

United States Department of Interior
Fish and Wildlife Service

Wildland Fire Management Plan

**Sand Lake National Wildlife Refuge
Columbia, South Dakota**

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Prepared by: _____ Date:
Refuge Operations Specialist
Sand Lake National Wildlife Refuge

Reviewed by: _____ Date:
Project Leader
Sand Lake National Wildlife Refuge

Reviewed by: _____ Date:
Regional Fire Management Coordinator
Mountain-Prairie Region

Reviewed by: _____ Date:
Geographical Area Regional Director
Northern Ecosystem

Approved by: _____ Date:
Regional Director
Mountain-Prairie Region

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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.

B. Description of Refuge

Sand Lake Complex has management and administrative responsibility on essentially six different landholding. Including: Sand Lake National Wildlife Refuge, Pocasse National Wildlife Refuge, Waterfowl Production Areas, Wetland Easements, Grassland Easements, and FmHA Conservation Easements (Table 1).

Table 1: Management Units

Management Unit	Acres
Sand Lake National Wildlife Refuge	21,498
Pocasse NWR	2,585
Waterfowl Production Areas	44,032
Wetland Easements	196,462
Grassland Easements	100,000
FmHA Conservation Easements	6,368 (proposed)

Figure 1 - Sand Lake National Wildlife Refuge

Figure 2 - Pocasse National Wildlife Refuge

Figure 3 - Sand Lake Wetland Management District

1. Location

Sand Lake is located in north central South Dakota, approximately 25 miles northwest of Aberdeen, in the heart of the Prairie Pothole Region of the Northern Great Plains. The area extends south 17 miles along the James River, beginning three miles south of the North - South Dakota state line and west of Hecla, South Dakota. The southern boundary is four miles north of Columbia, South Dakota (Figure 1).

Pocasse National Wildlife Refuge, located approximately two hours to the west of Sand Lake NWR, falls under the management of Sand Lake Refuge staff. Pocasse NWR was established in 1962 with a cooperative agreement negotiated with the Corps of Engineers in 1968. The Corps owns the land but the Service has management responsibility under the agreement. The refuge is 2,585 acres and is located along the Missouri River (Oahe Reservoir) in Campbell County, South Dakota (Figure 2).

In addition to the two refuges, the Fish and Wildlife Service (Service) has management and administrative responsibility of Waterfowl Production Areas (WPAs). The Service owns and manages 162 WPAs for a total of 44,032 acres over 8 counties within the wetland district (Figure 3).

2. Climate

The climate is typically continental, characterized by cold winters and hot summers with rapid fluctuations of temperatures. This cool, dry, sub-humid climate has an annual precipitation of 15 to 19 inches and precipitation is normally heaviest in late spring and early summer. The average seasonal snowfall varies from 25 inches in the western counties to 35 inches in the eastern portion. Winter and summer temperatures can vary from extremes of minus 45 degrees Fahrenheit to 112 degrees Fahrenheit. Intense thunderstorms are normal occurrences in summer. In winter, snow and high winds bring blizzard conditions to the area. Prevailing winds are from the northwest. Wind speeds average 13 miles per hour but can often be much higher, especially in the spring. The growing season varies from 109 to 112 days.

3. Topography

The north central region of South Dakota overlaps two major physiographic provinces, the Great Plains Province and the Central Lowlands Province. The major land features associated with this area of South Dakota are products of the Pleistocene glaciations which formed the Missouri River and the prairie pothole region.

Sand Lake Refuge is located within two distinct physiographic regions, the James River Basin, and the Lake Dakota Plain. The James River Basin is a large glacially-eroded valley which is drained by the James River, and the Lake Dakota Plain is a result of ancient lake deposits of silt and sand which formed under old Lake Dakota. The Wetland Management District is located within three distinct physiographic regions, the Missouri Coteau, the James River Basin, and the Lake Dakota Plain.

The refuge is situated in the northern portion of the physiographic province known as the Coteau des Prairies. A large oval shaped portion of this landform occupies the eastern one-fifth of the state. Flanking the Coteau des Prairies are the Minnesota River Valley to the east and the James River Valley. The Coteau des Prairies has been described as a highland area of numerous hills and swales. This rolling terrain was formed by the oscillations of glaciers during the late Wisconsin period. Glacial features such as kames, moraines, meltwater channels, glacial lakes, and outwash plains constitute the topography, which is best described as flat to rolling.

4. Soils

The soils within the eight counties comprising the WMD and Refuge have been completely inventoried and detailed soil mapping is available at Refuge Headquarters. Cropland acreage is mostly the silty soils that are moderately well drained with areas of poorly drained level soils. The excessively drained soils and very poorly drained soils support grasses and are used mainly for grazing or hay.

5. Hydrographic Features

Even though wetland drainage has taken a toll, prairie wetlands are still a prominent part of the South Dakota landscape over much of eastern South Dakota and are incorporated by the Wetland Management District and other easements.

The James River, which flows through the Refuge north to south, was dammed by the Works Progress Administration in the late 1930's to create two lakes, Sand Lake (6100 acres) and Mud Lake (5,300 acres). Other smaller impoundments also are located on the Refuge to provide additional wetlands habitat. The Pocasse Refuge is an impoundment of Spring Creek with the dam and water control facilities being managed by the Corps of Engineers.

6.

Wildlife

Many wildlife species occurring on the Refuge can potentially occur on the Wetland Management District (District) as well. The information that follows is not intended to represent or describe all species that might occur at these locations but will give the reader an overall picture of the current conditions that may exist. A complete listing of wildlife is on file at the Refuge Headquarters.

a. Invertebrates

Wetlands associated with Service lands normally carry high invertebrate populations. Nesting waterfowl, waterfowl broods, marsh and water birds, and shorebirds are highly dependent on these protein food sources for healthy, vigorous growth. Invertebrates associated with the wetlands include worms, crustaceans, snails, and insects.

No Federal endangered invertebrate species have been documented as occurring on the Sand Lake NWR or WMD.

b. Fish

There are over 100 species of freshwater fish that inhabit South Dakota and sixty-eight of these species have the potential to occur in lakes and wetlands on Service lands. The fishery associated with Service lands is classified as a warm-water fishery with low numbers of game fish and high numbers of minnows, carp, and suckers. Due to the shallow nature of lakes and wetlands, there is a high probability of fish winterkill.

No Federally listed fish species have been observed or documented.

c. Reptiles and Amphibians

Thirty-three species of reptiles occur in South Dakota. Twenty of these species potentially occur within the Complex. Broad reptile groups include turtles, skinks, and snakes.

State threatened species include Blanding's turtles (*Emydoidea blandingi*), Northern red-bellied snake (*Storeria occipitomaculata*), Northern lined snake (*Tropidoclonion lineatum lineatum*) and the

Eastern hognose snake (Heterdon platyrhinos).

There are 17 species of amphibians that could potentially occur on Service lands, consisting of salamanders, toads, and frogs. No Federally listed reptiles or amphibians have been observed nor documented.

d. Birds

Since South Dakota is in the Northern Great Plains, grassland birds are the predominant bird life in the State. A total of 239 bird species are recorded as regularly occurring within the Complex with 113 of these species documented to nest on the Complex.

1. Shore and Wading Birds

The diversity of wetlands associated with uplands on Service lands attracts a great variety of shorebirds and wading birds. Many shorebirds use the mud flats and shallows along the wetland edges or the shallows as wetland levels recede during their migrations in the spring and fall.

2. Raptors

Red-tailed hawks, Swainson's hawks, ferruginous hawks, and Northern harriers are the most common raptors in the area. They all nest within the Complex.

3. Waterfowl

The Sand Lake NWR/WMD lies within the Prairie Pothole Region of North America. This area is of prime importance for producing many of the nation's ducks. In addition, as part of the Central Flyway, other waterfowl species use the area as important stopover sites on migrational routes. Hundreds of thousands of snow geese and other migratory waterfowl rest and feed on Sand Lake during the spring and fall migrations.

4. Upland Game Species

The ring-necked pheasant, gray partridge, and sharp-tailed grouse are common upland species that nest within the area. The greater prairie chicken can be found in isolated areas near by, but nesting has not been documented.

5. Passerine and Other Bird Species

Approximately 124 other bird species nest and/or migrate through the Sand Lake Complex.

7. Mammals

There are an estimated 55 mammal species found within the eight-county complex. They range in size from the tiny shrew to the large white-tailed deer.

