KOYUKUK AND NORTHERN UNIT INNOKO NATIONAL WILDLIFE REFUGE

FIRE MANAGEMENT PLAN

May 2005

REVIEW AND APPROVALS

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Prepared by	Date
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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF EXHIBITS IN APPENDIX

Appendix

A. Alaska Interagency Wildland Fire Management Plan.

B. Enabling Legislation.

C. Key Points of the National Fire Plan, 2001 Federal Fire Policy Guiding Principles, A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy and Implementation Plan and U.S. Fish and Wildlife Service – National Wildlife Refuge System Wildland Fire Management Program Strategic Plan 2003-2010 (November 2003 Draft).

D. Decision Criteria Record.

E. Wildland Fire Situation Analysis (WFSA).

F. Federal Interagency Wildland Firefighter Medical Qualification Standards Introduction.

G. Alaska Enhanced Smoke Management Plan October 2003.

H. Wildland Fire Use Management.

I. Prescribed Fire Plan Format.

J. Prescribed fire qualifications.

K. AWFCG Fire Effects Group Monitoring Data List.

L. Contact List.

M. Fire Cache Equipment.

N. Incident Complexity Analysis.

O. Prescriptive Criteria for wildland fires managed for resource benefit.

P. Hauling Chart.

Q. Minimum Requirement Decision Guide.

R. Koyukuk and Northern Unit Innoko Fire Regime and Condition Class.

S. Wildland Fire Use Decision Matrix.

T. Fire Surveillance Form.

U. Koyukuk Preparedness Plan.

ACRONYMNS

ADEC = Alaska Department of Environmental Conservation
ADF&G = Alaska Department of Fish and Game
AIWFMP = Alaska Interagency Wildland Fire Management Plan
AFS = Alaska Fire Service
AMR = appropriate management response
ANILCA = Alaska National Interest Land Conservation Act
AWFCG = Alaska Wildland Fire Coordinating Group
BIA = Bureau of Indian Affairs
BLM = Bureau of Land Management
BTU = British thermal unit
BUI = buildup index
CCP = comprehensive conservation plan
CDI = Canadian drought index
CFFDRS =Canadian Forest Fire Danger Rating System
DC = drought code
DM = departmental manual
DMC = drought moisture code
DOF = (State of Alaska) Department of Forestry
EA = environmental assessment
EFF = emergency firefighter
EIS = environmental impact statement
FFM = fine fuel moisture
FFMC = fine fuel moisture code
FMO = fire management officer
FMP = fire management plan
FMU = fire management unit
FRCC =fire regime and condition class
FY = fiscal year
IQCS = Incident Qualifications and Certification System
MAC = Multi-Agency Coordination
MMA = maximum manageable area
NEPA = National Environmental Protection Act
NFFL = Northern Forest Fire Laboratory
NFDRS = National Fire Danger Rating System
NWR = National Wildlife Refuge
OAS = Office of Aircraft Safety
RH = relative humidity
Service = U. S. Fish and Wildlife Service
TES = threatened, endangered and sensitive (species)
WFIP = Wildland Fire Implementation Plan
WFSA = Wildland Fire Situation Analysis
WR = wilderness review

I. INTRODUCTION

A. PURPOSE OF THE FIRE MANAGEMENT PLAN

The purpose of the Koyukuk and Northern Unit of Innoko Fire Management Plan (FMP) is to describe the fire management activities that will occur on the Koyukuk and Northern Unit of Innoko National Wildlife Refuges (Refuge). The FMP provides the framework for all Refuge fire management decision-making and specifies the uses of fire which are consistent with Refuge goals and objectives. Once the FMP is approved, it becomes the authority for the expenditure of fire funds. U.S Fish and Wildlife Service (Service) policy requires all refuges with vegetation capable of sustaining fire to develop a fire management plan. The FMP describes the relationship to land management goals and fire policy, wildland fire management strategies and components, organization and budget, and monitoring and evaluation. An approved FMP is also a prerequisite to conducting prescribed burning and wildland fire use activities.

B. ACHIEVING LAND AND RESOURCE MANAGEMENT OBJECTIVES

This FMP will help achieve land and resource management goals and objectives as defined in the Koyukuk and Northern Unit of Innoko National Wildlife Refuge Comprehensive Conservation Plan, Environmental Impact Statement, and Wilderness Review - Final, October 1987 (CCP/EIS/WR), the Alaska Interagency Wildland Fire Management Plan 1998 (AIWFMP), the National Fire Plan 2001 and the Healthy Forests Restoration Act 2003.

C. COMPLIANCE

As required by the National Environmental Protection Act (NEPA), the Service must assess environmental effects of specific Service actions. Generally fire management activities are categorically excluded (40 CFR 1508.4 and 516 DM 2 Appendix 1). For each action a NEPA Compliance Checklist and an Environmental Action Statement shall be completed, along with supporting documentation. Based on this initial assessment the action will either meet the criteria for a categorical exclusion or require an Environmental Assessment (EA) or an Environmental Impact Statement. Before taking any fire management action, an EA or EIS is prepared for all actions not categorically excluded.

Fire management activities were analyzed in the Koyukuk and Northern Unit Innoko NWR CCP/EIS/WR and the FMP is tiered to that document. Operational plans developed and implemented are usually categorically excluded from further NEPA analysis when there is an approved CCP, the CCP has been through the NEPA process and burning is done for habitat improvement or prevention purposes. Fire management activities will comply with all applicable regulations including but not limited to Section 106 of the National Historic Preservation Act of 1966, Section 7 of the Endangered Species Act (as amended in 1973), Section 810 of the Alaska National Interest Land Conservation Act of 1980 (ANILCA), and Section 118 of the Clean Air Act (as amended in 1990).

D. COLLABORATIVE PROCESS

The FMP was prepared in cooperation with Refuge neighbors and interested parties. Personal contacts and correspondence, radio announcements and e-mail were among the methods used to contact interested parties. Various village Elders, the Alaska Department of Fish and Game and

the Bureau of Land Management Alaska Fire Service (AFS) contributed to the development of the plan. The plan was also developed in association with many Fish and Wildlife Service (Service) biologists, managers and fire management officers.

B. DESCRIPTION OF THE REFUGE

The Koyukuk and Northern Unit of the Innoko National Wildlife Refuges (NWR) are part of the fire dependent Interior Alaska boreal forest ecosystem. Fire is the major recycler of nutrients in the arctic and sub arctic region. Fire is among the most important dominant natural influences in determining the health and vigor of the Refuge's ecosystems. Interior Alaska's boreal forest ecosystem is part of the Sub arctic Division (shown in Figure 1) that is bordered by the Brooks Range to the north, the Alaska Range to the south, and coastal tundra to the west. Defined as the upper drainage of the Yukon and Kuskokwim Rivers, it is bordered on the west by the Yukon Delta NWR, and on the east by the Rocky Mountains in Canada. This vast area covers over 220,000 square miles. The natural forces of flooding and wildfire strongly influence this area. This ecosystem is biologically diverse and contains productive fish and wildlife habitat.

This plan applies to an area covering 5.251 million acres including the 400,000 acre Koyukuk Wilderness (see Figure 1. Map of the Koyukuk and Northern Unit Innoko NWR). The Refuge lies in west central Alaska 300 air miles northwest of Anchorage. The Koyukuk NWR begins six miles north of Galena and extends north about 90 miles, and east to west about 130 miles. The Northern Unit of the Innoko NWR (also referred to locally as the Kaiyuh Flats) begins approximately one mile southwest of Galena and south of the Yukon River. The refuge extends about sixty miles to the southwest.

The Koyukuk Refuge is comprised of an oblong flood plain basin surrounded by high hills. The basin includes numerous lakes, marshes, rivers and streams. The vegetation types include treeless bogs, open black spruce forests, closed black spruce forests, white spruce stands along riparian areas and south-facing slopes and mixed spruce and hardwoods (white spruce, quaking aspen, balsam poplar, willow and some alder). Alpine tundra exists above the tree line (which is approximately 2,000 ft. in elevation). The refuge has a 400,000 acre designated wilderness area (Koyukuk Wilderness) surrounding the geologically unique Nogahabara Sand Dunes. Except for the dune area the major soil types are Inceptasols (mineral soils that have one or more horizons in which mineral materials have been weathered or removed and that are only beginning to develop a distinctive soil profile). Permafrost is present and discontinuous. Permafrost-free soils occur on the south facing slopes, raised moraines and along the major rivers.

The Northern Unit Innoko NWR contains 751,000 acres of lowlands bordered on the southwest by the Kaiyuh Hills. Swamp, bogs, ponds, sloughs and lakes dominate the entire basin. The Yukon River borders the entire northern and western boundaries of the parcel.

The Koyukuk basin has a continental climate with short warm summers and long cold winters. The summer sun provides almost continuous radiation, heating the basin which is protected from coastal winds by the surrounding hills. During mid- winter the sun stays above the horizon for less than four hours. The valleys become cold sinks and temperatures are among the coldest on the continent.

Temperature extremes range from near -70º F to the high 90's º F. Galena, Alaska has a mean annual temperature of 25.2º F, a July mean of 60.1º F, and a January mean of -9.3º F. The frost-

free period is normally about 100 days. Ice is present in the lakes from early October to mid May. Precipitation averages 14.6 inches, the bulk being in the form of rain during July, August and September.

The Koyukuk NWR and the Northern Unit of the Innoko NWR are not solid blocks of federal land. The boundaries encompass a complex pattern of Native corporation, State, private and federal lands. Non-federal lands within the Refuge boundaries total about 1.33 million acres. This acreage will undoubtedly change as various state, corporate and private land inholdings are finalized.

The major public use of the Koyukuk basin is subsistence. Approximately 2,000 people live near or within the boundaries of the Refuge, mainly in the villages of Galena, Koyukuk, Nulato, Kaltag, Huslia and Hughes. A few people live on Native allotments or on allotments or on homesteads. Most residents participate in some subsistence activities.

Three Day Slough is located in the western center of the Koyukuk Refuge just south of the Nogahabara Sand Dunes. The area has one of the highest moose densities in Alaska. Heavy browsing and over-maturity of willow may limit future food availability in this area. Prescribed fire could be used to stimulate willow regrowth. There is great potential for the combined effects of fire and flooding to enrich the natural habitat.

