservation Service (SCS) with reference to the SCS Technical Guides, The Center for Holistic Resource Management, Albuquerque, NM through attendance at seminars, an on-site workshop, and references, Fish and Wildlife Service (FWS) Range Specialists, refuge managers and biologists from other FWS field stations, special interest groups, and local residents and landowners.

Weed control has been discussed over the years with FWS Land Management Specialists, the State Department of Agriculture, local county weed supervisors, the local extension agent, local landowners, and extensively with other FWS field station managers.

The application of irrigation water for waterfowl brood waters has been discussed with Regional FWS Specialists, the State Department of Natural Resources, Water Resources Division, FWS field biologists, the local county commission, and local landowners.

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GLOSSARY

Grazing Pressure: The number of animals on a given area of land for a specified time period. Usually expressed in Animal Units Months (AUM), one AUM = one animal on one acre for one month, or in Animal Days/ Acre (ADA), one ADA = one animal on one acre for one day. By definition then 10 AUM can mean 10 animals on one acre for one month, or one animal on one acre for 10 months.

Lister: A tillage practice to reduce soil erosion by wind on highly erodible soils. A large widely spaced disk is used to form ridges (listers) more or less perpendicular to the prevailing wind in order to catch the blowing soil in the spaces between the ridges.

Native Grass: Endemic grass species that developed naturally during the evolution of the area.

Paddocks: As used in the practice of Holistic Resource Management, a fenced subdivision of a grazing unit.

Tame Grass: Grass species that are introduced by man or as a result of human influence.

Use Days: A generic term to measure the density of a use by animals of man. One use day (UD) = one animal or person using an area for one day, e.g. 10 use days can mean one animal of 10 days, or 10 animals for one day.

Vigor: A term to describe the condition of a plant during active growth, e.g. vigorous growth, healthy, robust.

Waterfowl Maintenance: The management practice of maintaining habitat for the protection, feeding, resting, and loafing of waterfowl.

FINDING OF NO SIGNIFICANT IMPACT

MANAGEMENT OF UPLAND HABITATS ON LACREEK NATIONAL WILDLIFE REFUGE MARTIN, SOUTH DAKOTA

Based upon the analysis of the attached Environmental Assessment (EA), I find that the manipulation of upland habitat for wildlife on Lacreek National Wildlife Refuge (NWR), to accomplish unit goals and objectives, will not have a significant impact on the human environment. I therefore find that no Environmental Impact Statement is necessary.

My rationale for this finding (based on 40 CFR 1508.27) follows:

The proposed Prescribed Multiple Action Alternative addresses all the applicable management techniques needed to achieve refuge upland management goals and objectives. The positive and negative environmental effects of the following alternatives are addressed in the attached environmental assessment.

Weed control as addressed will provide adequate noxious weed control.

Refuge wood lots, while beneficial to refuge wildlife, have no significant impact on the local community.

Refuge croplands provide winter feed for refuge wildlife and provide depredation relief on adjacent private crops. While a few cooperating farming permittees yield some income from refuge farming, the economic impact on the local community is insignificant.

Prescribed burning in the refuge is limited in scope and the impact on the total local

environment is minimal.

Haying on the refuge provides some benefit to a few local stockmen, but the volume of harvested hay is insignificant when compared to the total haying operations of the local community.

Refuge grazing of domestic cattle provides benefits to a few local stockmen, but the number of cattle grazed, when compared to the total livestock industry in the local community, is not significant.

Flood-irrigation of the Brown Ranch Meadows has raised some controversy among adjacent landowners. Their objections, currently under litigation, are being addressed by the courts, the State Division of Water Rights, and the FWS for resolution. The final decisions of these collective parties will provide adequate protection to the landowners to reduce any adverse effects to insignificance.

Regional Director

Date

APPENDIX A: WILDLIFE

LACREEK NWR MAMMAL CHECKLIST

MARSUPIALS- Order Marsupialia

OPPOSUMS-Family: Didelphidae

Virginia Opossum, *Didelphia virginiana*

INSECTIVORES-Order Insectivora

SHREWS- Family Soricidae

Masked Shrew, *Sorex cinereus*

Sorex haydeni

Short-tailed shrew- *Barina brevicauda*

Least shrew, *Cryptotis parva*

MOLES- Family Talpidae

Eastern Mole- *Scalopus aquaticus*

BATS-Order Chiroptera

INSECTIVOROUS BATS-Family Vespertilionidae

Little Brown myotis, *Myotis lucifugus*

Northern long-eared Myotis- *Myotis septentrionalis*

Small-footed Myotis- *Myotis ciliulabrum*

Silver-haired Bat- *Lasionycteris noctivagans*

Big Brown Bat- *Eptesicus fuscus*

Red Bat- *Lasiurus borealis*

Hoary Bat- *Lasiurus cinereus*

LAGOMORPHS-Order Lagomorpha

HARES AND RABBITS-Family Leporidae

Eastern Cottontail- *Sylvilagus floridanus*

Desert Cottontail- *Sylvilagus audobonii*

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White-tailed Jack Rabbit- *Lepus townsendii*
Black-tailed Jack Rabbit- *Lepus californicus*