8. Threatened and Endangered Species

The Bald eagle, though no longer listed but still protected, can be seen throughout the area primarily along rivers and around larger lakes during spring and fall migrations. A pair of eagles attempted to nest on the Refuge in 1992 and 1993. In addition, a pair attempted to nest on private land in eastern Brown County in 1993. To date no nesting activity is known to occur on Service lands. Upland habitat management activities are not expected affect the bald eagle.

The whooping crane passes through the area during its migration, the most recent sighting was in northern Spink County in the spring of 1993.

The peregrine falcon is also uncommon but has been observed in the early spring and fall with occasional sightings during the winter.

The Eskimo curlew is nearly extinct but may pass through on their migration and can potentially occur in wet meadows within the Sand Lake Complex.

The interior least tern nests along the Missouri River which borders the three western counties in the WMD. No habitat suitable for interior least terns is found on WPA's in the WMD.

The piping plover is a federally threatened species that is known to occur along the Missouri River bordering the three western counties in the WMD and may be found on alkalic wetlands with the WMD.

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.

9. Cultural Resources

No historic or prehistoric resources have been identified on WPA's within the WMD and there are no known cultural or archaeological resources on Sand Lake NWR. The WMD lies within the Upper James and Missouri Coteau Archeological Regions. Documented occupation of the area spans a 10,000 year period. The probability is good that significant cultural resources are present on some of the thousands of acres of native prairie.

10. Land Use, Values, and Improvements

The lands surrounding and adjacent to Service lands are mainly in private ownership. The use of the land is primary agricultural in nature. Farming is more prevalent in the eastern portion of the District, while ranching is more prevalent in the western portion of the District. There are homesites and farmsteads scattered throughout the area. The primary value of the land is based on the crops it will produce or the number of head of livestock it will carry per acre. The loss of mature crops or grazing land due to wildland fire or an escaped prescribed burn could have severe impacts on a neighbors livelihood. The primary improvements on much of the Service owned land consist of fencing. There is significant development at the Refuge Headquarters and scattered employee residences. A complete listing of improvements is on file at the Refuge Headquarters.

11. Socio-Political Climate

Fire in north central South Dakota is viewed in two ways. Wildfire is bad and grazing is preferred to prescribed fire because grass was intended as fodder for livestock. Many do recognize that burning is a good way to manage grasslands and agricultural burning is an expected management practice. The refuge is well accepted by the local population and they expect the Service to manage the lands. Locals would rather see the Service lands treated with fire than left to become decadent, weed infested

plots of grounds of no value.

C. Habitat Types

This region of South Dakota was once dominated by native prairie vegetation. Tall grasses and associated plant allies thrive in wetter climates or on heavier soils that better retain moisture. Drier climates or coarser soils tend to favor short prairie grasses and their associated flora. The tall grass prairie is located primarily east of the James River, and the mixed-tall grass transition dominates most of the James Basin Physiographic region.

Table 2: Habitat Types - Sand Lake National Wildlife Refuge

Habitat Type	Acres
Prairie Marsh ecosystem (marsh and open water)	11,000
Cropland	1,900
Grasslands	8,098
Woodlands and Administrative lands	500

Table 3: Habitat Types - Pocasse National Wildlife Refuge

Habitat Type	Acres
Marsh and Open water	1,545
Tall grass prairie.	1,040

Table 4: Habitat Types - Sand Lake Wetland Management District

Habitat	Acres
Mixed-tall grass transition prairie	39,332
Mixed grass prairie	14,700

D. Historical/Ecological Role of Fire

Prior to the 20th century the role of fire in the northern plains had been one of continued perpetuation of the prairie ecosystem. Fire restored vigor to plant growth, increased seed production, released nutrients, and reduced accumulations of litter (Higgins 1986). This included the area now designated as the Sand Lake National Wildlife Refuge Complex.

Since the early 20th century and the establishment of the Complex, nearly all fires within the boundaries have been suppressed and adjacent habitat has been fragmented from agricultural practices. These activities have significantly reduced the role fire plays as a vital element of the prairie ecosystem in the north

central South Dakota. In more recent years there has been an accumulation of knowledge, now being translated into management practices, which recognizes fire as an essential process of the mixed grass prairie.

Wildfire is one of the primary natural forces which created native prairie. Historic records describe huge prairie fires started by lightning or humans. Fires burned millions of acres as there were few natural fuel breaks and no suppression. Wright (1980) and others believe that fire frequency in the prairie grasslands is on the order of 5 -10 years. Other studies indicate that longer frequency of 10-20 years may be more accurate.

The fire frequency has diminished since the Complex was established. Increased agriculture activity and fragmented prairie greatly suppressed the occurrence of wildfires. Remaining areas within the Complex were generally hayed or grazed, denying the essential process fire provides the prairie. Managers now accept the fact that fire plays a unique ecological role which has no substitute in the management of grasslands. Fire is recognized as an essential natural process, an inert part of the prairie ecosystem.

E. Refuge Fire History

Historically, wildfire has not been too prevalent within the Complex. Over the past twenty years (1977 thru 1997), only 16 wildfires, burning a total of 517 acres of Service and non-service lands, have been reported. The small loss of acreage to wildfire can be attributed to burnable vegetation being in relatively small blocks that, when ignited, burn into barriers such as roads, plowed fields, lakes, ponds, or rivers and are consumed before suppression action can be taken.

II. POLICY COMPLIANCE - GOALS AND OBJECTIVES

A. Compliance with Service Policy

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).

B. NEPA Compliance

This plan meets the requirements established by the National Environmental Protection Act (NEPA). An environmental assessment (EA) of the Management of Upland Habitats on Sand Lake National Wildlife Refuge and Management of Upland Habitats on Sand Lake Wetland Management District were completed in 1994 and are on file. A copy of the Compatibility Determination and FONSI can be found in Appendix A. 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 surrounding Sand Lake National Wildlife Refuge was once a vast, rolling grassland interrupted only by the slow moving James River. Settlers arrived in the 1880's and brought sweeping changes to the landscape. Farming and grazing depleted essential wildlife habitat, and by the 1930's caused waterfowl to dwindle to alarmingly low numbers. Sand Lake National Wildlife Refuge was established by Congress in 1935 to protect critical nesting and migrating habitat for our nations waterfowl. The following authorities were used to establish and manage the refuges. Mission Statements for the three units can be found in Appendix A.

1. Pocasse NWR

“... shall be administered by (the Secretary of the Interior) directly or in accordance with cooperative agreements... and in accordance with such rules and regulations of the conservation, maintenance, and management of wildlife, resources thereof, and its habitat thereon, ...” 16 U.S.C. ss 664 (Fish and Wildlife Coordination Act).

2. Sand Lake NWR

“... as a refuge and breeding ground for migratory birds and other wildlife:...” Executive Order 7169, dated September 4, 1935.

“...for use as a inviolate sanctuary, or for any other management purpose, for migratory birds.” 16 U.S.C. ss 715d (Migratory Bird Conservation Act).

“...suitable for- (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species...” 16 U.S.C ss 460k-1 ‘...the Secretary...may accept and use...real...property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors...” 16 U.S.C. ss 460k-2 (Refuge Recreation Act (16 U.S.C. ss 460k-460k-4), as amended).

3. Sand Lake WMD

“...as Waterfowl Production Areas” subject to “...all of the provisions of such Act (Migratory Bird Conservation Act) ...except the inviolate

sanctuary provisions...” 16 U.S.C. 718(c) (Migratory Bird Hunting and Conservation Stamp Act)

“...for any other management purpose, for migratory birds.” 16 U.S.C. ss715d (Migratory Bird Conservation Act)

“... for conservation purposes ...” 7 U.S.C. ss 2002 (Consolidated Farm and Rural Development Act)

F. Overview of Planning Documents

The Complex currently has no Comprehensive Management Plan but are operating under the Environmental Assessments for the Management of Upland Habitats on the Refuge and Sand Lake Wetland Management District that were developed in 1994, and from objectives in operational plans such as, the Safety Plan.

Environmental Assessments were prepared in 1994 to evaluate the alternatives for managing upland habitats to achieve goals and objectives for waterfowl production, migratory birds, and other wildlife associated with Waterfowl Production Areas (WPA's) with the Sand Lake Wetland Management District (WMD)and Sand Lake NWR.