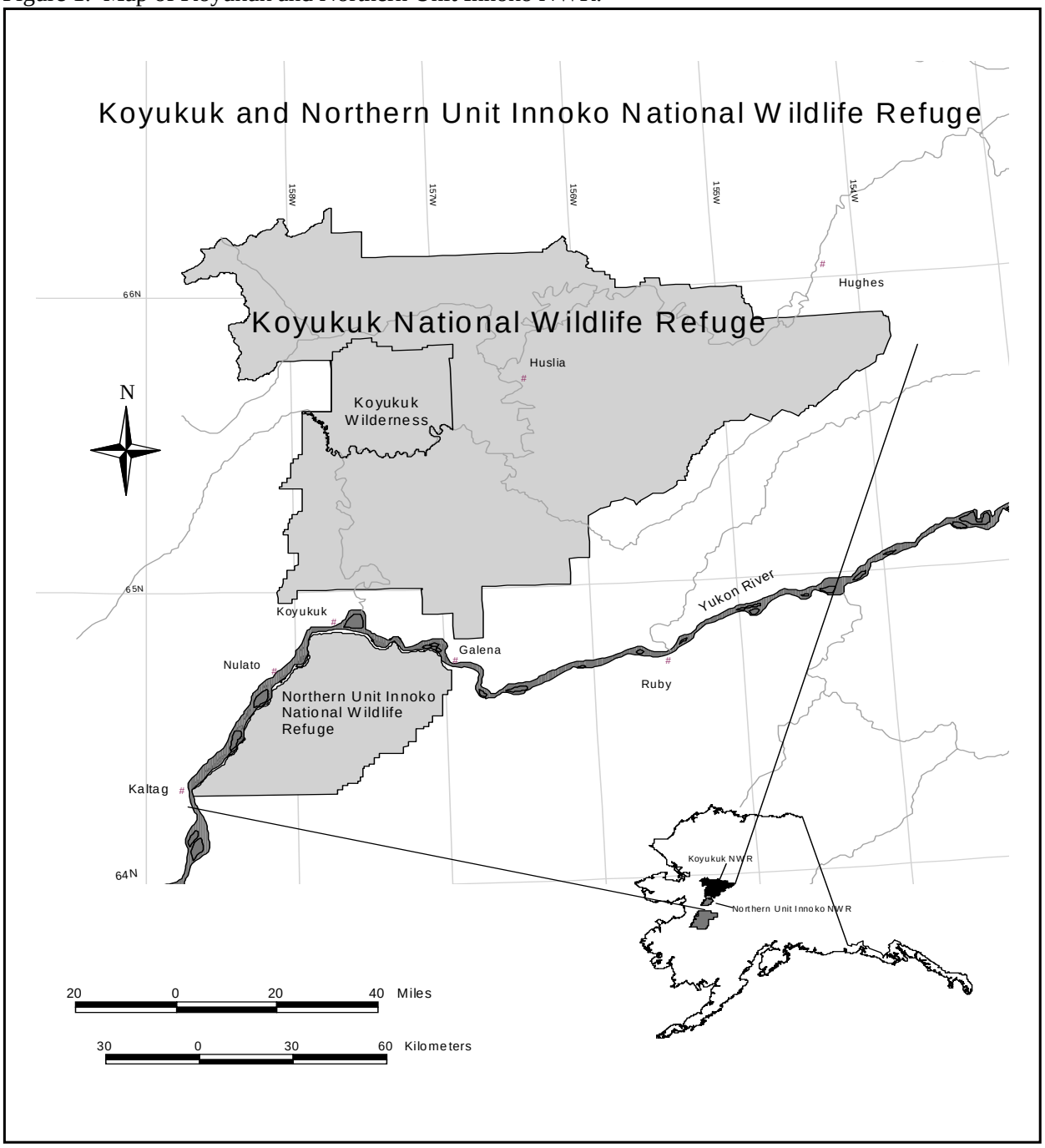
The source of water for the Koyukuk valley comes from geologic limestone formations in the Brooks Range that may contribute to the region's high productivity. In the spring ice jams often cause the river to flood out into the lowlands. The high water tends to flush out the ponds, bogs and sloughs while nutrients tend to wash in. Moving accumulations of ice tend to scour the islands and river banks. This activity usually results in an annual regrowth of willows.

C. GENERAL REFUGE FIRE INFORMATION

Historical/ecological role of fire

Fire is an integral part of the ecosystem and has caused plants and animals to adapt to fire over the eons. Climate change, especially in the interior, may alter some of these fire relationships. Both black and white spruce depend on intense ground fire to clear organic layers and expose a fertile seed bed. Black spruce is dependent on stand-replacement fires to release the seeds from its semi-serotinous cones in its canopy that would otherwise remain closed. More fundamentally, fire plays a key role in the regulation of the permafrost table throughout all Interior Alaska ecosystems. Without fire, organic matter accumulates, the permafrost table rises and the ecosystem productivity declines. Vegetation communities become less diverse and productivity of wildlife habitat decreases. Fire rejuvenates these ecosystems. It removes some of the insulating organic matter and elicits a warming of the soil and an increased active layer depth. Nutrients are added as a result of combustion and by increased decomposition rates.

Figure 1. Map of Koyukuk and Northern Unit Innoko NWR.



Before an active fire suppression program was implemented in Alaska, about 2.5 million acres burned annually. Today, after the evolution of fire control methods, the annual burn has dropped to an average of less than a million acres. Despite this reduction in acres burned annually, large high intensity fires remain a frequent occurrence. This is in part due to a conscientious effort on the part of AWFCG members to allow wildland fires to burn as a natural ecosystem function in some areas and to the inaccessibility of many fires.

Lightning causes ninety-five percent of Interior Alaska wildfires. Lightning activity usually begins the first week in June and may continue until the end of July. The main window of wildland fire activity is from the end of May to mid-July. August tends to be the wettest month, but a drought can make August a active fire month. From August on new lightning starts are rare. Human-caused fires are the exception but can occur from May through October.

The primary local attitude towards fire is that they are undesirable (from a timber loss standpoint) and should be extinguished. The early fire fighting concepts of putting out all the fires and fires are undesirable have influenced the local view of the role of wildland fire. Firefighting is one of the main sources of income for many of the residents of remote villages. It will take some time to educate the local public of the ecological benefits of wildland and prescribed fire.

Refuge fire history

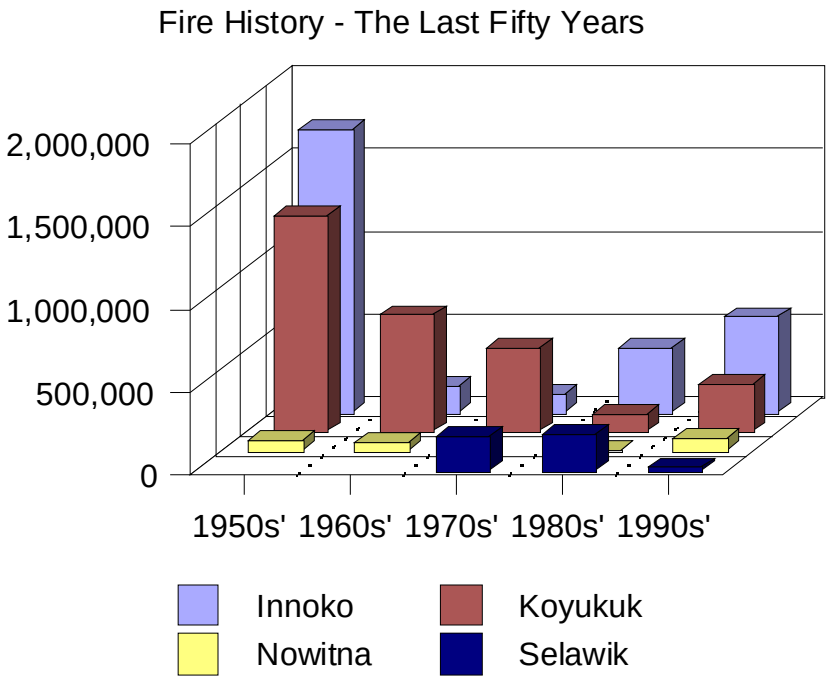
The chart on the following page indicates that the annual acreage burned in Alaska dropped from around 2.5 million acres to about one million since modern suppression efforts began after World War II.

Figure 3 gives the location of all fires by decade occurring on the Refuge since 1950. Approximately 18 % of the Refuge burned during the last half century. This roughly equates to a 275 year cycle for fire occurrence. Prescribed fire has not played a significant role historically.

Fire Frequency and Behavior

Interior Alaska appears to experience a widespread, serious fire season once or twice every decade. Extreme fire seasons occur when lightning starts, drought, sustained high winds, low relative humidity (RH) and low fine fuels moisture (FFM) occur simultaneously.

Drought is an important factor because the organic mat or active layer which covers the soil dries out to an extensive depth. Any ignition becomes difficult to control even when surface indicators (wind, RH and FFM) are not significantly low. When conditions are as described above, it only takes a few other factors to move into a serious fire danger level. Once a drought is in effect and dries out the organic mat, it may require six inches of rain over a period of two or more days to thoroughly saturate the entire mat again. Canadian fire scientists have investigated the drought factor. Their system is called the Canadian



Drought Code Indices are a valuable indicator for fire managers to use as an indication of what to expect for fire severity.

Fire behavior can range from a creeping fire to a very active crowning fire. Most fires will exhibit a range of fire behavior during their duration as different variables such as topography, aspect, fuel type, continuity of fuels, time of day, fuel moisture content, period since last rain, presence or absence of wind and current weather enter into the picture.

The climate and vegetation of the boreal forest produce high intensity crown fires that have created some of the largest fires in the world. Alexander and Cole (1994) discuss fire behavior in spruce forests under a range of environmental conditions and present a "hauling chart" of fire intensity and fire potential. The Alaska Fire Suppression Field Handbook, or "Handy Dandy" (BLM May 1997) also contains valuable information on fire behavior. Much of the following discussion on fire behavior is from Van Wagner (1983).

Fuels can be divided into four types: surface fuels, deep organic layers, down/ dead trees/branches and live foliage. Surface fuels are composed of dead foliage, litter, mosses/ lichens and fine shrubs. Surface fuels to a large extent determine whether a fire will spread or not. Deep organic layers are made up of partially decomposed plant parts. Although a portion of this layer may burn during the flaming front passage, much of it burns later in a smoldering fire. Down woody fuel loads may be heavy and contribute to

crowning and flare-ups. Live foliage is highly flammable in some species. Crown fire behavior depends on the amount of live foliage present, its density, moisture content and flammable wax, oil, and resin content. Ignition usually occurs when there has been no rain for one to two weeks and on days with low relative humidity, high temperatures, high wind and lightning.