RODENTS- Order Rodentia

SQUIRRELS- Family Sciuridae

13-Lined Ground Squirrel- *Spermophilus tridecemlineatus*

Spotted Ground Squirrel- *Spermophilus spilosoma*

Franklin's Ground Squirrel- *Spermophilus franklinii*

Black-tailed Prairie Dog- *Cynomys ludovicianus*

Fox Squirrel- *Sciurus niger*

POCKET GOPHERS- Family Geomyidae

Plains Pocket Gopher- *Geomys bursarius*

POCKET MICE- Family Heteromyidae

Olive-Backed Pocket Mouse- *Perognathus fasciatus*

Plains Pocket Mouse- *Perognathus flavescens*

Hispid Pocket Mouse- *Perognathus hispidus*

Ord's Kangaroo Rat- *Dipodomys ordii*

BEAVER-Family Castoridae

Beaver- *Castor canadensis*

NEW WORLD RATS AND MICE-Family Cricetidae

Planis Harvest Mouse- *Reithrodontomys montanus*

Western Harvest Mouse- *Reithrodontomys megalotis*

Deer Mouse- *Peromyscus maniculatus*

White-footed Mouse- *Peromyscus leucopus*

Northern Grasshopper Mouse- *Onychomys leucogaster*

Eastern Woodrat- *Neotoma floridana*

Meadow Vole- *Microtus pennsylvanicus*

Prairie Vole- *Microtus ochrogaster*

Muskrat- *Ondatra zibethica*

JUMPING MICE-Family Zapodidae

Meadow Jumping Mouse- *Zapus hudsonius*

PORCUPINE-Family Erethizontidae

Porcupine- *Erethizon dorsatum*

CARNIVORES-Order Carnivora

DOGS AND RELATIVES-Family Canidae

Coyote- *Canis latrans*

Red Fox- *Vulpes vulpes*

Swift Fox- *Vulpes velox*

Gray Fox- *Urocyon cinereoargenteus*

RACOONS-Family Procyonidae

Raccoon- *Procyon lotor*

WEASELS AND RELATIVES- Family Mustelidae

Least Weasel- *Mustela nivalis*

Long-tailed Weasel- *Mustela frenata*

Black-footed ferret- *Mustela nigripes*

Mink- *Mustela vison*

Badger- *Taxidea taxus*

Eastern Spotted Skunk- *Spilogale putorius*

Striped Skunk- *Mephitis mephitis*

CATS- Family Felidae

Bobcat- *Lynx rufus*

EVEN-TOED UNGULATES-Order Artiodactyla

DEER AND RELATIVES-Family Cervidae

Mule Deer- *Odocoileus hemionus*

White-tailed Deer- *Odocoileus virginianus*

PRONGHORN-Family Antilocapridae

Pronghorn- *Antilocapra americana*

EXTIRPATED SPECIES

- 1). Gray Wolf- *Canis lupus*
- 2). Mountain Lion- *Felis concolor*
- 3). Black Bear- *Ursus americanus*
- 4). Grizzly Bear- *Ursus horribilus*
- 5). River Otter- *Lutra canadensis*
- 6). Elk- *Cervus elaphus*
- 7). Bison- *Bison bison*

APPENDIX B: VEGETATION

APPENDIX C: FIRE HISTORY

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APPENDIX D: REFUGE STAFF AND COOPERATORS

Table 1: Fire Personnel Directory - Lacreek NWR

| Name | Position | Work Number | Home Number |
|---------------|--------------------|--------------|--------------|
| Rolf H. Kraft | Refuge Manager | 605-685-6508 | 605-685-6529 |
| James Stengle | ROS | 605-685-6508 | 605-685-6260 |
| Kim Bousquet | Wildlife Biologist | 605-685-6508 | 605-685-1335 |
| Ann Harris | Admin Assistant | 605-685-6508 | 605-867-1313 |
| Benny Ayres | Eng Equip Operator | 605-685-6508 | 605-685-1039 |
| Joe Nichols | Pvt Lands/Bio Tech | 605-685-6508 | 605-685-6391 |

Table 2: Local Cooperators

| Agency | Name | Work Number | Home Number |
|-------------|-----------------|-------------|--------------|
| Martin VFD | Doug O'Bryan | 911 | 605-685-6281 |
| Tuthill VFD | Wallace Denison | 911 | 605-685-6907 |