Finding of No Significant Impact signed by U.S. Fish and Wildlife Services Regional Director, Region 6, is based upon the analysis in the Sand Lake NWR and Sand Lake WMD Environmental Assessments (EA). The Regional Director found that manipulation of upland habitat for wildlife on Sand Lake NWR and Wetland Management District, to accomplish unit goals and objectives, would not have a significant impact on the human environment. No Environmental Impact Statement was necessary. The Regional Directors findings are based on 40 CFR 1508.27 as follows:

1. The use of the habitat management tools discussed in the EA would not cause detrimental impacts on public health or safety.
2. The use of these habitat management tools would not detrimentally impact the cultural resources, farmland, wetlands, or ecologically critical areas found within the eight-county wetland district.
3. The habitat management tools analyzed within the EA have been

used at the Refuges and WMD for at least the past 10 years. There has been no controversy from the ongoing use of these tools. The increased use of these tools would not be any more controversial than what has occurred in the past.

4. The use of these habitat management tools causes no possible effects on the human environment that are highly uncertain or involve unique or unknown risk.
5. The use of these habitat management tools will not establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration.
6. The use of the habitat management tools is not related to other actions resulting in cumulatively significant impacts.
7. The use of the habitat management tools would not adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant scientific, cultural, or historical resources.
8. The use of the habitat management tools would not adversely affect endangered and threatened species or their habitats found within the wetland district. Species included are the whooping crane, piping plover, interior least tern, bald eagle, golden eagle, Baird's sparrow, Dakota skipper, American burying beetle, and Western prairie fringed orchid.
9. The use of these habitat management tools does not threaten a violation of Federal, State, or local requirements imposed for the protection of the environment.

G. Habitat Management Goals and Objectives

Sand Lake goals are to protect, restore and maintain wetland and upland habitats to provide for the life requirements of waterfowl and other migratory birds; to protect endangered and threatened species and their habitats (i.e. provide nesting and roosting habitat for bald eagles); to optimize the diversity of naturally

occurring plants and animals; to provide opportunities for public recreation and appreciation of our natural heritage. A complete listing of Refuge goals and objectives can also be found in Appendix A.

1. Provide habitat and protection for any endangered species that may occur on the refuge
2. Provide sufficient habitat (wetland and grasslands) for the production and maintenance of waterfowl species.
3. Provide and manage wetland habitats as nesting areas for the tremendous variety of colonial bird species using the refuge.
4. Promote the natural biological diversity of the area, and, through management of refuge habitats, provide for the greatest number of fauna and flora species within the capabilities of the refuge.
5. Provide consumptive recreational opportunities on the refuge which are compatible with station purpose...
6. Provide the public with the opportunity to enjoy wildlife and wildlands viewing opportunities, and through education and outreach, encourage them to gain a greater understanding and appreciation of nation wildlife refuges and wildlife resources in general.
7. Provide habitat for sustainable populations of resident wildlife...

III. REFUGE FIRE MANAGEMENT OBJECTIVES

As indicated above, the Sand Lake Complex does not have an approved Master or Comprehensive Plan. Various operational plans, Executive Orders, and laws pertaining to the Complex establish a number of management objectives and operational goals which directly relate to the refuge fire management program.

It is the intention of the fire management program to support the habit management goals and objectives and operational objectives of the Complex by protecting refuge resources and habitats from the effects of uncontrolled wildfire. The fire management program will also include the use of prescribed fire to restore and enhance refuge habitats, promote

natural diversity and manipulate wetlands to promote primary operational goals of increasing the production of waterfowl.

A. Overview

The following considerations influenced the development of the Refuge's fire management goals and objectives.

1. Fire is an essential natural part of the Complex's native biotic communities.
2. Uncontrolled wildfire has the potential for negative impacts on and off the Refuge.
3. Positive or negative effects of prescribed fire on vegetation, and wildlife depend on burning conditions and species involved.
4. Use of "minimum tool" concept has been shown to minimize resource damage.
5. Rapid rates of spread and fire suppression response time can pose suppression problems and increase the likelihood of escape onto adjacent lands.

B. Fire Management Goals for Sand Lake Complex

1. Protect life, property, and other resources from unwanted fire.
2. Manage all forms of wildland fire (wildfire and prescribed fire) to achieve identified management goals and objectives.
3. Use prescribed fire as a tool to accomplish habitat management objectives.
4. Conduct all fire management activities in a cost effective manner.
5. Create an informed public regarding the role of prescribed fire within the Refuge

C. Fire Management Objectives for Sand Lake Complex

1. Firefighter and public safety is the priority objective of the program. All Fire Management activities will insure that safety is the paramount concern.
2. Safely suppress all wildland fires using strategies and tactics appropriate to safety considerations, values to be protected, and in accordance with Service policy. Cost of suppression should not exceed the value of the resource being protected.
3. Prevent the inappropriate application of fire where it may degrade cool-season grasslands and promote weed infestation.
4. Use prescribed fire to restore and perpetuate native wildlife species, by maintaining a diversity of plant communities. Treat 1000 acres annually.
5. Maintain prairie by retarding the invasion of woody species and noxious weeds. Treat 100 acres annually.
6. Protect private and governmental property and sensitive areas by reducing hazard levels of fuels. Treat 900 acres annually.
7. Implement the monitoring plan found in this document to ensure the

collection, analysis and application of high quality fire management information needed for sound management decisions.

8. Restore and rehabilitate resources lost or damaged by fire or suppression activities.
9. Manage all wildland fire using the Incident Command System.

IV. FIRE MANAGEMENT STRATEGIES

It is the intention of the U.S. Fish and Wildlife Service to continue to suppress all wildfire occurring within the Complex, including natural lightning ignitions. Management ignited prescribed fire will be utilized under controlled conditions and defined weather variables.

A. Basic Fire Management Strategy

The basic fire management strategy for the Complex will be to control wildfire using the Appropriate Management Response concept, suppress all wildfires commensurate with values at risk. Strategies employing a range of suppression options will be considered. The primary suppression strategy employed will be direct attack. However, there may be occasions when direct attack on high intensity, rapidly spreading wildland fire would jeopardize firefighter safety and not be appropriate. In these cases indirect attack will be employed utilizing natural and human-made features as wildfire control points, utilizing minimum impact suppression techniques (MIST), where appropriate.

Table 5: Appropriate Management Response

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

All fire management activities will be conducted in a manner consistent with applicable laws, policies, and regulations.

B. Strategy for Managing Wildfire

1. As indicated, all wildfire will be controlled using the appropriate management response. Suppression strategies and tactics will be unique to each wildland fire, predicated by weather parameters, fuel conditions, safety considerations, availability of resources, and location of the fire in relation to structures, species of special concern, and cultural resources. If

the fire can not be controlled using direct attack, an indirect attack utilizing roads, changes in vegetation, water features, etc. will be used.

2. Suppress all unplanned ignitions in a safe and cost effective manner consistent with resources and values to be protected. The cost of strategy implementation must be less than the value of the resource being protected.
3. Minimum impact strategies and tactics will be used when possible. However, utilization of heavy equipment remains an option for control of high intensity fires and fires threatening critical values such as historical structures, endangered species, cultural resources, private property, and the like.
4. Develop Memorandums of Understanding (MOU) with local fire suppression agencies to provide for cooperative suppression action.

C. Strategies to Implement Prescribed Fire Program

1. Prescribed fire will be used to manipulate degenerated grasslands, help open up wetlands, and as a tool for hazard fuel reduction to compliment resource management objectives.
2. Prescribed fire will be used in combination with other management tools to manage Complex resources.
3. Initiate cost effective fire monitoring which will tell managers if objectives are being met. Monitoring information will be used to refine burn prescriptions to better achieve burn and resource management objectives.

D. Limits to Implementation Strategies

1. Smoke management will be carefully considered for all prescribed burns and will be addressed in all prescribed burn plans.
2. All fires occurring on the Refuge will be staffed or monitored until declared out.
3. Prescribed burning in areas where threatened, endangered, and candidate

species exist will not be conducted if the prescribed fire will be detrimental to the species or any adverse impacts cannot be mitigated. Section 7 clearance will be secured, as appropriate.

4. Heavy equipment (dozers, discs, plows, and graders) will not be used for fire suppression except in life threatening situations without the express approval of the Project Leader or his/her designee.
5. The use of prescribed fire to achieve management objectives must be conducted in a cost effective manner.
6. Aerial Retardants and foams will not be used within 300 feet of any waterway as described in the Guidelines for Aerial Delivery of Retardant or Foam near Waterways.

E. Impacts of Fire Management Activities

The fuel surrounding Service lands can be categorized into four general categories: wildland fuels, urban interface, rural interface and agricultural row crops. The wildland fuels are composed of three NFFL fuel models:

- G Fuel Model 1 is characterized by cured continuous short grassland and savanna fuels with an average fuel depth approximately 1 foot.
- G Fuel Model 3 is characterized by cured continuous tall grass prairie, wild grains and marshlands with a average fuel depth of approximately 3 feet.
- G Fuel Model 9 is characterized by surface loose hardwood litter under stands of deciduous trees with an average fuel depth of 2-3 inches. This fuel type typically is found in scattered pockets and is best represented in the river bottoms and shelterbelts of eastern South Dakota.