There are five main types of fires: smoldering fires in deep organic layers; surface backfires (burning against the wind); surface head fires (burning with the wind); crown fires (advancing as a single front); and high-intensity spotting fires. Crown fire development depends on height of the canopy layer above ground, foliage density in the canopy, canopy leaf moisture content, initial surface fire intensity, and rate of spread after crowning.

Vegetation types and fire effects

Vegetation types found on the Refuge have been assigned to fuel type models from the Northern Forest Fire Laboratory (NFFL), National Fire Danger Rating System (NFDRS), and Canadian Forest Fire Danger Rating System (CFFDRS, see Table 1). The Canadian system can predict not only rate of spread and flame length, but also likelihood of ignition, crown involvement, crown fire effect on rate of spread, fuel consumption, and fire shape and growth rate. The hauling chart (Appendix P) relates fire behavior outputs and resistance to control. The fire behavior likely to be encountered in each fuel type is discussed below (from BLM 1995, USDI 1982, and USFWS 1995). The CFFDRS will be used for most future discussions because it is the system that is used for fire behavior prediction by the suppression agencies in Alaska.

Figure 3. Refuge Fire History since 1950.

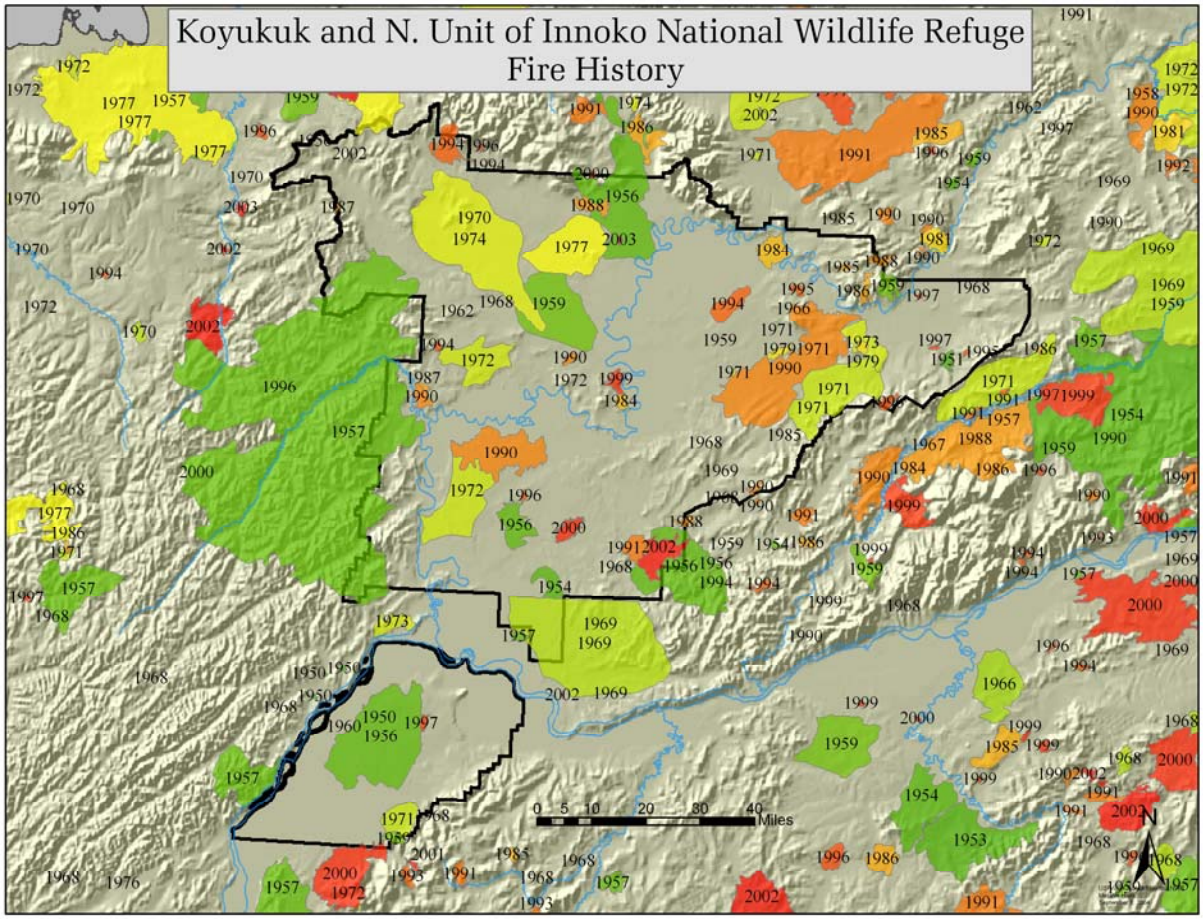


Table 1. Fuel models for fire behavior prediction and fire danger rating for vegetation types of the Koyukuk and Northern Unit Innoko NWR. From the Canadian Forest Fire Danger Rating System (CFFDRS) (see Stocks and others 1989), the Northern Forest Fire Laboratory (NFFL--Anderson 1982), and National Fire Danger Rating System (NFDRS--Deeming and others 1978).

Vegetation Type	CFFDRS Behavior/ Danger Model	NFFL Fire Behavior Model	NFDRS Fire Danger Prediction Model
Black Spruce Forest	C-2, C-1	custom black spruce[1]	Q
White Spruce Forest	C-2	8 or 10 (heavy downed fuel)	H
Mixed Spruce/ Hardwood Forest	M-2 (can set amount of spruce)	8 (few spruce) or 9 (moderate spruce)	R
Hardwood Forest	M-2	8	R
Shrub lands/Brush	M-2	2 (grass w/ ericaceous shrubs) or 5 (dwarf ericaceous shrubs) or 6 (heavy dead woody load)	B
Marsh Grasses	O-1	3	N
Tundra	O-1	1 (tussocks < 1 foot high) or 3 (tussocks > 1 ft.)	S

[1] Also see discussion in a. below and Norum (1982)

Following are Fuel Type descriptions as classified by the CFFDRS fuel type system for fuels on the refuge:

Black Spruce (C-1 Spruce Lichen Woodland, C-2 Boreal Spruce): Black spruce woodlands usually occur on poorly drained permafrost sites. Stunted white spruce stands resemble and are commonly called black spruce stands. The ground cover dries rapidly and is quite flammable. It is composed of mainly feather mosses, lichens and ericaceous shrubs such as blueberry, Labrador tea and low-bush cranberry.

Fires in black spruce are carried by surface fuels and generally burn with relatively high intensities and slow rates of spread. Ignition of the tree crowns (torching) will occur just behind the flaming fire front if flame lengths are high enough (two feet or more) to ignite the lower branches. Lower branches often grow right into the mossy ground cover. Because black spruce usually grows on poor sites, the trees are commonly moisture or nutrient stressed. This condition, coupled with the fact that surface fuels respond quickly to changes in relative humidity, causes this fuel type to be flammable through a longer part of the fire season than any other fuel type. Areas where fire has only partially

burned surface fuels are susceptible to re-burns. Dead and down fuel loads are about two tons/acre. After 30-40 years, these sites have accumulated sufficient amounts of continuous fuels to be able to sustain large fires again.

Spotting by aerial firebrands from torching trees is common, which increases the overall rate of fire spread. Instability of the atmosphere, surface winds and fuel moisture of receptor fuels are critical factors influencing the amount and distance of spotting.

Norum (1982) correlated fire behavior with NFFL fuel models. Rate of spread was generally 1.2 times that predicted by model 9 (hardwood litter). Flame length was approximated by model 5 (short brush).

White Spruce(C-2 Boreal Spruce): These sites usually occur on warm, permafrost-free, well-drained sites along river corridors and on south facing slopes. White spruce can grow quite large in size, up to about 130' tall and three foot in diameter. Paper birch and balsam poplar are often mixed in spruce stands. Spruce stands may be open and park-like or have a dense shrub layer (often alder).

White spruce fires are generally slow spreading and burn with lower intensities than in black spruce. Smoldering fires in the root systems are common. Increased canopy cover and shading tempers the response of fine fuels to changes in relative humidity. Ladder fuels are not as common except in young dense stands. Crowning occurs mostly under very dry conditions or in proximity to jackpots of dead fuels. Dead and down woody fuels generally range from four to eight tons/acre, but may be as much as three times higher.

Hardwoods and Mixed Spruce/Hardwood (M -2 Hardwood Forest): Aspen is most abundant on warm, well-drained sites, which often change into white spruce stands over time. Birch is most abundant on cooler, wetter sites, especially moist flat lands or east and west slopes. These habitats are often dominated by black spruce in later succession. Young hardwood stands are often dense with little understory development.

In mixed spruce-hardwood forests, fire intensity generally increases in relation to the amount of spruce in the stand. Pure hardwood stands often serve as natural fuel breaks. Because surface fuel loading is light and composed primarily of leaf litter, fires in this fuel type are usually slow spreading and burn with relatively low intensities. Fuel and soil moisture are relatively high in this type because of shading and a compacted leaf litter layer. Crown fires in spruce stands will normally drop to the forest floor when they encounter a hardwood stand.

Under very dry conditions or in the spring before green-up, mixed hardwood stands may burn with fairly high intensity and carry a crown fire. Smoldering fire in root systems and dead logs is common. Dead and down fuel loads generally range from five to 14 tons/acre and increase with stand age.

Brush and Shrublands (M-2 Hardwood Forest): In wet sites or where surface fuels are sparse, fire will not carry in this fuel type. When fires do burn, the rate of spread and fire intensity depend on the size classes and amount of fuel present. The presence of grasses

and sedges greatly increases rate of spread. Ericaceous shrubs (such as shrub birch, crowberry, low-bush cranberry and Labrador tea) contain combustible chemicals that increase fire intensity. Significant amounts of dead woody material can contribute to high fire intensities. Dead and down fuel loads are generally around four tons/acre, but are much less in small brush and may be up to 20 tons/acre in decadent stands of large willows.

Tundra and Marshes (O-1a Matted Grass or O-1b Standing Grass): The term tundra means treeless. Basically these are arctic and sub arctic grasslands. Substantial accumulations of fine fuels (cured grasses and sedges) can result in fires with high rates of spread and high intensities, especially in windy conditions. Tussocks are pillars of grass or sedge. They vary from about three inches to about four feet in height. Tussocks increase control difficulties. Taller tussocks correspond with higher fire intensities and rates of spread. Some types of tundra rarely burn because moist conditions and sparse fuels create slow rates of spread and low intensities. These types include low shrub, mesic graminoid/herbaceous, wet sedge, and dryas (mountain avens) dwarf shrub tundra.

Figure 5 depicts refuge area land cover/fuel models using above outlined fuel descriptions. Table 2 documents the acreage by Fuel Type/Land Cover type for all lands in the Refuge, both federal and private.