Table 3: Regional Cooperators

| Agency | Name | Title | Work Number | Home Number |
|------------------------------|--------------|----------------------|-----------------------|--------------|
| FWS Region 6 | Phil Street | Regional FMC | 303-236-8145 x 676 | 303-933-6851 |
| FWS Region 6 | Jim Kelton | Prescribed Fire Spl. | 303-236-8145 x 618 | |
| FWS Region 6 | Vacant | Fire Program Asst. | 303-236-8145 x 671 | |
| FWS Region 6 | Lou Ballard | Zone FMO | 970-826-5053 | |
| Ft.Niobrara NWR | Vacant | FMO | 402-376-4641 | |
| Custer IA Dispatch Center | June Johnson | Center Manager | 605-673-4434 | 605-673-2030 |
| | Mary Eide | Ast. Dispatcher | | 605-673-4063 |

APPENDIX E: FIRE AGREEMENTS

APPENDIX F: NORMAL UNIT STRENGTH

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

Table 1: Equipment

| Item | Year Purchased | percent of Fire Funding | Have | GVW | Need | GVW |
|--|----------------|-------------------------|--------|-----|------|-----|
| Engine Modules Medium (200-400 gallon) Light (50 - 150 gallon) | | | 0 | | 1 | 18k |
| Slip-on Unit(s) 200 gallon | 1983 | unk | 2 | | 1 | |
| Water Tender(s) | | | | | | |
| Portable Pump(s) Mini-Mark Stihl 1.5" Flot-a-pump | unk unk | 100 100 | 1 1 | | 1 | |
| Power saw(s) | 1997 | 100 | 1 | | | |
| Mower(s) 15' Batwing | 1999 | - | 1 | | | |

| | | | | | | |
|--|--|--|--|--|--|--|
| Tractor(s) | | | | | | |
| ATV(s) | | | | | | |
| Grader(s) | | | | | | |
| Plow Unit/Disk | | | | | | |
| Other (List) | | | | | | |
| Other Equipment Available for Fire Suppression or Prescribed Fire operations Not Fire Funded | Use the table to the left to list capital equipment used for preparedness and initial attack or for prescribed fire activities funded wholly or in part by fire. | | | | | |
| JD2640 and JD6400 Tractors | In the above table, Indicate the year purchased, if known, and the percent of fire funding (e.g.: The station purchased a tractor. Fire paid 25% and the station secured other funding for the remainder. Radios are listed on a separate inventory | | | | | |
| 1 6x6 Polaris & 2 ATV's w/sprayers | | | | | | |
| 1 Grader | | | | | | |
| 1 Plow/disk Unit | | | | | | |
| | | | | | | |
| | | | | | | |

Table 2: Supplies and PPE

| Item | Quantity | |
|--------------------------------------|------------|------------|
| | Need | Have |
| Hose, lightweight, lined 1.5" x 100' | 9 | 1 |
| Hose, lightweight, lined 1" x 100' | 9 | 1 |
| 1" NH gated wye | 2 | |
| 1.5" NH gated wye | 2 | |
| 1.5" nozzle | 2 | 1 |
| 1" Forester nozzle | 4 | |
| Hydrant wrench, spanner | 2 | |
| Hose clamp | 2 | |
| flapper | 6 | 6 |
| Pulaski w/sheath | 3 | 3 |
| Shovel w/sheath | 6 | 2 |
| rake | 2 | |
| Combi tool | 2 | |
| Drip Torch | 2 | 6 |
| Fusees | 1 Case | 1 Case |
| Safety Can: 3 Gallon | 2 | 3 |
| Foam | 15 gallons | 15 gallons |
| Backpack Pump | 6 | |
| Canteen, large | 2 | |
| Belt Weather Kit | 2 | 2 |
| Hard Hat | 8 | 8 |
| Goggles | 8 | 4 |
| Headlamps | 8 | 6 |
| Fire Shelter w/Liner | 8 | 8 |
| Line Pack w/harness | 8 | 5 |
| Water Bottle | 24 | 16 |
| Ear Plugs | 12 pks | Case |
| Leather Gloves, Assorted sizes | 12 pr | 15 pr |
| Sleeping Bags | 8 | 2 |

| | | |
|--|--|---|
| Pearsonal Gear Pak (Red Bag) | 8 | 3 |
| Personal First Aid Kit | 8 | 5 |
| Nomex Shirts Small Medium Large X-Large | Enter Desired Number should have 18 pr (Men & Women) | |
| Nomex Pants - Men's 28x30 32x30 32x34 34x30 34x32 34x34 36x30 36x32 36x34 38x34 40x34 | | |
| Nomex Pants - Women's Size 10 Size 12 Size 14 Size 16 | | |