The agricultural private lands surrounding Service lands are subject to changing land use practices due to crop rotation, summer fallowing, enrollment in Conservation Reserve Programs (CRP), variable livestock grazing practices and on agricultural crop prices. This continuous change in land use results in the seasonal fuel changes. The surrounding agricultural fuels are typically characterized as cultivated crop land or planted crop land. Planted crop land is characterized by one on the following NFFL fuel models:

- G Fuel Model 1 is characterized by cured short herbaceous grain crops with an average fuel depth of approximately 1-2 foot (i.e. Alfalfa, oats, millet, mustard, flax, soybeans and etc.).
- G Fuel Model 3 is characterized by cured cultivated tall grains that have not been harvested with an average fuel depth of approximately 3 feet. (i.e. wheat, corn, sunflowers, sudan grass).

Several WPA's are located adjacent to urban and rural interface areas. This intermixture of wildland fuels, combined with urban and rural community sprawl has the greatest risk to threaten or destroy life and personal property. These fuel complexes generally consist of a combination of wildland fuels, agricultural fuels, structures, public utilities, hazardous fuels, commercial and residential facilities, out buildings, fences, and etc.

Suppression of wildland fires on remote WPA's and in urban interface areas is challenging. The scattered WPA's are spread over eight different counties. The District relies heavily on volunteer fire protection districts for suppression and notification of wild fires at remote WPA's.

V. FIRE MANAGEMENT UNITS

Fire management units (FMUs) are areas within or near the refuge that have common fire management strategies, similar characteristics, and require similar efforts in fire protection or conducting prescribed fire operations.

The Complex is broken into two Fire Management Units for both prescribed fire and wildfire suppression (Table 6). The Complex was divided into two management units for the following reasons:

- # There is adequate staffing and resources at Sand Lake NWR to take initial action on wildland fires occurring on the Refuge and handle most wildland fires relying on the resources at hand.
- # There is no staffing and equipment at Pocasse NWR which is separated by over 100 miles from the headquarters at Sand Lake NWR. As a result, staffing at Lake Andes cannot take action on wildfires occurring on the Pocasse NWR. It will be necessary to rely on local volunteer fire departments for assistance.
- # The WMD is composed of several small blocks of land which in many cases are

miles from the Complex headquarters and are intermingled with private lands. For these reasons it is expected that most of all the reported wildfires will be suppressed by local volunteer fire departments.

Table 6: Fire Management Units

Fire Management Unit	Acres
Sand Lake FMU	21,498
Pocasse NWR and Wildlife Management District FMU	56,617

A. Sand Lake FMU (Figure 1)

1. Primary Fuels

Fuels include grasses, brush, and marsh vegetation.

Fuel Model 1 (Short grass): Approximately half of the Complex area fits fuel model 1. Annual and perennial grasses are included in this fuel model. Very little shrub or timber is present in this area. Fire is spread by fine, porous, and continuous fuels that have cured or are nearly cured. Total fuel load equals 0.74 tons per acre of dead fuels. Spread rates with 5 mph wind speed and 8% moisture content fire can spread at 78 chains per hour and can have a 4 ft. flame length.

Fuel Model 3 (Tall grass): Fires in this model are the most intense for grasses and spreads quickly when influenced by the wind. Over one-third of the grass stand is considered dead or cured. This would include cured stands of cattails and patches of tall grass species. Fuel loading consists of fine and course dead fuels, averaging 3 tons per acre. Spread rates with 5 mph winds can reach 104 chains per hour and can have a flame length of 12 feet.

Fuel Model 9 (Hardwood litter): This fuel model describes areas where loosely compacted leaf litter is the primary carrier of the fire. Fires run through the surface litter faster than model 8 and have longer flame height. Fall fires in hardwoods are predictable, but high winds will actually cause hire rates of spread than predicted because of spotting caused by rolling and blowing leaves. Rates of spread are slow, 7.5 chains/hour with flame lengths of 3 feet or less, under normal conditions.

2. Expected Fire Behavior

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 BEHAVE, nomograms and other prediction models developed for the purpose. 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 Complex 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.rfd/fsd will be accessed to determine potential fire behavior using the Rangeland Fire Dander Index and trends necessary to properly manage the fire management 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. Unusual 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 suppress wildfires. In addition, severe weather may also provide a source for ignition in the event of lightning and downed electrical lines. Drought, as indicated by a Keetch-Byram Drought Index reading of 400 or greater, can also affect fire behavior and resistance to control. Although many of these cases are not common, staff will be alert and will monitor weather conditions which may cause havoc during fire management operations.

5. Fire Effects

Effects of Topography on Fire:

Boundaries within the Complex were established along jurisdictional lines rather than geographic features. Many of the boundary lines for Complex fire management and prescribed burn units are conducive to fire spreading onto private land due to topography and continuous fuel.

Effects of Fire on Soils:

Soil erosion resulting from suppression or prescribed fire is generally not a problem on the Complex. Occasionally, local cooperators use disc lines as a fire suppression tactic. The use of a disc line is not permitted on Complex lands without the permission of the Project Leader or his/her designee due to noxious weed invasion and soil erosion. Mowing and wet lines will be used whenever possible.

Effects of Fire on Insects:

Fire can cause an immediate decrease 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 Complex, 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 Complex'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 Complex grasslands.

First Order Fire Effects

Expected fire effects on common species and species of special concern can be found at <http://www.fire.org/perl/tools.cgi>.

6. Fire Objectives

Fire Objectives are listed in Section III - Fire Objectives

7. Suppression Strategies and Techniques

- a. The number of people dispatched to the fire will depend on the time of year and burning conditions at time of ignition. At a minimum two firefighters and one engine will be dispatched and the Incident Commander will determine additional needs.
- b. The primary method of controlling wildfire will be direct attack. MIST will be used whenever possible. The use of existing barriers to conduct burnout operations or set backfires will be used to control fires where direct attack is not feasible.
- c. If conditions warrant and time permits new firelines will be plowed, by heavy equipment, then burned out. Getting this equipment to a fire scene often takes too long to be practical.
- d. Local fire departments will be called when needed. The following fire departments will respond to a call from the refuge; Hecla, Columbia, and Frederick
- e. Whenever smoke or fire believed to be on Service lands is observed or reported by an employee, each employee at the scene must take immediate action and do the following:
 - # Warn or evacuate people who may be in danger.
 - # If properly trained and equipped, initiate fire suppression action, if possible, or call for necessary backup. Try to prevent fire from spreading until help arrives.
 - # Prevent public from accessing the area.

8. Limits

- a. Suppression crews will be alerted to importance of protecting structures and will also be informed of Service Policy that indicates that Service employees do not fight structural fires but can take action to keep the fire from spreading to the structure from wildlands or from the structure to wildlands.

- b. Power lines pose a threat to suppression personnel. Personnel will be instructed to avoid being in the vicinity of a high voltage power line due to high carbon arching.

B. **Pocasse NWR and Wetland Management District FMU (Figures 2 & 3)**

The lands comprising this unit are spread over eight counties and vary in size from approximately 18 acres to 2600 acres and total approximately 47,000 acres.

1. Primary Fuels

Fuels include grasses and marsh vegetation.

Fuel Model 1 (Short grass): Approximately one third of the unit fits fuel model 1. Annual and perennial grasses are included in this fuel model. Very little shrub or timber is present in this area. Fire is spread by fine, porous, and continuous fuels that have cured or are nearly cured. Total fuel load equals 0.74 tons per acre of dead fuels. Spread rates with 5 mph wind speed and 8% moisture content fire can spread at 78 chains per hour and can have a 4 ft. flame length.

Fuel Model 3 (Tall grass): Fires in this model are the most intense for grasses and spreads quickly when influenced by the wind. Over one-third of the grass stand is considered dead or cured. This would include cured stands of cattails and patches of tall grass species. Fuel loading consists of fine and course dead fuels, averaging 3 tons per acre. Spread rates with 5 mph winds can reach 104 chains per hour and can have a flame length of 12 feet.

2. Expected Fire Behavior

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 BEHAVE, nomograms and other prediction models developed for the purpose. 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 Complex 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.rfd/sd will be accessed to

determine potential fire behavior using the Rangeland Fire Danger Index 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. Unusual 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 ignition in the event of lightning and downed live electrical lines. Drought, as indicated by a Keetch-Byram Drought Index reading of 400 or greater can also affect fire behavior and resistance to control. Although many of these cases are not common, staff will be alert and will monitor weather conditions which may cause havoc during fire management operations.