Annual fire cycle

The first phase of a typical fire season begins in late April or early May when the snow cover disappears. It ends in late May or early June when green-up begins. During this transition period fires are generally man-caused. These fires usually burn with low intensity due in part to high relative humidity recoveries at night, moderate daytime temperatures and high soil and duff moisture. However, wind and low humidity can combine to produce higher intensity fires. Black spruce may be moisture stressed and have relatively low live fuel moistures at this time of year, promoting active crown consumption. If spring fires are not suppressed or adequately monitored, they can smolder through this period and flare up later in the season when fuels are even drier.

The second and third phases of the annual fire cycle correlate with lightning activity and limited humidity recovery at night due to continuous daylight. Phases two and three are the heart of the fire season. The second phase begins after green-up in June and extends until late in the month. Most of the fires that occur during this period are lightning caused. These fires generally do not develop as great intensity as the third phase fires, but if the weather is hot, dry and windy, problem fires can result. The third phase runs from late June through the end of July. This is normally the period of highest fire activity. If the fuels have dried out through the second phase into this phase, fire rates of spread and intensities will be high. Resistance to control for fires that are actively suppressed may be high, and indirect attack may be the only viable option on those fires. Low-pressure weather systems bringing in rain usually dictate how long this phase lasts.

The final phase occurs from the beginning of August through early September. Lightning activity is rare and most of the fire starts are man-caused, often related to hunting, fishing and other subsistence or recreational activities. Fires starting during this phase normally

burn with lower intensities, due to increased humidity recovery at night. Problems from fires starting during this phase are infrequent, and are generally associated with wind events.

Ecological impacts of fire suppression

The ecological impacts of fire exclusion in the area are unclear due to the short history and limited activity of effective fire suppression on the Refuge. Because fire has affected a significant portion of the Refuge during the past 50 years, one can only assume - given our current level of understanding of fire ecology in the Interior - that fire's natural role on the landscape has not been drastically altered. Hazardous fuel buildup has occurred in some areas due to slow decomposition of organic matter. Whether or not this buildup is within the natural range of variability is not known. The Fire Regime and Condition Class (FRCC) map of the Refuge will be helpful in interpreting the ecological impacts – especially as that process becomes better defined over time. Currently the guidelines for interpreting FRCC are being developed for Alaska. Concern about fire exclusion applies mainly to the critical and full management options and to some degree to the modified management option. The overall effect of fire exclusion in these areas will be a shift from Condition Cass I to Condition Class II. What is not known at this time is how long that shift will take.

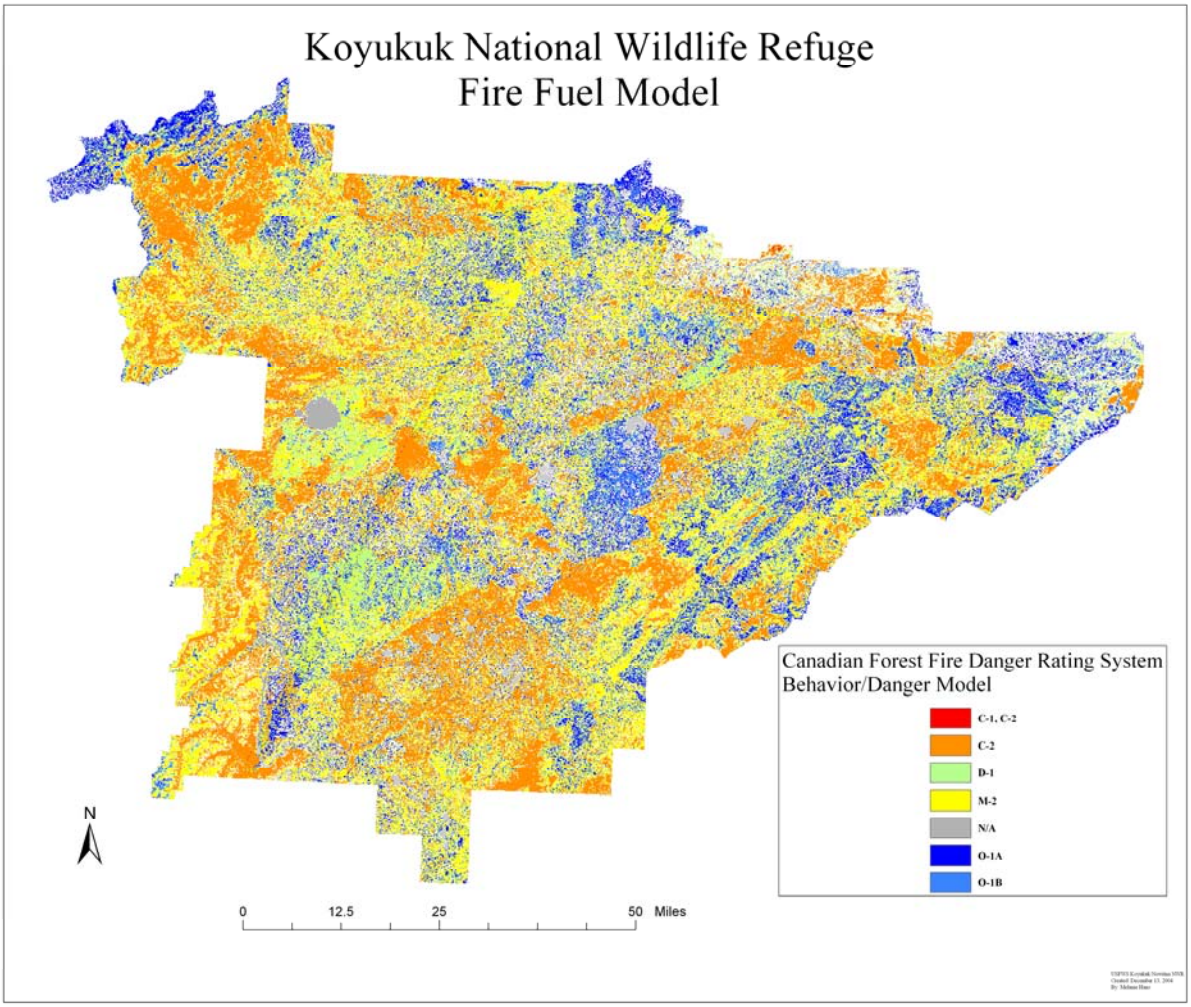
Some impacts (ground disturbance) have resulted from suppression activities. They have been documented on some Refuge fires and are usually associated with heavy equipment line construction or fire retardant. The greatest potential is for creation of erosion problems and permafrost thaw resulting from line construction activities and from retardant entering streams or lakes. This potential is prevalent throughout the Interior. Heavy equipment is no longer used on the Refuge for line construction and retardant formulations are now less hazardous to environment.

Economic importance

Participation in fire suppression activities has been and continues to be an important source of income for village residents. This participation is associated with the organized Emergency Firefighting (EFF) Crews involved in the suppression of large fires throughout the nation. EFF crews are maintained and trained by AFS. They are available from the villages of Galena, Hughes, Huslia, Kaltag, Koyukuk, Nulato and Ruby. The EFF Crews can be hired to assist with Refuge prescribed burns.

Trapping activities on the Refuge can be disrupted by fire. Trapping in general is no longer the important source of income that it once was. There is some controversy surrounding the fire effects on trapping. Large catastrophic fires leaving little or no unburned inclusions have a long term negative impact on furbearers and consequently on trapping success (especially when trap lines within the burn cannot be relocated) due to the dispersal of furbearers. The eventual blow down of dead trees often results in a physical barrier to getting out on traplines.

Figure 3. Fuel Model Image of Koyukuk and Northern Unit Innoko NWR.



Archaeological/cultural/historic resources

There are several known prehistoric sites plus several hundred recorded place names mainly in the northern portion of the Refuge. Specific location information is available to the Fire Management Officer and Refuge Manager through the Regional Archaeologist for the protection of sites. This information should be referred to for every suppression response on the Refuge to avoid impacting any archaeological/cultural/historic site.

Refuge management decision impacts on fire management

Fire is an important disturbance process that creates and maintains a diversity of habitats on the Refuge. Consideration of this fact has resulted in the designation of a high percentage of the Refuge as Alaska Interagency Wildland Fire Management Plan limited and modified management option (see Appendix A pp. 24-32 for definition of options). In these areas wildland fires are allowed to burn unless they threaten human life or property.

From 1959 to 1979 fire suppression did occur on all land that eventually became National Wildlife Refuge land. What effect fire suppression has had on the natural fire regime is not well understood at this time.

II. RELATIONSHIP TO LAND MANAGEMENT PLANNING/FIRE POLICY

A. AGENCY FIRE/RESOURCE MANAGEMENT POLICY

Service wildland fire management policy is based on Departmental Manual, 620 DM 1-3. The following are not a comprehensive list of Department of Interior or Service policy but a list of those areas that generally affect all aspects of the fire plan and its implementation. It is our policy that:

1. ***Firefighter safety and public safety is the first priority of the Fire Management Program***.

2. Only **trained and qualified people** will conduct fire management duties.

3. **Trained and certified employees** will participate in the wildland fire management program as the situation demands.

4. We will conduct fire management planning, preparedness, wildland and prescribed fire operations, monitoring, and research on an interagency basis with the **involvement of all partners** when appropriate.

5. An **approved Fire Management Plan** must be in place for all of our lands with burnable vegetation.

6. We will integrate **fire, as an ecological process**, into resource management plans and activities on a landscape scale, across bureau boundaries, based upon the best available science.

7. We will use **wildland fire** to meet identified resource management objectives when appropriate and the Fire Management Plan contains such direction.

8. We will employ **prescribed fire** whenever it is an appropriate tool for managing our resources and to protect against unwanted wildland fire whenever it threatens human life, property and natural/cultural resources.

9. Our Regions will provide **safe, cost-effective fire management programs** in support of land, natural, and cultural resource management plans through appropriate planning, staffing, training, and equipment.

10. Management actions we take on wildland fire will consider firefighter and public **safety**, be **cost effective**, consider **benefits** and protection **values**, and be consistent with **natural and cultural resource** objectives.

11. Refuge staffs must **work with local cooperators** and the public to prevent unauthorized ignition of wildland fires on our lands.

U.S. Fish and Wildlife Service Manual, 621 FW 1, Policy and Responsibilities for Fire Management states: "*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.*"

B. RELATIONSHIP TO ENABLING LEGISLATION

The statutes authorizing the Service to engage in wildland fire management and providing the means for managing wildland fires on and/or adjacent to refuge lands are found in Appendix B.