APPENDIX G: STAFF FIRE QUALIFICATIONS

| Name | Qualification | |
|-----------------|---------------|---------|
| | Wildland Fire | RX Fire |
| Bousquet, Kim | FFT2 | FFT2 |
| Nichols, Joe | FFT2 | FFT2 |
| Stengle, James | FFT2 | FFT2 |
| Ayres, Benny F. | ENOP | ENOP |
| | | |

APPENDIX H: FITNESS

APPENDIX I: STEP-UP PLAN

This Step-Up plan will be used to guide Refuge fire preparedness operations and the use of emergency presuppression and severity funding. The plan incorporates fire danger and fire behavior variables including the South Dakota Rangeland Fire Danger Index (RFDI) and the Keetch - Byram Drought Index (KDBI). The KDBI examines soil moisture based on precipitation and temperature divergence from normal, and is an excellent drought indicator model for grass fuels.

The KDBI is perhaps the best long-term drought measurement tool available. The RFDI utilizes factors that can change greatly in a single 24 hour period. Trying to quantify emergency presuppression or severity resources needs using this method alone would be nearly impossible. For this reason, the KDBI carries the greatest weight in the Step-Up Plan.

The break-point for requesting Emergency Presuppression funding for the Refuge will be a KDBI reading of 625 or greater. If this period lasts or is anticipated to last for longer than three weeks, or if the KDBI exceeds 700, Severity Funding will be requested.

Table 1: Staffing Classes

| Staffing Class | RFDI | KDBI |
|----------------|----------|---------|
| I | Any | <400 |
| II | ANY | 400-500 |
| III | Any | 500-625 |
| IV | H, VH, E | >625 |
| V | H, VH, E | >700 |

TABLE 2: Refuge Fire Step-up Plan

| Preparedness Actions | I | II | III | IV | V |
|---|---|----|-----|----|---|
| FIRE STAFF | | | | | |
| No full time fire staff at this time | | | | | |
| REFUGE STAFF FIREFIGHTERS | | | | | |
| Carry PPE while on duty | | | | | X |
| May assigned to engine | | | | X | X |
| Tour of duty/schedule may be extended | | | | X | X |
| FIRE EQUIPMENT | | | | | |
| Type 6 engines ready | X | X | X | X | X |
| Heavy Equipment | | | | X | X |
| FIRE PREVENTION ACTIVITIES | | | | | |
| Restrict vehicles to parking lots/gravel roads | | | | X | X |
| Post fire danger signs at high public use areas | | | | X | X |
| MISC EMERGENCY PREPAREDNESS ACTIONS | | | | | |
| Notify Zone FMO and open emergency preparedness account | | | | X | X |
| Temporary closures for certain activities at the Refuge Managers discretion | | | | X | X |
| Alert area volunteer fire departments of fire danger | | | | X | X |

The above Step-Up Plan may not apply when Refuge resources are assigned to fires. Ready status is unstaffed, but filled with water, ready to respond. Resources assigned to fires may prevent some staffing actions. The Refuge Manager in consultation with the Zone FMO will determine whether to fill behind the dispatched resources.

APPENDIX J: FIRE DISPATCH PLAN

LACREEK NATIONAL WILDLIFE REFUGE

Upon report of smoke or fire:

- I Record as much information as possible from the caller (See below).**
- II. Maintain log of all radio and telephone communication (Attachment 1).**

Initial information from reporting party:

- A. Name:
- B. Callback number:
- C. Location of smoke or fire:
- D. Access to fire:
- E. Color of smoke (White, Grey, Black):
- F. Size of fire (Small, Medium, Large):
- G. Type of vegetation (Grass, Brush, Trees):
- H. Fire behavior (Smouldering, Creeping, Running):
- I. Improvements threatened:
- J. Anyone on the fire:

K. See anyone in area or vehicles leaving area:

III. Check map for ownership/protection status.

IV. If fire is on refuge or within 2 mile initial attack zone:

A. After regular working hours use the **Fire Personnel Directory** for contacting Refuge staff. Start with Refuge Manager and work down list until someone is contacted.

B. During regular working hours:

1. Notify Refuge Manager.
2. Utilize Administrative Assistant if available or use other refuge staff as dispatcher.
3. Select and dispatch an Incident Commander (should be qualified IC or the highest qualified firefighter available).
4. IC to follow procedures outlined in Attachment 2.
5. Dispatch appropriate resources. Do not dispatch unqualified resources or incidental firefighters.
6. Call 911, notify Martin VFD and/or Tuthill VFD depending on fire location. Also advise them of Refuge response and resources sent from Refuge.
7. If fire danger is high, request a spot weather forecast for the next 24 hours from National Weather Service, Rapid City (800) 684- 4163. Ask them to use their best information and that we will call with on site weather observations as soon as possible. The forecast should include any predicted changes in temperature, humidity, wind direction, wind speed, barometric pressure, precipitation, and lightning activity.
8. If fire is threatening public use areas or direct route to fire is through a public use area, dispatch law enforcement personnel (refuge, state, or county) to evacuate and close area.
9. Remain on duty and dispatch further assistance as requested by IC.