5. Fire Effects

Effects of Topography on Fire:

Boundaries within the Complex were established along jurisdictional lines rather than geographic features. Many of the boundary lines for Complex fire management and prescribed burn units are conducive to fire spreading onto private land due to topography and continuous fuel.

Effects of Fire on Soils:

Soil erosion resulting from suppression or prescribed fire is generally not a problem on the Complex. Occasionally, local cooperators use disc lines as a fire suppression tactic. The use of a disc line is not permitted on Complex lands without the permission of the Project Leader or his/her designee due to noxious weed invasion and soil erosion. Mowing and wet lines will be used whenever possible.

Effects of Fire on Insects:

Fire can cause an immediate decrease 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 Complex, 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 Complex'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 Complex grasslands.

First Order Fire Effects

Expected fire effects on common species and species of special concern can be found at <http://www.fire.org/perl/tools.cgi>.

6. Fire Objectives

Fire Objectives are listed in Section III - Fire Management Objectives.

7. Suppression Strategies and Techniques
 - a. Due to the distance from the Complex Headquarters to the majority of the Service owned lands in the Unit, Local fire departments will be relied on to suppress wildland fires.
 - c. Direct Attack and Minimum Impact Suppression Tactics (MIST) will be used whenever appropriate. When conditions are not favorable to direct attack, other methods may be used.
8. Limits
 - a. The use of heavy equipment must be approved by the Project Leader or his acting.
 - b. All suppression and prescribed fire activities must be in accordance with Service and State Policy, rules, laws, and guidelines.

VI. FIRE SEASON

A. Refuge Fire Frequency

Over the past twenty years (1977 thru 1997), only 16 wildfires, burning a total of 517 acres, have been reported. Two of the fires were lightning caused and burned a total of .2 acres. The number of fires and the acres burned over a 20-year period is too small to develop meaningful statistical information. However, certain trends can be noted. Wildfires occur infrequently, are small, and are generally caused by human activity (Appendix B).

B. Fire Season

The Refuge has a split fire season. The Spring fire season starts mid-April and runs through mid-May. A second season starts the first of October and continues to mid-November. Much is dependent on snow melt in the spring and snow fall in the fall.

VII. FIRE MANAGEMENT RESPONSIBILITIES

A. Refuge Staff Responsibilities

The Sand Lake Complex does not have a dedicated fire management staff. The Refuge staff consists of the Project Leader, Refuge Manager, Wetlands District Manager, Biologist, and administrative and maintenance personnel. Fire management responsibilities fall under the direction of the Refuge Manager.

1. Project Leader

- a. Ensures that the fire management program is carried out in accordance with Service policies, regulations and guidelines
- b. Reviews and submits annual Firebase submission to the Regional Fire Management Coordinator
- c. Approves prescribed burn plans

2. Refuge Manager

- a. Serves as the primary line officer responsible for all aspects of the fire management program
- b. Prepares the annual Firebase submission. Authorized expenditures of fire management funds in accordance with Service policy.
- c. Provides initial attack fire suppression capability and ensure all wildland wildfire receive some type of initial attack response.
- d. Conducts prescribed fire activities in support of refuge habitat management programs.
- e. Establishes appropriate fire related agreements/contracts and ensures they are reviewed and updated on an annual basis.

- f. Monitors results of wildland and prescribed fires to assure they are meeting established objectives.
- g. Updates fire management and associated plans (dispatch, training, etc.).
- h. Continues to develop "red-carded" firefighters for prescribed and wildland fire, trained and equipped to accomplish the fire management program.
- i. Assures fire equipment in a ready state.
- j. Annually administers the physical fitness test and ensures only those who have passed may participate in wildland fire management activities.
- k. Ensures sufficient collateral duty firefighters meeting Service standards are available for initial attack and prescribed burns.
- l. Serves as Incident Commander and Prescribed Burn Boss, as qualified.

3. Wetland District Manager

- a. Conducts prescribed fire activities in support of refuge habitat management programs.
- b. Establishes appropriate fire related agreements/contracts and ensures they are reviewed and updated on an annual basis.
- c. Monitors results of wildland and prescribed fires to assure they are meeting established objectives.
- d. Serves as Incident Commander and Prescribed Burn Boss, as qualified.

4. Biologist

- a. Assists the Refuge and Wetland District Managers with the development of prescriptions that will meet habitat management objectives.
- b. Serves on the Station Fire Management Team, as qualified

5. Refuge Mechanic

- a. Responsible for the proper maintenance and repair of firefighting equipment and vehicles used in fire management activities.
- b. Serves on the Station Fire Management Team, as qualified

6. Clerk

- a. Sees that records of names, addresses and telephone numbers of additional fire suppression resources are kept up to date and readily available.
- b. Acts as dispatcher during prescribed fire and suppression activities.

7. Station Fire Management Team

- a. Responsible for their own fitness and meeting fitness standards.
- b. Maintains issued fire management equipment in a ready state and wears and uses it in accordance with NWCG guidelines and Service policy.
- c. Responsible for keeping their own fire management records and assisting the Refuge Manager with the annual qualifications update process.

d. Participates in fire suppression and prescribed fire operations, as qualified.

8. Burn Boss

a. Implements prescribed fire actions in accordance with the approved burn plan.

b. Provides for the safety of the prescribed fire crew

c. Keeps Refuge Manager informed of all aspect of the operation

d. Ensures monitoring is conducted

e. Completes Fire Report (DI 1202) within three days of the fire being declared out

9. Incident Commander

a. Initiates all suppression actions in accordance with the guidelines identified in this plan.

b. Provides for the safety of the prescribed fire crew

c. Keeps Refuge Manager informed of all aspect of the operation

d. Completes Fire Report (DI 1202) within three days of the fire being declared out

B. Cooperator Involvement and Standards

Due to the widespread nature of Service lands, the Complex relies on local fire departments to suppress fires occurring on Service lands. The Complex maintains MOUs with the Columbia and Hecla Fire Departments (Appendix C). There is a need to develop MOUs with the other county departments as well.

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.

VIII. EQUIPMENT AND STAFFING NEEDS

A. Normal Unit Strength

A listing of normal unit strength can be found in Appendix D.

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.

The Complex has adequate staff to meet current needs. Additional staff members should take the necessary training and gain additional experience to fill additional positions at the Complex and provide for additional flexibility for the program. Minimum staffing needs are found in Table 7.

Table 7: Minimum Staffing Needs - Sand Lake NER Complex

POSITION	WILDFIRE	PRESCRIBED FIRE
Incident Commander (ICT5)	1	

Engine Boss (ENGB)	1	2
Engine Operator (ENOP)	2	2
Prescribed Burn Boss (RXB3)		2
Firefighters	2	4

Note: One person can be qualified for more than one position.

IX. PREPAREDNESS

A. Staffing

A listing of current staff members and their qualifications can be found in Appendix E.

B. **Pre-season Readiness Activities**

Table 8 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										
Weather Station Maintenance and Calibration										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 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 K provides specific instructions to administer the tests, a health screening questionnaire to aid in assessing personal health and fitness of employees prior to taking the test, an informed consent form, and safety considerations. A trained and qualified American Red Cross First Responder (or equivalent) who can recognize symptoms of physical distress and appropriate first aid procedures must be on site during the test.

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

Physical Examinations

In keeping with Service Policy, a physical examination is required for all new permanent employees and all seasonal employees assigned to arduous duty as fire fighters prior to reporting for duty. A physical examination may be requested for a permanent employee by the supervisor if there is a question about the ability of an employee to safely complete one of the work capacity tests. All permanent employees over 40 years of age who take the Pack or Field Work Capacity Test to qualify for a wildland or prescribed fire position are required to have an annual physical examination before taking the test.

C. Regional and National Preparedness

As indicated previously, periods of drought can greatly impact fire behavior and resistance to suppression. For that reason the 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://www.boi.noaa.gov/fwweb/fwoutlook.htm>. 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).

The Rangeland Fire Index is calculated daily during the fire season by the National Weather Service (NWS) in Sioux Falls, South Dakota. Greenness factors of fuels are calculated by an Advanced Very High Resolution Radiometer (AVHRR) onboard NOAA weather satellites. Satellite calculated greenness factors are combined with forecasted windspeed and relative humidities. The data is accurate enough to calculate greenness factors and fire danger ratings on a county by county basis. The Range Land Fire Index is available on the Internet at:

[Http://www.crh.noaa.gov/fsd/forprod.rfdfsd](http://www.crh.noaa.gov/fsd/forprod.rfdfsd)

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

All preparedness activities will be in accordance with the Complex Step-up Plan (Appendix F).