C. PURPOSE OF THE REFUGE

The Koyukuk and Northern Unit of Innoko National Wildlife Refuges were established in 1980 as a result of the Alaska National Interest Lands Conservation Act (ANILCA).

ANILCA. SEC 302 (3) KOYUKUK NATIONAL WILDLIFE REFUGE--(B) The purposes for which the Innoko National Wildlife Refuge is established and shall be managed include--

(i) to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, waterfowl, waterfowl and other migratory birds, moose, caribou (including participation in coordinated ecological studies and management of Western Arctic caribou herd), furbearers and salmon;

(ii) to fulfill international treaty obligations of the United States with respect to fish and wildlife and their habitats;

(iii) to provide, in a manner consistent with the purposes set forth in paragraphs (i) and (ii), the opportunity for continued subsistence uses by local residences; and

(iv) to ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the refuge.

The Wilderness Act provides an additional refuge purpose : the Koyukuk Wilderness will be managed to secure an enduring resource of wilderness, to protect and preserve the wilderness character of the area, and to administer the area for the use and enjoyment of the American people in a way that will leave it unimpaired for future use and enjoyment as wilderness.

Major purposes for which the Innoko Refuge was established and shall be managed were set forth in Section 302 (3) of ANILCA. Only the first purpose differs from those for the Koyukuk Refuge. This purpose is:

(i) to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, waterfowl, peregrine falcons, other migratory birds, black bear, moose, furbearers, and other mammals and salmon.

Special values to be protected include as listed in the CCP/EIS/WR (p. 35):

1. Early successional habitats. Maintain these habitats by allowing wildfires to burn in areas where other values are not jeopardized.

2. Diverse system of wetlands. Allow natural processes, such as fire, to occur in the wetlands.

3. Peregrine falcon habitat. Protect known peregrine falcon nesting sites.

4. Nogahabara Sand Dunes. Do not impair wilderness qualities/experience.

5. Subsistence harvest on the Koyukuk and Northern Unit of Innoko Refuges. Provide the opportunity for continued subsistence use by local residents.

6. Western Arctic caribou herd. Protect critical caribou habitat.

D. LAND AND RESOURCE MANAGEMENT PLAN DIRECTION

Federal and State law, Service policy and principles of sound resource management govern the management of the Refuge. The common management directions affecting fire management include:

1. Coordinating management with other resource management agencies and cooperating with owners of refuge inholdings and adjacent lands.

2. Working with the village corporations on the use and development of village lands.

3. Cooperating with the ADF&G in ensuring that fish and wildlife populations and habitats necessary to conserve natural diversity are maintained.

4. Ensuring that water quality and quantity, air quality and visual resources are protected in compliance with federal and state laws and regulations.

5. Ensuring that all significant historic, archaeological, paleontological and cultural resources on the Refuge are protected and managed in accordance with federal and state laws.

6. Cooperating with ADF&G and other agencies in ensuring that subsistence opportunities are maintained by assessing potential impacts of proposed uses or activities, conducting research, enforcing regulations and monitoring fish and wildlife populations and uses.

7. Maintaining opportunities for wildlife and wildland recreational activities on the refuge.

8. Maintaining current management of the Koyukuk Wilderness area in accordance with the Wilderness Act of 1964 as modified by ANILCA.

The management direction for the CCP/EIS/WR Preferred Alternative includes (pp. xii-xiii):

1. Fish and Wildlife.

    a. Maximize protection of natural diversity of fish and wildlife populations and habitats in their naturally occurring states on the refuge.
    b. Continue to gather information on refuge resources in order to make appropriate management decisions.
    c. Maximize protection of wetlands and the waterfowl populations they support.

2. Subsistence.

    a. Maintain existing subsistence opportunities throughout the refuge.

3. Wilderness.

    a. No additional refuge lands would be recommended for designation as wilderness, but management would continue to be directed at maintaining the pristine nature and wilderness values of the refuge. The existing Koyukuk Wilderness would continue under wilderness management.

4. Public Use and Access Management.

a. Maintain existing opportunities for hunting, fishing, and other recreational uses and provide opportunities for scientific research and wildlife observation throughout the Refuge.

III. WILDLAND FIRE MANAGEMENT STRATEGIES

A. GENERAL MANAGEMENT CONSIDERATIONS

Wildland fires occurring on the Refuge will either be suppressed or they will be placed under surveillance, monitored and managed as wildland use fires. The CCP/EIS/WR on page 140 states: "*Fires will generally be allowed to burn naturally where not endangering life or property.*" The Refuge will help to improve federal, state and local firefighting resources capability and readiness to protect communities from wildland fires. Efforts will be taken to reduce hazardous fuels where needed to protect human life and property and/or areas of special concern. The guiding principles of ecosystem management allow lightning-ignited wildland fires to burn providing they do not threaten human life or property and/or items of special concern.

The Alaska Fire Service - Bureau of Land Management (AFS) provides fire suppression support for all refuge land, but the Service is still responsible for what happens on refuge lands. Upon notification of a fire, the Fire Management Officer will consult with the Refuge Manager or Acting Refuge Manager regarding special concerns and specific direction. Together the AFS and the Refuge will determine an appropriate management response.

When appropriate or needed, representatives from the Louden Village Council Inc., Gana A' Yoo Ltd., Tanana Chiefs Conference, Bureau of Indian Affairs, Alaska Department of Forestry and/or the local Alaska Department of Fish and Game staff will be consulted for input/concerns regarding suppression or wildland use fire strategies.

Upon receiving the detection report from AFS, a decision criteria check list and a Stage I of the Wildland Fire Implementation Plan (WFIP) will be completed. See the Service Fire Management Handbook Chapter 3.3 for the instructions on how to complete Stage I of the WFIP.

Wildland fire suppression

All natural-caused fires occurring in "critical", "full" or "modified" (until the conversion date) management options will be suppressed through the selection and implementation of an Appropriate Management Response (see Appendix A pp. 18-32 for a description of each option). Fires occurring in the limited management option will be managed as wildland use. Appendix A. Alaska Interagency Wildland Fire Management Plan pages 18-32 contains a description of the fire management options. In selecting the suppression appropriate management response, the Incident Commander and the Agency Administrators must consider firefighter and public safety, cost effectiveness, and impact of suppression activities as well as protection of resources and values to be protected. Accordingly, suppression appropriate management responses may range from aggressive initial attack to surveillance/monitoring and/or indirect containment. Intensity of suppression will depend upon fire protection level and other factors.

Wildland fire use

Certain natural ignitions within the Refuge may be used for resource benefit (e.g., managed for the purpose of maintaining fire's natural role in the landscape, reducing hazardous fuel loads and/or improving wildlife habitat). Wildland fire use will be considered for all natural ignitions detected within the Refuge's Limited Protection Fire Management Unit (FMU) and in Modified Protection FMUs after the conversion date, unless the Refuge Manager or designee (usually the Refuge Fire Management Officer) directs otherwise. Wildland fire use comprises an *alternative* response in the Refuge's Modified (prior to the conversion date) and Full Protection FMUs if initial attack has not been initiated and/or initial attack resources are not available. Wildland fire use may be implemented within these units by the Agency Administrator upon consultation with AFS and signing of the Decision Criteria checklist and development of a Stage I Wildland Fire Implementation Plan (WFIP).

A WFIP will be developed for all wildland fires that will be managed for resource benefit. The format in Exhibits 3-3-1 through 7 and 3-3-9 (see Appendix H or the Fire Management Handbook Chapter 3) will be utilized to produce the assessment. If the assessment indicates the fire can be managed for resource benefit, the WFIP is signed by the Refuge Manager or Acting Refuge Manager, resources will be assigned to manage the fire and the Refuge will take over management of the fire. If the assessment indicates the fire cannot be managed for resource benefit, then it will continue to be managed by AFS.

Wildland fire use will support the 10-Year Comprehensive Strategy goals of reducing hazardous fuels and restoring fire-adapted ecosystems. The 10-Year Strategy principles will be followed by 1) protecting communities, 2) collaborating with the AFS and Alaska Department of Fish and Game (ADF&G) in setting priorities, 3) establishing meaningful performance measures and 4) monitoring the fires before and immediately after they are out. Protecting human life will be the number one priority. Fire use priorities will be established immediately following the decision to manage a wildland fire as a wildland use fire. The AFS and ADF&G will both be consulted and together we will establish wildland fire use priorities and performance measures (wildland fire use objectives). A monitoring plan will be written within one to three days following the implementation of wildland fire use. Monitoring and surveillance are key components of Stages II and III of the WFIP. Each wildland use fire will be monitored on a daily basis (depending upon weather and the availability of surveillance personnel and aircraft) in order to determine whether fire performance measures/objectives are being met. Responsibility for fire surveillance can be shared with AFS providing AFS has available time, personnel and aircraft. AFS will be briefed daily on the status of each wildland use fire. All wildland use fires will strive to be fiscally responsible.

B. WILDLAND FIRE MANAGEMENT OBJECTIVES

In the past three years all federal agencies with wildland fire management responsibilities have been given specific direction regarding the goals of fire management. These goals are stated in the National Fire Plan, 2001 Federal Fire Policy Guiding Principles, A Collaborative Approach for Reducing Wildland Fire Risk to Communities and the Environment 10-Year Comprehensive

Strategy Implementation Plan and the U.S. Fish and Wildlife Service Wildland Fire Management Program Strategic Plan 2003-2010. Following is a summary of each plan's goals, key points and principles. The intent of these plans is to provide a unified direction and accountability. Appendix C outlines the key points of each of these documents.