C. If fire is on Refuge but involves a structure:

1. Call 911 and ask for assistance.

2. Structural firefighting is not the functional responsibility of the Service; however, refuge personnel may assist in structure protection on an emergency basis to save human life. Refuge personnel may assist in protecting wildlands around the structure when such actions can be accomplished safely. Water or retardant chemicals may be applied to a structure from the outside in an effort to safeguard it from an advancing wildfire.

D. If there is a hazardous material spill on or near the refuge:

1. Call 911 and have them dispatch appropriate resources.
2. Clear area of all people.
3. Dispatch law enforcement (refuge, county, state) personnel to assist in keeping area clear.
4. Close area to public use if necessary.

V. If fire is not on refuge or threatening refuge:

A. For mutual aid, request from Bennett County Sheriff, (605) 685-6515 or 911

1. Take resource order information:
 - Nature of incident.
 - Location and access to fire.
 - What type and quantity of resources are needed.
 - When they are to report.
 - Radio Frequency and IC/Officer in Charge call sign
2. Inform cooperator that you will check what is available and call back ASAP (must be within 1 hour).
3. Notify Refuge Manager and get approval for dispatch. Refuge staff limited to fires within 2- mile protection zone during Staffing Class IV and

V.

4. Dispatch resources requested and approved by Refuge Manager. Additional resources can be obtained from nearby refuges if needed and available (see regional dispatch plan in back of Fire Management Handbook).
5. Notify cooperator of what was dispatched and an estimated time of arrival.
6. Coordinate the filling of additional resource orders from the Cooperator.
7. Remain on duty until relieved by Task Force Leader.

B. If refuge is first agency contacted and fire not on or threatening refuge:

1. Notify appropriate county dispatch.
2. Dispatch resources if approved by appropriate county dispatch and Refuge Manager.
3. Remain at scene until relieved by a representative of the agency who has fire protection responsibility for the fire.

C. Interagency dispatch request.

1. Take resource order information:
 - Nature of incident.
 - What type and quantity of resources are needed.
 - Reporting location.
 - Specific location of the incident.
 - Reporting time.
 - Travel instructions.
 - Resource order number and request number.

- Agency responsible for incident.

2. Inform cooperator that you will check what is available and call back within 1 hour.
3. Notify Refuge Manager and get approval for dispatch.
4. Dispatch resources requested and approved by Refuge Manager. Additional resources can be obtained from nearby refuges if needed and available (see also Region 6 Wildland Fire Mobilization Plan).
5. Notify cooperator of what was dispatched and an estimated time of arrival at reporting location.

INCIDENT COMMANDER PROCEDURES

DISPATCH AND TRAVEL TO FIRE

1. Gathers initial attack data about fire.
 - a. Data includes fire location, behavior, access, and resources threatened.
 - b. Receives a briefing from dispatch in person or by radio.
2. Assembles and dispatches initial attack forces.
 - a. A minimum of 2 person engine crews.
 - b. Engines should be dispatched in pairs whenever possible.
 - c. Brief crews on fire location and give direction for travel to fire.
3. Safely travel to fire.
 - a. Approach fire from rear or rear flanks.
 - b. Flag best access to fire for other resources to follow.
 - c. Identify possible water sources on way to fire.
4. Observe pertinent information while en route to fire.

Observe and record information about fire ,relating to fire cause, weather, fire behavior, resources available, safety hazards, and opportunities for effective control.
5. Locate and arrive safely at fire.
 - a. Arrive within acceptable travel time.
 - b. If fire not located, measures taken to try to locate fire before returning to base.

SIZE UP

1. Size-up the fire situation.
 - a. Include fire size, rate of spread, fire intensity, values at risk, point of origin, and possible cause.
 - b. Protect point of origin if cause other than natural is suspected.

2. Determine potential fire behavior.
Analyze the current fire environment including fuels, topography, and weather.
3. Determine control force capabilities.
Line construction rates are based on resistance to control at various portions of the fireline.
4. Plan the attack and control of fire.
5. Report to dispatch with current fire situation.
Include potential threats to life, property, and natural resources; ability to control the fire; and need for additional resources.