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. 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

Fires occurring in flashy fuels such as grass tend to have rapid rates of spread, especially with moderate to strong winds. Heavy smoke can also obscure visibility. Forces attacking grass fires should avoid attacking the head of the fire and must watch for hazards such as coolies, ravines, fences, etc. that may be obscured by heavy smoke. Always have escape routes and safety zones established and make them known to all fire fighters at the scene. Work with "one foot in the black" whenever possible.

Smoke from wildfires and prescribed fires is a recognized health concerns for firefighters. Prescribed burn bosses and wildfire incident commanders must plan to minimize exposure to heavy smoke by incorporating the recommendations

outlined in the publication Health Hazards of Smoke (Sharkey 1997).

B. Fire Prevention

Human caused fires through agricultural practices and other sources make up the majority of wildfires that have occurred on the Complex. In general, the public and visitors to the Complex are aware of fire prevention. As a reminder, the Complex may do the following:

- # Signing
- # Contacts with Complex cooperators and neighbors
- # Public contacts through press releases and verbal contacts
- # Employee training and awareness
- # Closures when necessary
- # Implementation of State regulations and restrictions
- # Enforcement of regulations and prosecution of violators

C. Detection

The Complex relies on neighbors, visitors, cooperators, and staff to detect and report fires. In addition, the Step-Up Plan provides for increased patrols by Complex personnel 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. Initial Reporting and Dispatching

All fires occurring within or adjacent to the Complex that are observed by Complex personnel will be reported to the Complex Headquarters. The person receiving the report will be responsible for implementing the Fire Dispatch Plan and assume the duties of Fire Dispatcher until relieved or released (Appendix G).

For local fires, the Fire Dispatcher will stay on duty until: (1) all Complex resources return; (2) relieved by another dispatcher; or (3) advised by IC that he/she can leave. The Fire Dispatcher will not be required to stay on duty if the fire occurs outside Complex radio coverage, but the Dispatcher must notify the Brown County Sheriff's Office Dispatch Center (605-626-7100) that a dispatcher is not on duty at the Complex before leaving.

The Fire Dispatcher will be responsible for coordinating the filling and delivery of any resource orders made by the IC for all operational and logistical needs, 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 Custer Dispatch Center (1-605-673-4434). The Zone FMO at J. Clark Salyer NWR or the Center Coordinator will generally be able to assist with ordering resources from outside the area.

Requests for assistance by cooperators on fires not threatening the Complex must be made to the Project Leader or designee. Only qualified and properly equipped resources meeting NWCG standards will be dispatched off of the Complex.

E. Fire Suppression

1. Initial Attack

Often Initial Attack action is initiated by local volunteer fire departments. Cooperative agreements with the State and local fire departments will be maintained to provide for cooperative suppression actions. Assistance from local or Federal cooperators will follow the "closest resources" and "total mobility" principles in accordance with Service policy.

All fires occurring on the Complex and staffed with Service employees will be supervised by a qualified Incident Commander (IC), whenever possible. The Incident Commander or lead firefighter (also referred to as the IC) will be responsible for all management aspects of the fire until the fire is declared out or he/she is relieved. If a qualified IC is not available, the highest qualified firefighter will assume command until relieved or the fire is declared out. All resources will report to the IC (either in person or by radio) prior to deploying to the fire and upon arrival to the fire. The IC will be responsible for: (1) providing a size-up of the fire to dispatch as soon as possible; (2) determine the resources needed for the fire; and (3) advising dispatch of resource needs on the fire.

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 (MIST) will be used whenever possible.

2. Limits

a. The use of earth moving equipment for suppression activities (dozers, graders, plows) on the Complex will not be permitted without the approval of the Project Manager.

b. Fires will be suppressed in a cost effective manner.

3. Escaped Fires/Extended Attack

Whenever it appears a fire will escape initial attack efforts, leave Service lands, or when fire complexity exceeds the capabilities of command or operations, the IC will take appropriate, proactive actions to ensure additional resources are ordered. The IC, through dispatch or other means, will notify the Zone FMO of the situation. The Zone FMO will assist the Project Leader in completing a Wildland Fire Situation Analysis (WFSA) and Delegation of Authority (Appendix H).

F. Mop up Standards and Emergency Stabilization and Rehabilitation

The IC will be responsible for mop-up and mitigating suppression impacts incurred 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 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 Environmental Assessments for Upland Management on Sand Lake\Pocasse NWR and WMD (1994) addresses the use of prescribed fire as one of the management tools which is used to help accomplish objectives. The use of prescribed fire as a management tool at the Refuge began in 1965. Grasslands were burned primarily to manipulate vegetation and enhance the biological productivity and diversity of specific organisms or to accomplish specific objectives. Specific objectives may be broad (prairie restoration and maintenance) or narrow (management for endangered or rare species or reduction of woody plants). The primary reasons for burning at the Complex are to restore, improve, or enhance the prairie habitat for wildlife.

1. Primary Objectives

Enhance habitats by removing heavy accumulations of dead or rank vegetation that hinders new growth. This will in turn create habitats that are beneficial to wildlife and release nutrients to enrich the soil. Treat 1,000 acres annually.

Reduce accumulation of fuel which could lead catastrophic fire that may endanger the public or damage to structures and resources. Treat 900 acres annually.

Use prescribed fire by itself or in combination with other management tools to manage invader species and encourage the growth of native species. Treat 1,000 acres annually.

2. Burn Schedule

Units once they are established will be treated every three to five years, depending on the condition of the unit.

B. Limits

1. The County Sheriff's Office and fire departments will always be notified by the Burn Boss prior to ignition. Private landowners adjacent to the proposed burn will also be notified. The required notifications will be included in each burn plan.

2. The initial fire will be set between three hours after sunrise and three hours before sunset in accordance with South Dakota air pollution regulations.

3. Prescribed fire activities may be limited during nesting season

4. Drought can have an effect on fire severity and control. It is important to track one or more of the drought indicators. Prescribed burns should not be initiated if the Keetch-Byram Fire Danger Index is 600 or higher. The drought indexes are on the Internet at:

<http://www.boi.noaa.gov/fwxweb/fwoutlook.htm>

5. The use of heavy equipment and other ground disturbing devices will be approved by the Project Leader.

C. Burn Season

Prescribed fire activities can be initiated throughout the year, depending on the objectives to be achieved. The primary burn season is mid-April to mid to late October.

D. Complexity

Prescribed fires on the Refuge may vary from low to moderate complexity as determined by the Fish and Wildlife Service Complexity Analysis found in the Fire Management Handbook (Appendix I). It is anticipated, however, that most prescribed fires, if not all, will be of low complexity.

E. Planning

The Refuge Manager, in concert with other key refuge staff, is responsible for identifying units or areas in need of treatment, and for developing resource and treatment objectives for those units/areas based on refuge resource management goals and objectives.

Should prescribed fire be selected as the preferred treatment alone or in some combination with other treatments the Refuge Manager will develop a burn prescription and plan which will accomplish the desired objectives. All completed plans are forwarded to the Zone FMO for review and approval. Once approved, the plans are valid for a three year period, provided the conditions specified in the plan remain the same.

Contingency planning can range from the a simple injury to a key person on the burn, to the complete loss of control of a situation due to unanticipated weather events and control problems. Contingency planning shall be an essential part of the Sand Lake fire management program because of the potential risk involved with prescribed burning. The essential components of all contingency plans included in prescribed burn plans will identify “Who, What, When, Where as well as how” an unanticipated problem will be managed .

All prescribed burn plans shall identify the following essential elements for contingency planning:

- G Who has the authority to activate the contingency plan.
- G Clearly defined trigger points.
- G Special instructions for reporting and escaped fire or slopover.
- G Who will be notified when the contingency actions are being implemented.

- G The location of values or resources requiring protection and a established a priority for providing protection.
- G Identify the initial action used to suppress the wildland fire. Including the organizational structure, strategies, tactics, additional resources, health and safety concerns.
- G Containment opportunities outside of the burn unit (i.e. fuel breaks, roads, and other areas).
- G Contingency elements required to be on-site during a prescribed burn operation.

There is no “one size fits all” standard for determining when a prescribed fire should be declared a wildland fire. Therefore, determining when to implement the contingency plan or declare a prescribed fire a wildfire will vary with every situation. Because of this, the following “trigger points” have been identified to serve as a guide to determine when and if the contingency plan will be implemented:

- G When five or more slopovers occur.
- G When private property, cultural resources, structures and other resource values are threatened.
- G When the fire behavior predictions exceeds the prescription parameters.
- G When local burning restrictions and fire use policies have been implemented.