Broad Refuge-level fire management goals

a. Manage wildland fires to ensure a natural fire regime on the Refuge and to protect life, property, and other resources. *This goal supports **NFP** key point 3; **Guiding Principles** 1 and 2; **10-Year Strategy** Goal 3; and, **Service Strategy** Goals A and B*

b. Pursue the development of opportunities for prescribed fire on or adjacent to the Refuge to restore the vegetation matrix resulting from under a natural fire regime, reduce hazardous fuels and to protect life, property, and other resources. *This goal supports **NFP** key points 3 and 4; **Guiding Principles** 2, 3, 7 and 8; **10-Year Strategy** Goals 2, 3 and 4; and, **Service Strategy** Goals A, B, C and E.*

c. Continue the collection, analysis, and application of fire management information needed for sound management decisions. *This goal supports **NFP** key point 5; **Guiding Principles** 3, 4, 5, 6 and 7; **10-Year Strategy** Goals 1 and 3; and, **Service Strategy** Goals B, D and E.*

d. Continue public involvement and interagency coordination and collaboration to ensure effective communication and education regarding Refuge fire management activities. *This goal supports **NFP** key points 4 and 5; **Guiding Principles** 3, 8 and 9; **10-Year Strategy** Goal 4; and, **Service Strategy** Goals A, C and E.*

e. Assist local communities with implementing FireWise projects. *This goal supports **NFP** key points 3 and 4; **Guiding Principle** 8; **10-Year Strategy** Goal 4; and **Service Strategy** Goals A, B, C and E.*

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Refuge specific fire management goals and objectives

a. Protect from fire human life, settlements, sensitive biological communities, cultural and historic sites, Native allotments, privately owned and legally permitted cabins and refuge administrative facilities and equipment from fire. *This goal supports **NFP** key point 4; **Guiding Principles** 1; **10-Year Strategy** Goals 4; and, **Service Strategy** Goals A and C.*

i. *Objective 1:* Contact all cabin owners by 2009 and identify FireWise steps to be taken to protect each cabin from the threat of fire. Identify priorities for suppression action and steps that will be taken by the Refuge and by the cabin owner/lease holder in the advent of a nearby fire.

ii. *Objective 2:* Treat the four administrative facilities and equipment sites (Hog River Cabin, Roundabout Repeater, Tough Repeater and the Cottonwood RAWS) by 2006 to remove adjacent hazardous fuels and reduce the risk of loss to wildland fire.

iii. *Objective 3:* Together with the Regional Archaeologist or Cultural Resources Specialist, identify (by 2009) which cultural and historic sites are at risk of unacceptable damage from wildland fires so that suppression efforts can be prioritized appropriately.

b. Restore, perpetuate and protect native wildlife species and habitat by maintaining a diversity of plant communities. *This goal supports **Guiding Principles** 2; **10-Year Strategy** Goal 3; and, **Service Strategy** Goal B.*

i. *Objective 1:* Work with the Refuge Wildlife Biologists to identify (by 2006) areas where early seral vegetation has been excluded as a result of fire suppression efforts and/or is needed to provide for desired wildlife habitat.

ii. *Objective 2:* Develop and implement strategies to restore appropriate seral stages to the Refuge for those areas identified in Objective 1 above.

c. Maintain fire-related ecological processes to the maximum extent feasible. Allow fire to play its natural role in the Koyukuk Wilderness Area ecosystem. *This goal supports **Guiding Principles** 2; **10-Year Strategy** Goal 3; and, **Service Strategy** Goal B.*

i. *Objective 1:* Establish the fire history for the southwest quarter of the Refuge by 2007.

ii. *Objective 2:* Work with interested stakeholders (Native allotment owners, adjacent land managers, local Village Councils and Native Corporations) to identify opportunities to allow natural fires to burn in order to maintain ecological processes.

iii. *Objective 3:* Work with AFS (by 2009) to test the practicality of using hand and/or aerial ignition to redirect fires under differing fuel types and drought indices in the Limited Management Option areas to gain experience that could potentially be applied to the future management of fires located in the Modified Management Option areas.

d. Utilize prescribed fire in those areas where fire has been excluded in the past and to modify wildlife habitat. Mimic the role fire historically played on the landscape during windows of opportunity in critical, full, and modified option areas of protection. *This goal supports **Guiding Principles** 2; **10-Year Strategy** Goal 3; and, **Service Strategy** Goal B.*

i. *Objective 1:* By 2008 identify areas within the Critical, Full and Modified Fire Management options where prescribed fire could be used to mimic natural ecological processes or improve wildlife habitat.

ii. *Objective 2:* Document burn severity and first order fire effects on at least one natural burn per year to establish base-line information necessary to document long-term fire effects on wildlife habitat.

e. Continue involvement with the Refuge environmental education and public outreach programs to inform the public about the natural role of fire in the Interior and the prevention of unwanted human-caused fires. *This goal supports **NFP** key point 4; **Guiding Principles** 3, 7 and 8; **10-Year Strategy** Goal 4; and, **Service Strategy** Goals C and E.*

i. *Objective 1:* Participate in at least one science camp focusing on the fire ecology of the Interior.

ii. *Objective 2:* Identify by 2009 the locations where human-caused fires are most frequent and work with the appropriate groups to educate them about fire prevention methods.

f. Assist local communities with performing risk assessments and implementing FireWise projects. *This goal supports **NFP** key points 3 and 4; **Guiding Principle** 8; **10-Year Strategy** Goal 4; and **Service Strategy** Goals A, B, C and E.*

i. *Objective 1:* Annually discuss FireWise opportunities with Village Councils to encourage participation in FireWise programs.

g. Initiate a prevention program by June 2004. Annually air prevention messages from April 15 through September 30 on the local radio station KIYU. Include by FY04 a prevention section in the annual Science Camp Fire Ecology session. *This supports **NFP** key point 3; **Guiding Principles** 1, 3, 6, 7 and 8; **10-Year Strategy** Goal 1; and, **Service Strategy** Goals A and E.*

The intent of the Koyukuk/Northern Unit Innoko fire management program and this FMP is to follow the guidance established in the National Fire Plan, 2001 Federal Fire Policy Guiding Principles, 10-Year Comprehensive Strategy and Implementation Plan and Service - National Wildlife Refuge System Wildland Fire Management Program Strategic Plan. Following the above guidance and implementing the above goals and objectives will result in the improvement of fire prevention and suppression efforts, a reduction in the level of hazardous fuels, the restoration of fire-adapted ecosystems and the promotion of community assistance. Together all of these factors contribute to the achievement of national, regional, State and Refuge goals.

Regarding wildland fire management, the Refuge's ***first priority is to provide for human safety***; second priority is to provide for protection of property, historical/archaeological

resources and resources of special concern; and, third priority is to provide for fire's natural role in the Interior ecosystem.

Collaboration with partners and neighbors is imperative to the success of the Refuge's fire management program. Following agency policy/direction will ensure accountability. A well-defined monitoring program will help to ensure project specific objectives are being met and will contribute to the fire ecology knowledge base.

C. WILDLAND FIRE MANAGEMENT OPTIONS

The following fire management options will be used on the Refuge: 1) suppression, 2) surveillance and monitoring, 3) wildland fire use, 4) prescribed fire, 5) prevention activities, 6) education activities, 7) monitoring and 8) FireWise community assistance/wildland urban interface activities.

Suppression tactics will be employed in those areas designated as critical, full and modified (until conversion) fire management options as specified in the AIWFMP (for a detailed description of each fire management option, see Appendix A. AIWFMP - pp. 16-33). Also see Section D. Description of Wildland Fire Management Strategies by Fire Management Unit following for more detail. This strategy will be used in order to protect human life and property and other resources of special value and to comply with the AIWFMP.

Surveillance and monitoring status will be assigned to those fires occurring in the limited management option and determined not needing suppression. The protocols outlined in the AIWFMP (pp. 26-27) will be followed. Note that some of the fires falling into this category will be managed as wildland use fires. This tactic will be used in order to comply with the AIWFMP. Placing some wildland fires in this status will help to maintain fire-related ecological processes.

Wildland fire use will be utilized when the Refuge determines that resource benefits would result from a naturally ignited wildland fire. Two major resource benefits for the Refuge would be improvement to wildlife habitat particularly moose browse and the maintenance of natural ecological (fire-related) processes. Wildland fire use is described in more detail in Section IV. Wildland Fire Management Program Components subsection B. Wildland Fire Use.

Prescribed fire will be used on a site-specific basis to enhance wildlife habitat (primarily to improve moose browse) and to maintain fire-dependent ecosystems. We may use prescribed fire in wilderness only if prescribed fire is the minimum requirement for administering the areas as wilderness and is necessary to accomplish the purposes of the refuge, including Wilderness Act purposes. Section IV. Wildland Fire Management Program Components subsection C. Prescribed Fire describes the program in more detail.

Prevention will focus on increasing youth and young adult awareness of the effects of human-caused fires and the benefits of natural fire. A prevention analysis will be completed for the Refuge by the end of FY05. This aspect of the fire program is further discussed in Section IV. Wildland Fire Management Program Components subsection A. Wildland Fire Suppress – Prevention.

Participation in the annual Galena Science Camp will focus on furthering the understanding of fire ecology. The Refuge will also pursue other avenues to bring fire ecology education into the Galena City and Yukon-Koyukuk Area School Districts. More details can be found in the prevention section mentioned above.

Fire effects monitoring of wildland and prescribed fires will be an essential part of the Refuge's fire management program. Specifics regarding this aspect of fire management can be found under Section VI. Monitoring and Evaluation.

Depending upon resource availability and collaboration with other agencies, the Refuge may provide assistance to any local village requesting help in dealing with hazardous fuels assessments and/or treatments or any other fire related issue(s). Wildland urban interface/FireWise information and/or assistance are examples of help that may be provided to those requesting assistance.

D. DESCRIIPTION OF WILDLAND FIRE MANAGEMENT STRATEGIES BY FIRE MANAGEMENT UNIT

The determination of the Koyukuk/Northern Unit Innoko fire management options was based on values at risk, the natural role of fire, wilderness management direction and overall Refuge management objectives. The land manager determines the fire management unit for the lands under their jurisdiction. They also have the flexibility to change the (AIWFMP) fire management option for lands they manage as needed due to changes in land use, protection needs, laws, mandates or policies.

For purposes of planning the Refuge is divided into two fire management units (FMU): the Koyukuk Wilderness was designated as one FMU, the Wilderness FMU, and the remainder of the Refuge was designated as the Non-wilderness FMU. Each FMU was further subdivided into (AIWFMP) fire management options. The areas contained within each FMU are contiguous. The lands adjacent to the Refuge have not been designated into FMUs at this time. Figure 6 shows the general location of the Refuge's FMU boundaries and the (AIWFMP) fire management options as well as the fire management options for the adjacent lands (primarily Bureau of Land Management and State of Alaska).

Non-wilderness fire management unit

Fuels/vegetation in the Non-wilderness FMU varies greatly but is dominated by black spruce and mixed conifer/hardwoods. The fuels are described in more detail by vegetation type in Section I. INTRODUCTION – F. GENERAL REFUGE FIRE INFORMATION – Vegetation types and fire effects. This FMU covers approximately 3,497,210 acres.

The dominant features of this FMU are the Kaiyuh Mountains and Pilot Mountain, Kaiyuh Flats and the Yukon River on the Northern Unit Innoko NWR. Dominant features of the Koyukuk NWR include Roundabout Mountain in the center, Takhokhdona Hills and Hochandochtla Mountain on the east, the Zane Hills and the foothills of the Purcell Mountains on the north and the Koyukuk River on the west. Gentle rolling hills and lowlands containing numerous lakes, creeks and rivers dominate the inland terrain.