DEPLOYMENT, ESCAPED FIRE, AND CONTAINMENT

1. Brief and assign forces on the fire.
 - a. Tactical plan including what, where, when, who, and how.
 - b. Priorities for attack.
 - c. Safety procedures on the fireline.
2. Direct the attack in a safe and effective manner.
 - a. Maintain communication with all resources on fire.
 - b. Monitor environmental conditions, fireline progress, condition or status of various control forces assigned to or on standby for the fire.
 - c. Make adjustments to current and expected fireline conditions.
 - d. Priorities will be based on potential threats to life, property, and natural resources.
 - e. Order overhead resources if containment is not expected until the next day or later, there is serious risk to life or structures, multiple fires are occurring and the incident commander can not gain control of the situation.
 - f. Complete and Escaped Fire Situation Analysis if the fire is not expected to be contained by 10:00 am the following day.

CONTROL, MOP-UP, AND MANAGEMENT

1. Coordinate fire control activities with cooperators, resource managers, and the general public.
2. Watch out for health and welfare of people.
 - a. Applies to personnel assigned to fire and others that may be threatened by fire.
 - b. Provide for essential needs of personnel (food, water, etc).
3. Keep dispatch advised of progress, unusual problems, resources threatened or destroyed.
4. Secure fireline and complete mop-up before departing.
 - a. Attempt to release rural fire departments first.
 - b. Keep a minimum of personnel on the fire after control to mop-up and patrol.
 - c. Release other federal agencies and home unit resources last.
 - d. Ensure all equipment is ready for next fire before releasing crews.

ADMINISTRATIVE REQUIREMENTS

Complete all administrative requirements as soon as possible.

1. Obtain a fire number.
2. Maintain a log of all personnel time.
3. Log all equipment used on the fire and any damages occurred during suppression activities.
4. Complete a fire report (DI-1202) as soon as possible.
5. Log and track any expenditures which can be charged to the fire.

POST FIRE ANALYSIS

Critique fire suppression operations with personnel.

1. Identify problems, and provide solutions for events that occurred on the fire.
2. Recommend formal and on-the-job training for self and assigned fire personnel to gain desired fire qualifications.

Attachment 3: Adjacent Landowners

| | | |
|---|---------------|---------------------|
| Jim Buckles | 685-6748 | |
| Jim Cummings | | |
| Arlis DeKay | 685-6706 | |
| Ansel Ellis | (308)684-3334 | |
| Joy Fairhead | (308)684-3423 | |
| Ray Gardiner | 685-6121 | |
| Larry Hancock | 685-6083 | -Anna Richards Land |
| Brett Heath | 685-6649 | |
| Kenneth Hines | 685-6220 | |
| Herbert Hodson | 685-6608 | |
| Roy Ireland | 685-6388 | |
| Bill Johnson | 685-1007 | |
| Carl Johnson | 685-6621 | |
| Edwin Johnson | 685-6577 | |
| Kenneth Keegan | 685-6122 | |
| Lawrence Kocer | 685-6680 | |
| Raymond Kocer | 685-6610 | |
| George Kosmicki | 685-6990 | |
| Lora Krause | | |
| Bill Lubby | | |
| Cliff McDonnell | 685-6507 | |
| Robert Moreland | (308)684-3426 | |
| John Slattery | 685-6408 | |
| Paul Slattery | 685-1258 | |
| Denzel Richards | 685-6863 | |
| South Dakota Game, Fish & Parks Tom Beck - CO | 685-6335 | |

Attachment 4: Local Services

Martin, SD

Drinks, Snacks, and Groceries

| | |
|--------------------|----------|
| Country Market | 685-6448 |
| K&M Jack & Jill II | 685-6505 |

Convenience Stores

| | |
|----------------------|----------|
| Bennett County Coop. | 685-6711 |
| Kwik Stop | 685-6885 |
| Larry's Amoco | 685-6668 |

Meals, Take-out & Restaurant

| | |
|----------------------------|----------|
| Double K's Hiway 18 Cafe | 685-6059 |
| Markota Acres | 685-6045 |
| Geo's Steak House & Lounge | 685-1088 |
| Martin Auction Cafe | 685-1066 |
| Sportsman's Lanes | 685-6474 |
| Dashboard Subs | 685-6885 |

Lodging

| | |
|----------------|----------|
| Crossroads Inn | 685-1070 |
| Kings Motel | 685-6543 |

Hardware

| | |
|------------------------------|----------|
| General Store (Ace Hardware) | 685-6730 |
| Coast to Coast | 685-6266 |

Small Engine Parts & Repair

| | |
|------------------------|----------|
| Bill's Sales & Service | 685-6513 |
|------------------------|----------|

Medical Services

Bennett County Community Hospital 685-6622

Ambulance 911

Sheriff's Dept.