The actual trigger pints will be identified in each burn plan.

The Project Leader will submit as part of the annual Firebase budgeting process requests for funding for individual fuel management projects. The Regional Fire Management Coordinator will review and approved the projects.

The Burn Boss is responsible for determining if prescribed fire can be utilized to meet the treatment objectives. If the plan must be revised, an addendum can be added to the plan and approved by the Project Leader.

F. Preparation and Implementation

Site preparation duties will be assigned by the Project Manager to qualified individuals. Site preparation needs will be specified in individual burn plans. As a general rule, site preparations will be completed for burn units not bordered by

defensible barriers. The treatments will vary from a twenty foot fire break, that will be mowed and raked, to a wet line. The specifications will be included in the individual prescribed burn plan for the unit.

G. Monitoring and Evaluation

Monitoring will be in accordance with the Region 6 monitoring standards (Appendix J).

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 has been discussed previously. In order to provide for public safety, the fire scene will remain clear of unauthorized people during fire management activities. The responsibility for managing public safety lies with the Incident Commander(IC) for wildland fire and the Burn Boss during prescribed fire operations. Actions to provide for public safety during prescribed burns will be indicated in the burn plans. It may be necessary to assign a law enforcement officer or request a County Deputy Sheriff to assist with traffic control, area closures or evacuation.

The greatest threat to public safety from fast moving range fires. Fire fronts in grass fuel models move rapidly and can be dangerous. Neighbors who initiate their own suppression without proper training, equipment, or communication are at greatest risk. Hunters and other visitors are at slight risk because the units are small, thereby closer to safety features such as plowed fields, water, and other natural and man-made fuel breaks.

B. Public Information and Education

Keeping the public informed is an important part of the Service's mission and the fire management program. 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. Wildland Fire Suppression

During and immediately following a wildfire , the IC is responsible for insuring that information concerning the suppression of the fire is provided to the public. Questions arising later will be referred to the Project Manager.

2. Prescribed Fire

Public information will be dealt with as part of the prescribed fire plan. Informing the public is a vital component of the prescribed fire program. Areas that have been burned will present opportunities for the public to actually see the effects of fires on resources, and offer staff members an opportunity to explain the purpose of the burns to the public. The following can be used to promote the prescribed fire program to the public:

- a. Programs for local schools and students and groups that visit the refuge.
- b. Attendance at local volunteer fire department meetings
- c. A prescribed fire message included in interpretive publications.
- d. Personal contacts with bystanders during prescribed burns.

C. Records and Reports

A fire report (DI-1202), will be completed by the Incident Commander, Burn Boss, or ROS and submitted to the Zone FMO for input into the Fire Management Information System (FMIS) within 10 days of the fire being declared out. The narrative portion of the DI-1202 will address the specifics of the fire, actions taken and outcomes from those actions. A formal review will be conducted on all serious injuries and losses of significant resources.

Personnel time sheets, orders for supplies and material expended on the fire, or other procurement needs will be forwarded to the Administrative Assistant for processing within three days of the fire being declared out.

D. Fire Critique and Review Process

- 1. Fire Management Plan Review

The fire management plan will be updated as major policy decisions and land acquisitions are made. At a minimum, this plan will be reviewed once a year by the Project Manager or his designee. Minor changes to the appendices, such as personnel changes, or pin and ink changes in the body of the plan can be made at the refuge as part of the yearly review process without involvement of the Regional Office. Amendments to the fire management plan which change the direction and scope must be forwarded to the Regional Office for review and concurrence. Major changes may mean that the plan will have to undergo review and approval by the Regional Director.

2. Operational Reviews

Operational Reviews will be conducted using the following guidelines:

a. Wildfire

All wildland fires will be critiqued by the Incident Commander. The Regional Fire Management Coordinator and/or Zone Fire Management Officer will conduct formal critiques in the event of the following:

- # Significant injury, accident, or fatality
- # Significant property or resource damage
- # Significant safety concerns are raised.
- # Extended attack

b. Prescribed Fire

Prescribed burns will be critiqued by the Burn Boss and the results documented in the prescribed burn plan or on the fire report. The Regional Fire Management Officer 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 AND SECTION 107 CLEARANCES

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.

No historic or prehistoric resources have been identified on WPA's within the WMD and there are no known cultural or archaeological resources on Sand Lake NWR. The WMD lies within the Upper James and Missouri Coteau Archeological Regions. Documented occupation of the area spans a 10,000 year period. The probability is good that significant cultural resources are present on some of the thousands of acres of native prairie.

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 Project Leader 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 Project Leader 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

Visibility and clean air are primary natural resource values. The protection of these resources must be given full consideration in fire management planning and operations. Additionally, smoke can have serious health and safety effects which must be considered during planning and approval processes as well.

In general, air quality of the area is good. The management of smoke will be incorporated into the planning of prescribed fires and, to the extent possible, in the suppression of wildfire. The State of South Dakota does not have a permit system for open field burning but does have regulations concerning agricultural burning. All prescribed burning must comply with State air quality regulations. A copy of the State's air quality regulations are on file at Complex Headquarters.

XV. FIRE RESEARCH NEEDS

The effects of fire on the Refuge's plants and animals, needs to be better understood. Through research and careful application of fire, data collected can provide managers with a better understanding of the natural ecological effects of fire, and the information needed to refine prescriptions to meet resource objectives. Funding will be sought from sources other than Fire for research, or educational institutions will be contacted and encouraged to conduct fire related research on refuge lands.

Fire behavior data will be collected as part of the monitoring program on all fires occurring on Sand Lake Complex. This data, along with any information gathered through research studies, will be used to improve the effectiveness of the fire management program

XVI. CONSULTATION AND COORDINATION

The Fire Management Plan will be made available to the following fire departments that have expressed an interest or may be utilized for initial attack under a MOU:

Columbia Fire Department
Hecla Rural Fire District
Frederick Rural Fire District

Managers of the Sand Lake Complex routinely discuss management practices with

Federal, State, and local agencies. Various management practices are discussed with local Soil Conservation Service soil conservationists for their professional input.

Integrated weed management is coordinated with the various County Weed Supervisors. All supervisors are contacted each spring and given notification of our weed control plans for their county. District weed meetings are attended and information is traded concerning weed control accomplishments and methods.

Local sportsmen's club meetings are attended as opportunities arise, and policies and management practices are explained. For example, a Waterfowl Planning meeting was held in 1993 to discuss management practices concerning long-term protection and improvement of habitat.

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APPENDIX A: MISSION AND GOALS STATEMENT

APPENDIX B: FIRE OCCURRENCE

APPENDIX C: COOPERATIVE AGREEMENTS

APPENDIX D: NORMAL UNIT STRENGTH

Item	Year Purchased	Percent of Fire Funding	Have	GVW	Need	GVW
Engine Module(s) medium (200-400 gal)	1991	100%	1	10K	1	18K
200 gallon Slip-on unit	1983	100%	1			
300 gallon Slip-on unit	1988	100%	1			
300 gallon Slip-on unit	1991	100%	1			
Water Tender(s)			2			
Portable Pump(s) Standard float-a-pump	1996	100%	1			
Power Saw(s)						
Mower(s)						
Tractor(s)						
Grader(s)						
Plow Unit/Disk						
ATV(s)						
Other List						

Other Equipment Available for Fire Suppression or Prescribed Fire Operations Not Fire Funded
Pickup CK 3500 10,000 gvw
Pickup CK 2500 8,800 gvw

Dozer H-P 1 each
Grader 1
Transport 1
Tractor 75 hp Tractor 100 hp
ATV's 4 each

Table 2: Supplies and PPE

Item	Quantity	
	NUS	Have
Hose, lightweight, lined 1.5" x 100'	9	
Hose, lightweight, lined 1" x 100'	9	2
1" NH gated wye	2	
1.5" NH gated wye	2	
1.5" nozzle	2	2
1" Forester nozzle	4	2
Hydrant wrench, spanner	2	2
Hose clamp	2	
flapper	6	8
Pulaski w/sheath	3	3
Shovel w/sheath	6	5
Rake/McCloud	2	2
Combi tool	6	0
Drip Torch	2	3
Fusees	1 Case	
Safety Can: 3 Gallon	2	2
Foam	15 gallons	
Backpack Pump	6	4
Canteen, large	2	
Belt Weather Kit	2	2
Hard Hat	12	15
Goggles	12	20
Headlamps	12	10
Fire Shelter w/Liner	12	10
Line Pack w/harness	12	10
Water Bottle	48	15
Ear Plugs	12 pks	200
Leather Gloves, Assorted sizes	24 pr	20
Sleeping Bags	10	3