The climate is continental sub-arctic. Annul precipitation averages 18 inches, including 81 inches of snow. The active fire season occurs during late June through mid July.

The fire regime consists of Regimes III (35-100+ year frequency and mixed severity) and IV (35-100+ year frequency and high severity). The condition class is a Condition Class 1 (within the natural range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and, other associated disturbances). A small scale map is found in Appendix R. Koyukuk and Northern Unit Innoko Fire Regime and Condition Class. A large-scale map delineating the Refuge's fire regime and condition class (FRCC) is on file at the Refuge in the forms of a GIS layer and hard copy. FRCC is in the process of being further refined for Alaska.

Access to this FMU is primarily via aircraft. Limited access via boat is possible along the Koyukuk River.

Special features/values of this FMU include Doyon Limited land, Native village corporation land, Native allotments, permitted cabins, the Hog River Administrative Cabin and Roundabout, Tough and Totson Mountain repeater sites. A map delineating these features is on file at the Complex Office (Fire large map file). Wildlife habitat, especially early seral along the riparian areas, is of concern from the standpoint of moose winter habitat. It is desirable to maintain as much of a natural fire regime as possible in order to maintain the fire-dependent ecosystems found on the Refuge.

The FMU is subdivided into the following (AIWFMP) management options:

***Full Management Option*:** This option consists of two parcels located along the Yukon River. Several tracts of Native (selected and conveyed) lands lie within this option.

The primary objective of the Full Management Option is to protect Native allotments and Corporation lands by minimizing the presence of uncontrolled fire. The unit will be protected using aggressive suppression. Wildland fire use may occur within this FMU only if initial attack is not initiated and/or suppression forces are not available. Wildland fire use requires a Wildland Fire Implementation Plan (WFIP) signed by the Refuge Manager. The purpose of wildland fire use would be to maintain fire dependent ecosystems, provide a representative amount of early seral habitat and keep the risk of catastrophic fire low. The use of prescribed fire for the purposes of reducing hazardous fuel accumulations, restoring historical conditions, providing early seral habitat or research may also be implemented in this FMU. Prescribed burns would require the Refuge Manager's approval of a prescribed fire burn plan.

Fire size for this management option will be specified in the WFSA, WFIP or prescribed burn plan.

***Modified Management Option*:** This option consists of parcels located around full protection areas in the north central and southern boundary areas of the refuge.

The Modified Management Option is intended to be the most flexible option available to land manager by providing a higher level of protection when fire danger is high, probability of significant fire growth is high and the probability of containment is low. A lower level of protection is provided when the fire danger decreases, potential for fire growth decreases and the probability of containment increases. Unlike the Full Management Option, the intent is not to minimize burned acres but to balance acres burned with suppression costs and to accomplish land and resource management objectives (maintenance of fire dependent ecosystems and early seral habitat). After the conversion date (usually July 10), the default action for all fires occurring within this option will be confinement and/or routine surveillance to ensure that identified values are protected and that adjacent higher priority management areas are not compromised.

Priorities include protecting identified resources and preventing the fire from burning into Full management option areas. Minimizing acreage burned is not a management priority. Prior to the conversion date, wildland fire use can only occur if initial attack has not been initiated and/or there are no available suppression forces. A WFIP signed by the Refuge Manager is also needed. After the conversion date, wildland fire use may occur within this FMU with the Refuge Manager's signature of WFIP. The intent of wildland fire use is to lower the future risk of wildland fire and to maintain fire dependent ecosystems or early seral habitat. Prescribed fire may also be used in this FMU for the purposes of reducing hazardous fuel accumulations, restoring historical conditions or research, with the Refuge Manager's approval of a formal prescribed fire burn plan.

Fire size will be specified in the WFSA, WFIP or prescribed burn plan.

***Limited Management Option*:** The Limited Management Option comprises the majority of the non-wilderness FMU. This unit includes the more remote, pristine and natural areas of the Refuge.

Fires occurring in this option will be allowed to burn while providing for the protection of human life and site-specific values. Because of the limited values at risk within this unit, most natural ignitions will be managed for the purpose of maintaining fire's natural role in the Interior Alaska boreal spruce ecosystem and to provide an array of early seral and seral habitats. Low impact or indirect suppression methods will be used whenever possible, if a suppression action is needed.

Aerial retardant and heavy equipment will not be used without the permission of the Refuge Manager (or Acting Refuge Manager), except in life threatening situations.

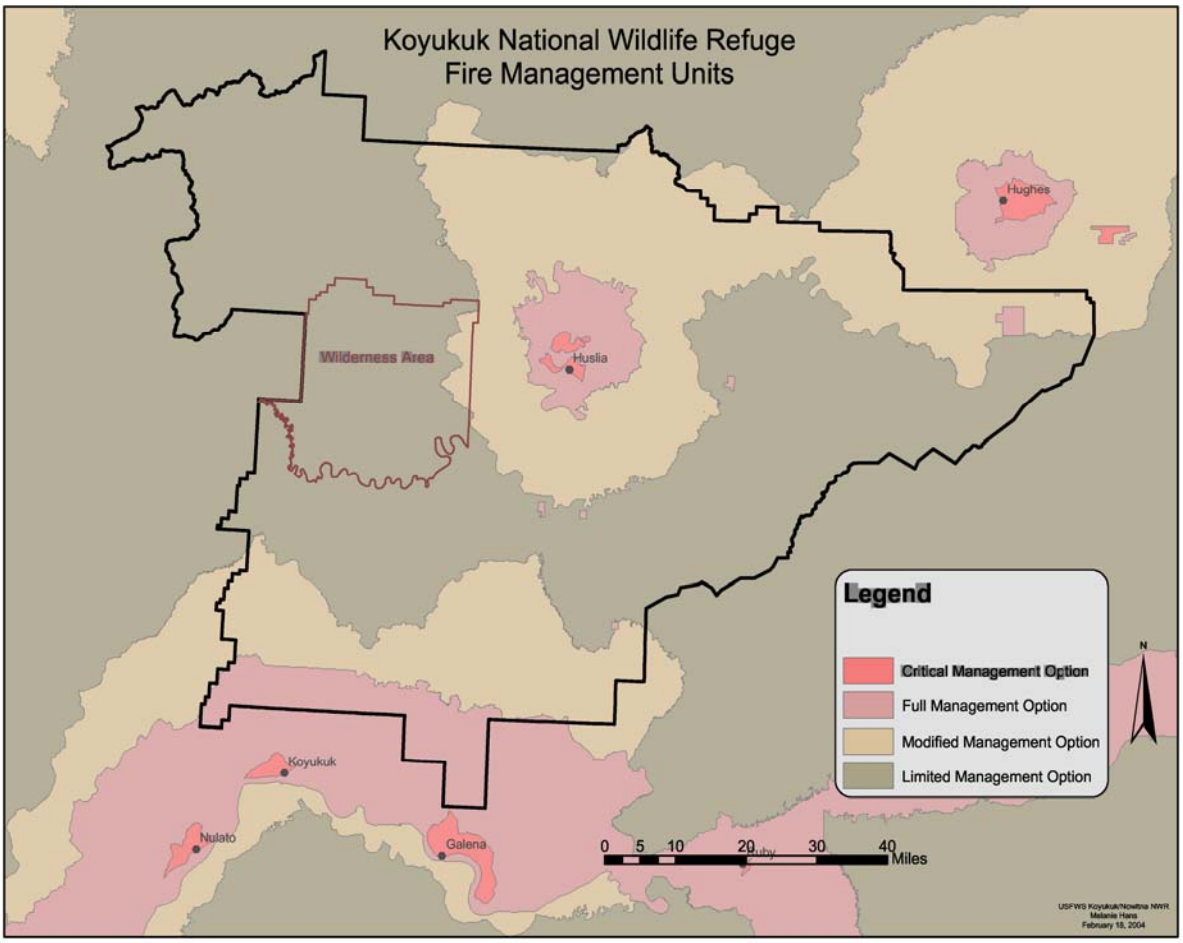
Wildland fire use may be used (to lower the risk of catastrophic fire, maintenance of fire-dependent ecosystems and to provide early seral habitat) in this option providing a WFIP is written and signed by the Refuge Manager or Acting. Prescribed fire may also be implemented in this FMU for the purposes of reducing hazardous fuel accumulations, restoring historical conditions/habitats or research, with the Refuge Manager's approval of a formal prescribed fire burn plan.

The maximum manageable area will be specified in the WFIP or prescribed fire plan.

Wilderness fire management unit

Fuels/vegetation in the Wilderness FMU is dominated by black spruce with some mixed conifer/hardwoods. The fuels are described in more detail by vegetation type in Section I.F. Vegetation and Fire Effects. This FMU covers approximately 400,000 acres of Refuge controlled land.

Figure 4. Koyukuk and Northern Unit Innoko Fire Management Unit Map.



Fuels/vegetation in the Wilderness FMU is dominated by black spruce with some mixed conifer/hardwoods. The fuels are described in more detail by vegetation type in Section I.F. Vegetation and fire effects. This FMU covers approximately 400,000 acres of Refuge controlled land. Access to this FMU is limited to foot, aircraft, or boat on the southern boundary.

The dominant feature of this FMU is the Nogahabara Sand Dunes. The FMU contains a fair amount of open-grown black spruce, scattered mixed hardwoods and riparian shrubs.

A 1970s origin fire dominates the south central portion of the FMU. The Koyukuk and Kateel Rivers form the southern border between this FMU and the Non-wilderness FMU.

The climate is continental sub-arctic. Annul precipitation averages 18 inches, including 81 inches of snow. The active fire season occurs during late June through mid July.

The fire regime consists of Regimes III (35-100+ year frequency and mixed severity) and IV (35-100+ year frequency and high severity). The condition class is a Condition Class 1 (within the natural range of variability of vegetation characteristics; fuel composition; fire frequency, severity and pattern; and, other associated disturbances). See Appendix R. Koyukuk and Northern Unit Innoko Fire Regime and Condition Class for a small scale map of FRCC. A large-scale map delineating the Refuge's FRCC (fire regime and condition class) is on file at the Refuge as a GIS layer.

Special features/values of this FMU include prehistoric sites and the wilderness area itself. Winter moose habitat is of concern from the standpoint of forage production, especially within Three Day Slough riparian area. This area contains one of the highest densities of moose in the State. It is desirable to maintain as much of a natural fire regime as possible in order to maintain the fire-dependent ecosystems found in this FMU.