Bennett County 685-6515

**APPENDIX K: WILDLAND FIRE SITUATION ANALYSIS &
DELEGATION OF AUTHORITY**

WILDLAND FIRE SITUATION ANALYSIS

Incident Name:

Jurisdiction:

Date and Time Completed:

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

Section I, WFSA Information Page

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

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

| | | |
|---|-------|--|
| Consequences of Failure * | _____ | |
| - Maps * | _____ | |
| - Decision Tree ** | _____ | |
| - Fire Behavior Projections * | _____ | |
| - Calculations of Resource Requirements * | _____ | |
| - Other (specify) | _____ | |
| * Required ** Required by FWS | | |

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

Section II. Objectives and Constraints

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

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

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

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

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

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

II.

Objectives and Constraints

To be Completed by the Agency Administrator(s)

A. Objectives (Must be specific and measurable)

1. *Safety*

- Public

- Firefighter

2. *Economic*

3. *Environmental*

4. *Social*

5. *Other*

B. Constraints

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

Section III. Alternatives

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

- I. A map for each alternative should be prepared. The map will be based on the "Probability of Success/Consequences of Failure" and include other relative information.

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

| | | | |
|---|--------------------|--------------------|--------------------|
| G. Risk Assessment - Probability of success - Consequence of failure | <hr/> <hr/> | <hr/> <hr/> | <hr/> <hr/> |
| H. Complexity | | | |
| I. Attach maps for each alternative | | | |

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

Section IV. Evaluation of Alternatives

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

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

| IV. Evaluation of Alternatives | | | |
|--|---|---|---|
| To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander | | | |
| A. Evaluation Process | A | B | C |
| Safety Firefighter Aviation Public | | | |
| <i>Sum of Safety Values</i> | | | |

| | | | |
|---|--|--|--|
| Economic Forage Improvements Recreation Timber Water Wilderness Wildlife Other (specify) | | | |
| <i>Sum of Economic Values</i> | | | |
| Environmental Air Visual Fuels T & E Species Other (specify) | | | |
| <i>Sum of Environmental Values</i> | | | |

| | | | |
|--|--|--|--|
| Social Employment Public Concern Cultural Other (Specify) | | | |
| <i>Sum of Social Values</i> | | | |
| Other | | | |

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

Section V. Analysis Summary

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

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

- C. External and Internal Influences: Assign information and data occurring at the time the WFSA is signed. Identify the Preparedness Index (1 through 5) for the National and Geographic levels. If available, indicate the Incident Priority assigned by the MAC Group. Designate the Resource Availability status. This information is available at the Geographic Coordination Center, and is needed to select a viable

alternative. Designate "yes," indicating an up-to-date weather forecast has been provided to, and used by, the Agency Administrator(s) to evaluate each alternative. Assign information to the "Other" category as needed by the Agency Administrator(s).

Section IV. Decision

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

| V. Analysis Summary | | | |
|--|---|---|---|
| To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander | | | |
| Alternatives | A | B | C |
| A. Compliance with Objectives Safety Economic Environmental Social Other | | | |

| | | | |
|---|--|--|--|
| B. Pertinent Data Final Fire Size Complexity Suppression Cost Resource Values Probability of Success Consequences of Failure | | | |
|---|--|--|--|

C. External / Internal Influences

National & Geographic Preparedness Level _____

Incident Priority _____

Resource Availability _____

Weather Forecast (long-range) _____

Fire Behavior Projections _____

VI. Decision

The Selected Alternative is: _____

Rationale:

Agency Administrator's Signature
Date/Time

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

Section VII. Daily Review

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

Section VIII. Final Review

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

| | |
|--|---------------------|
| VIII. | Daily Review |
| To be completed by the Agency Administrator(s) or Designate | |
| Selected to be reviewed daily to determine if still valid until containment or control | |

VIII. Objectives

Final Review

The elements of the selected alternative were met on: _____
Date Time

By: _____
(Agency Administrator(s))

A GUIDE FOR ASSESSING FIRE COMPLEXITY

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

Use of the Guide:

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

GLOSSARY OF TERMS

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

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

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

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

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

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

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

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

FIRE COMPLEXITY ANALYSIS

| A. | FIRE BEHAVIOR: Observed or Predicted | Yes/No |
|----|---|---------|
| 1. | Burning Index (from on-site measurement of weather conditions). | ___ ___ |

Predicted to be above the 90% level using the major fuel model in which the fire is burning.