Pearsonal Gear Pak (Red Bag)	12	12
Personal First Aid Kit	12	15
Nomex Shirts Small Medium Large X-Large	Enter Desired Number should have 18 pr (Men & Women)	15 Assorted Sizes
Nomex Pants - Men's 28x30 32x30 32x34 34x30 34x32 34x34 36x30 36x32 36x34 38x34 40x34		15 Assorted Sizes
Nomex Pants - Women's Size 10 Size 12 Size 14 Size 16		

APPENDIX E: LISTING OF EMPLOYEES AND QUALIFICATIONS

Name	Position	Qualifications		Fitness Level
		WF	RX	
John Jave	Refuge Manager	ICT5 ENOP	RXB3 ENOP	Arduous
Scott Glup	Wetland District Mgr	ENGB ENOP FFT1	ENGB ENOP FFT2	Arduous
Alice Hanley	ROS		FFT2	Moderate
William Schultze	Biologist	ENOP FFT2	ENOP FFT2	Moderate
Brian Wehausen	Private Lands Tech	FFY2	FFT2	
Ron Frohling	Carpenter		FFT2	Moderate

Ryan Frohling	Biological Tech	FFT2	FFT2	Arduous
Allen Olson	Private Lands Tech	FFT2	FFT2	Arduous
John Koener	Project Leader		FFT2	Moderate

APPENDIX _: FIRE MANAGEMENT TEAM MEMBERS AND QUALIFICATIONS

Position	Qualifications	Fitness Level	Name
SROS	Burn Boss, ICT5	Arduous	John Jave
ROS	FFT2, ENOP	Arduous	Scott Glup
ROS	RX-FFT2	Moderate	Alice Hanley
Biologist	ENOP, RX-FFT2	Moderate	Bill Schultze
Carpenter	RX-FFT2	Moderate	Ron Frohling
Private Lands Tech	FFT2	Auduous	Brian Wehausen

Position	Qualifications	Fitness Level	Name
Biological Tech	FFT2	Arduous	Ryan Frohling
Private Lands Tech	FFT2	Arduous	Allan Olson
Project Leader	RX-FFT2	Moderate	John Koerner

APPENDIX F: STEP-UP PLAN

STEP-UP PLAN

The Step-up plan will guide fire preparedness operations and use the Range Land Fire Danger Index available on the Internet at

PREPAREDNESS ACTION	Range Land Fire Danger Index				
	L	M	H	VH	E
Maintain Radio Contact	X	X	X	X	X
Maintain Response Time of: (minutes)	60	60	45	20	20
Fire-ready engine at Refuge Headquarters		X	X	X	X
Carry PPE while on duty, wear nomex and boots			X	X	X
Water tender on standby			X	X	X
Tour of duty changed at Manager's discretion			X	X	X

Detection patrol conditional				X	X
Refuge fire ban conditional				X	
Refuge fire ban mandatory					X

APPENDIX G: DISPATCH PLAN

DISPATCH PLAN

SAND LAKE NATIONAL WILDLIFE REFUGE COMPLEX

Upon report of smoke or fire:

II. Record as much information as possible from the caller:

- # Name:
- # Callback number:
- # Location of Smoke or Fire:
- # Access Route:
- # Color of Smoke:
- # Size of Fire:
- # Fuels (What's burning?):
- # Fire Behavior (What's the fire doing?):
- # Improvements Threatened:
- # Anyone at the Scene:
- # How did it Start?:
- # Suspects:

III. Maintain a log of all radio and telephone calls (Attachment 1)

IV. Check Map for Ownership/Protections Status

V. For a Fire on Service lands:

A. Outside Regular Working Hours use Fire Personnel Directory to Contact Refuge Staff. Start with Refuge Manager and work down the list until adequate staff is notified to respond to the situation.

B. During Regular Working Hours:

Notify Project Leader

Utilize Administrative personnel if available, or use other staff member as Dispatcher.

Select and dispatch an Incident Commander (Should be qualified IC or can be highest qualified firefighter available.)

Dispatch appropriate resources. Do not dispatch unqualified firefighters for line duty.

If fire danger is high to extreme, request a spot weather forecast from the Custer Dispatch Center.

Remain on duty and provide further assistance as requested by IC.

C. **If fire is on Service lands but involves a structure** contact the appropriate fire department.

VI. For a Fire Not on the Refuge or Threatening Service Lands:

A. Mutual Aid Requests

Take Resource Order information (Nature of Incident, Location and Assess to Fire, Resources Requested, Where, When, and to Whom they are to Report, Radio Frequency, and Name of IC)

Notify Project Leader and get approval for the Dispatch.

Dispatch requested and/or approved resources

Notify Requestor of what resources were dispatched and give an estimated time of arrival

Remain on duty until relieved or released.

B. Interagency Dispatch Request

Take Resource Order information (Name of Incident, Location and Assess to Fire, Resources Requested, Where, When, and to Whom they are to Report, Travel Instructions, Resource Order Number and Request Number, and Agency responsible for incident)

Inform requestor that you will check with Project Leader to determine availability of requested resources.

Notify Project Leader and get approval for dispatch

Call the requestor back within 1 hour and inform him of what resources were dispatched and provide an estimated time of arrival at the reporting location.

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>			

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

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

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			

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	

			P	I	R	W	F	W
			R	N	E	E	I	F
			E	C	S	A	R	S
			P	I	O	T	H	A
			A	D	U	R	E	B
			R	E	R	C	R	E
			E	N	E	E	F	H
			D	T	C	R	O	A
			N	P	A	F	V	V
			E	R	V	O	I	A
S	I	A	R	O	L			
S	O	I	E	R	I			
L	R	L	C	P	D			
E	I	A	A	R				
V	T	B	S	O				
E	I	I	T	J				
L	T	L	I	E				

Date	Time	By						

If WFSA is no longer valid, a new WFSA will be completed!

VIII. Objectives

Final Review

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

By: _____
(Agency Administrator(s))

A GUIDE FOR ASSESSING FIRE COMPLEXITY

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

Use of the Guide:

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

GLOSSARY OF TERMS

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

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

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

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

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

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

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

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

FIRE COMPLEXITY ANALYSIS

A.	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** _____

ATTACHMENT 1 - DELEGATION OF AUTHORITY

Sand Lake National Wildlife Refuge
Columbia, South Dakota

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

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

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

My specific considerations for management of this fire are:

1. Ensure the safety of firefighters, visitors, and neighbors.
2. Protect private 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 Refuge's aesthetic values.
5. Restrictions for suppression actions are no earthmoving equipment (dozers, discs, plows, graders) without approval of the Project Leader.
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.

Project Leader

Date

APPENDIX I: COMPLEXITY

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.

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

APPENDIX J: RECOMMENDED FIRE MONITORING STANDARDS

REGION 6

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

Planning and Preparation

Environmental Conditions Prior to the Burn

___ Photo Points Established

___ Fuel

___ Model(s)

- ___ Loading (By Size Class)
- ___ % Cover (Type/Model)
- ___ Continuity
- ___ Crown ratio
- ___ Depth of Fuel Bed
- ___ Other

- ___ Air Temperature (Maximum - Minimum to develop trends)
- ___ Relative Humidity (Maximum - Minimum to develop trends)
- ___ Wind Speed and Direction (Eye-level/20 Foot)

- ___ Fuel Moisture
 - ___ Dead Fuel Moisture (Use of Fuel Sticks and/or Drying Ovens highly recommended)
 - ___ Live Fuel Moisture (Fuel Models 2,4,5,7,10)
- ___ Soil Moisture (Dry, Moist, Wet)

___ Drought Indicator (Track One or More)

Execution

Environmental Conditions During the Burn

____ Date/Time

____ Air Temperature (Every 30 minutes)

____ Relative Humidity (Every 30 minutes)

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

____ Cloud Cover

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

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

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

Fire Behavior

____ Flame length (Head, Flank, Backing)

____ Rate of Spread (Forward, Flank, Backing)

____ Resistance to Control

____ Spotting Distance

Smoke/Air Quality

____ Mixing/Dispersion (Good, Fair, Poor)

____ Trajectory of Column (Surface/Upper Level)

____ Duration (Active Burning/Smoldering)

____ Problems

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

Post Burn

First Order Fire Effects

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

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

APPENDIX K: FITNESS TESTING