- | | | | |
|----|--|-----|-----|
| 2. | Potential exists for "blowup" conditions (fuel moisture, winds, etc.) | ___ | ___ |
| 3. | Crowning, profuse or long-range spotting. | ___ | ___ |
| 4. | Weather forecast indicating no significant relief or worsening conditions. | ___ | ___ |
| | Total | ___ | ___ |

B. RESOURCES COMMITTED

- | | | | |
|----|--|-----|-----|
| 1. | 200 or more personnel assigned. | ___ | ___ |
| 2. | Three or more divisions. | ___ | ___ |
| 3. | Wide variety of special support personnel. | ___ | ___ |
| 4. | Substantial air operation which is not properly staffed. | ___ | ___ |
| 5. | Majority of initial attack resources committed. | ___ | ___ |
| | Total | ___ | ___ |

C. RESOURCES THREATENED

- | | | | |
|----|--|-----|-----|
| 1. | Urban interface. | ___ | ___ |
| 2. | Developments and facilities. | ___ | ___ |
| 3. | Restricted, threatened or endangered species habitat. | ___ | ___ |
| 4. | Cultural sites. | ___ | ___ |
| 5. | Unique natural resources, special designation zones or wilderness. | ___ | ___ |
| 6. | Other special resources. | ___ | ___ |
| | Total | ___ | ___ |

D. SAFETY

- | | | | |
|----|---|-----|-----|
| 1. | Unusually hazardous fire line conditions. | ___ | ___ |
|----|---|-----|-----|

| | | | |
|----|--|-----|-----|
| 2. | Serious accidents or facilities. | ___ | ___ |
| 3. | Threat to safety of visitors from fire and related operations. | ___ | ___ |
| 4. | Restricted and/or closures in effect or being considered. | ___ | ___ |
| 5. | No night operations in place for safety reasons. | ___ | ___ |
| | Total | ___ | ___ |

E. OWNERSHIP

Yes/No

| | | | |
|----|---|-----|-----|
| 1. | Fire burning or threatening more than one jurisdiction. | ___ | ___ |
| 2. | Potential for claims (damages). | ___ | ___ |
| 3. | Conflicting management objectives. | ___ | ___ |
| 4. | Disputes over fire management responsibility. | ___ | ___ |
| 5. | Potential for unified command. | ___ | ___ |
| | Total | ___ | ___ |

F. EXTERNAL INFLUENCES

| | | | |
|----|--|-----|-----|
| 1. | Controversial wildland fire management policy. | ___ | ___ |
| 2. | Pre-existing controversies/relationships. | ___ | ___ |
| 3. | Sensitive media relationships. | ___ | ___ |
| 4. | Smoke management problems. | ___ | ___ |
| 5. | Sensitive political interests. | ___ | ___ |
| 6. | Other external influences. | ___ | ___ |
| | Total | ___ | ___ |

G. CHANGE IN STRATEGY

| | | | |
|----|---|-----|-----|
| 1. | Change in strategy to control from confine or contain. | ___ | ___ |
| 2. | Large amount of unburned fuel within planned perimeter. | ___ | ___ |
| 3. | WFSA invalid or requires updating. | ___ | ___ |
| | Total | ___ | ___ |

H. EXISTING OVERHEAD

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

Total ____ ____

Signature _____

Date _____ **Time** _____

DELEGATION OF AUTHORITY

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

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

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

My specific considerations for management of this fire are:

1. Ensure the safety of firefighters, visitors, and neighbors.
2. Protect private and refuge property to the extent possible.
3. Minimize damage to environmental resources
4. Key resource considerations are: protecting rare, threatened, and endangered species; preserving as much wildlife habitat as possible; avoiding wildlife entrapment situations; and limiting degradation of the Complex's aesthetic values.
5. Restrictions for suppression actions are no earthmoving equipment (dozers, plows, graders) without approval of the Refuge Manager.
6. Manage the fire cost-effectively for the values at risk.
7. Provide training opportunities for U. S. Fish and Wildlife personnel is requested to strengthen our organizational capabilities.

Rolf Kraft - Refuge Manager

Date

APPENDIX L: COMPLEXITY

Prescribed Fire Complexity Worksheet

Using the attached criteria, rate each element on a scale of 0 to 9, 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.

PRESCRIBED FIRES:

| 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 (6) | | | Mostly uniform and predictable. | Great variability & unpredictability. Prescription includes very low fuel moisture conditions. |
| 4. Fire duration (7) | | | 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 (5) | | | 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: | | | | |

Low Complexity: 50 - 115 Total Weighted Value Points - Management Level: RXB3

Normal Structure: 116 - 280 Total Weighted Value Points - Management Level: RXB2

Complex Structure: 281 - 450 Total Weighted Value Points - Management Level: RXB1

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, and prescribed burn will be declared a wildfire. Fuel outside burn unit may be continuous and heavy with no fuel breaks making suppression efforts difficult. Engines and heavy equipment are primary suppression tools. Probability of Ignition greater than 70 percent. |
| [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.

APPENDIX M: RECOMMENDED FIRE MONITORING STANDARDS

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.