The ***Limited Management Option*** comprises the whole wilderness FMU. This unit includes the most remote, pristine and natural areas of the Refuge.

Fires occurring in this option will be allowed to burn while providing for the protection of human life and site-specific values. Because of the limited values at risk within this unit, most natural ignitions will be managed for the purpose of maintaining fire's natural role in the Interior Alaska boreal spruce ecosystem, providing a range of early seral and seral habitats and avoiding catastrophic fire events. Low impact or indirect suppression methods will be used whenever possible, if a suppression action is needed.

Section 4 (d)(1) of the Wilderness Act contains a special provision that "such measures may be taken as may be necessary in the control of fire, insects, and diseases subject to such conditions as the Secretary deems desirable.." Therefore a Minimum Requirements Analysis (MRA) is not needed for suppression activities. Low impact or indirect suppression methods, including minimum impact suppression tactics (MIST) will be used whenever possible if a suppression action is needed. Fire lines will be constructed in a manner that minimizes erosion and follows the natural contours wherever possible. Indirect attack will be used to the maximum extent possible. Aerial retardant and heavy equipment will not be used without the authorization of the Refuge Manager. A fire line rehabilitation plan, as approved by the Refuge Manager, must be completed before the final demobilization occurs.

Wildland fire use is appropriate under this option, and may be authorized by the Refuge Manager through a WFIP. The maximum manageable area will be specified in the WFIP. Under wildland fire use particularly if MIST techniques are employed a WFIP may not need to contain a MRA.

Prescribed fire may be used in this FMU if it is determined to be the minimum requirement for administering the area as wilderness, and is necessary to accomplish the purposes of the refuge. Prescribed fire may be considered for the purpose of restoring the historical role of fire or for reducing an unnatural accumulation of hazardous fuels. The Refuge Manager will authorize prescribed fire through a prescribed fire plan and MRA. (see Appendix Q for the Minimum Requirement Decision Guide).

Fire management departures

The AIWFMP allows the land manager to authorize AFS to provide an increased level of suppression action or a decreased level of suppression action depending on the situation at hand. In either case a "Decision Criteria Record" Appendix D will be completed in order to document and authorize the adjusted level of protection.

Additionally, in either case the selected fire management option area must be re-evaluated during the next annual review period. The Alaska Wildland Fire Coordinating Group (AWFCG) may approve departures from the selected management options during periods of "unusual fire conditions" for a specific geographic area(s).

Determining the validity of appropriate management response

Staff from the Refuge and AFS can use several criteria to determine whether the appropriate management response is valid for a given set of circumstances. Criteria include, but are not limited to:

a. Will the safety of firefighters and the public be provided for?

b. Can we accomplish the specified fire objectives?

c. Are there any unique environmental or fuel conditions that could stop implementation of the appropriate management response?

d. Are there any other constraints to implementing the appropriate management response?

e. Number, location, and size of fires in the area and current and predicted fire behavior.

f. Existence of extended drought conditions.

g. Smoke from fires causing problems by:

    1. Substantially impacting the ability to suppress higher priority fires.

    2. Creating a safety hazard for travel.

3. Creating a health hazard where the smoke has drifted into populated areas. Health hazard complaints are to be documented and confirmed.

Constraints to specific strategies

The following restrictions have been or may be imposed by the Refuge:

a. A voluntary 2000 foot flight restriction applies to all refuges. This restriction appears in each Sectional Aeronautical Chart. Additional restrictions may be placed on suppression aircraft flying over certain waterfowl, waterfowl staging areas and raptor nesting areas depending upon time of year and amount of flyovers required.

b. Peregrine falcon nesting sites are marked on interagency fire maps. AFS will notify the Refuge immediately when fires are discovered near these areas. The Refuge will notify AFS of new nest sites. Extreme care must be taken to not disturb nests during the critical period from April 1st to August 15th because adults may abandon eggs or young.

1. All personnel are to keep away from nesting sites.

2. Camps must be located at least two miles from nesting sites.

3. All aircraft will be restricted from operating within one mile horizontal distance and below 1,500 feet above ground level over known nesting sites.

4. No retardant is to be dropped over known nesting sites.

c. The operation of aircraft at altitudes and in flight paths resulting in the herding, harassment, hazing or driving of wildlife is prohibited over Refuge lands. It is recommended that all aircraft except in the immediate vicinity of the fire and for take-off and landing, maintain a minimum altitude of 2000 feet above ground level (AGL).

d. Avoid black/grizzly bear encounters on the Refuge.

1. Emphasis will be placed on preventive measures. Keep a clean camp. Exhaust all attempts to drive the bear away from camp before destroying the bear.

2. Any person who takes a bear in defense of life and property must comply with all State regulations and immediately report the incident to the Refuge Manager. A Service bear incident report will be completed and filed.

e. Camp site selection:

1. Base camps, spike camps, helispots and other support areas should be located in natural clearings if possible. The construction of helispots should be minimized. Any opening created for support areas will be cut with an irregular pattern. Such areas will be kept clean so as not to attract animals.

2. The Service will collaborate with the BIA, compacted Tribe or land owner in the event a camp site becomes necessary on a Native allotment with Refuge boundaries. Any activity associated with a Native allotment must have prior approval from the appropriate Tribe, agency or landowner. The Service will discourage the use or removal of resources from a Native allotment.

3. Camps must be located away from known historic or archaeological sites. Artifacts **will not** be collected. The Refuge will be notified if any artifacts are found.

4. "High-use" areas (e.g. cooking and eating areas) will be covered with enough (road construction type) filter cloth or other suitable fabric to protect the vegetative layer from compaction and destruction prior to use.

5. Latrines must be located at least 200 feet from lakes, ponds and streams.

f. Camp site rehabilitation:

1. Use minimal disturbance-preventive rehabilitation.

2. Dismantle and remove all tent and shelter frame materials. Local materials (e.g. logs and poles) used for construction should be spread throughout the site.

3. Completely fill all fire and latrine pits.

4. Remove all trash from campsites and fire line. Burnable trash may be burned on site.

5. Camp rehabilitation must be approved by Refuge Manager or Acting before demobilization.

g. Fireline:

1. Control lines constructed during suppression activities should be located in a manner that limits erosion. If possible, lines dug down to mineral soil or permafrost should be located to meander obliquely

to the fall lines of slopes rather than to run straight down the fall lines. Arrow-straight line location should be avoided.

2. Whenever possible, a buffer of vegetation should be left immediately adjacent to water bodies to avoid running lines directly into water bodies.

3. Any control lines constructed on fires will have appropriate erosion control measures taken prior to the release of suppression forces. Those measures include building water bars and replacing organic material back into lines where permafrost or mineral soil has been exposed.

4. Hand-cut lines should be used sparingly and only where they are essential for holding and accessing hot perimeter and for holding indirect attack line during burnout operations. Direct attack black lining is possible on many fires without building cut lines.

Selection of fire management options and rationale

One or a combination of the following three fire management options will be used in the Refuge's FMUs:

Option 1: Suppression actions may range from surveillance to aggressive control tactics and are to be at minimum cost, considering values to be protected, and consistent with resource objectives. Guiding Principle 5 of the 2001 Federal Wildland Fire Management Policy states: *Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives*. The Service Fire Management Handbook defines an appropriate management response as the specific actions taken in response to a wildland fire to implement protection and/or fire use objectives.

The Fire Management Plan provides for rapid aggressive suppression of fires in developed or high resource value areas and on private inholdings, and a surveillance and confinement approach on fires in remote areas of the refuge. Inherent in all fire management decisions are the facts that (1) wildland fire is an integral and necessary part of the boreal forest ecosystem, and (2) the cost of suppression effort is to be commensurate with values identified for protection

Option 2: Wildland Fire Use will be utilized to help fulfill some of our national, Service and Refuge goals. Guiding Principle 2 of the 2001 Federal Fire Policy states: ***The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the planning process.*** Wildfires are a natural part of the boreal forest, and the plants and animals within are adapted to fire. Fire maintains ecosystem health. Wildfires may be better at maintaining or restoring ecosystems than are prescribed fires. The CCP/EIS/WR (p. 106) states: ***Natural fires may be permitted to burn, except where they threaten human life and property or reach excessive size.***

Option 3: Prescribed fire may be permitted subject to provisions of NEPA, Section 810 of ANILCA, and an approved plan for the purposes of habitat manipulation (CCP/EIS/WR, p. 125).

IV. WILDLAND FIRE MANAGEMENT PROGRAM COMPONENTS

The components of the Refuge's wildland fire management program are: 1) wildland fire suppression, 2) wildland fire use, 3) prescribed fire, 4) non-fire fuel applications, 5) emergency stabilization and rehabilitation/restoration and 6) remote access weather stations.

A. WILDLAND FIRE SUPPRESSION

Wildland fire management direction is derived from Departmental manuals and Service handbooks, the AIWFMP, and the respective parameters of each Fire Management Unit. ***Safety of firefighters and the public is the first priority in all fire management decisions***. Following are the fire management strategies for the Koyukuk and Northern Unit Innoko NWR that will be used exclusively or in combination:

Fires are classified either as wildland fires that are managed under the AIWFMP and agency policies, or prescribed fires, which are ignited to accomplish land and resource objectives, and are managed under agency policies and procedures. Appropriate suppression action must be taken on all wildland fires unless the fire is being managed under an approved Wildland Fire Implementation Plan (WFIP). Fires managed under an approved WFIP must be lightning-caused, must have a prescription applied and must be NEPA compliant. The Refuge Manager is responsible for all fire management activities on the Refuge, including wildland fire suppression, wildland fire use and prescribed fire activities.

Suppression authority and planning

Each agency in Alaska is responsible for administering its own fire management program. The Koyukuk/Nowitna Refuge Manager retains overall responsibility for fire management activities on the Refuge. The Regional Director retains overall responsibility for fire management activities on Service lands within the region.

Departmental Manual (620 DM 2.4.Policy.) states: *BLM will maintain and operate the Department of the Interior wildland fire suppression organization in Alaska with the primary intention of providing cost-effective suppression services and minimizing unnecessary duplication of suppression systems for Department of the Interior agencies. BLM will also provide consistency in State and Native wildland fire relationships and provide State-wide mobility of wildland fire resources. BLM is authorized to provide safe, cost-effective emergency wildland fire suppression services in support of land, natural and cultural resource management plans on Department of the Interior administered land and on those lands that require protection under the Alaska Native Claims Settlement Act, as amended (43 U.S.C. 1620(e)), herein after referred to as Native land. BLM will execute these services within the framework of approved fire management plans or within the mutually agreed upon standards established by the respective land managers/owners.*

a. *Nothing herein relieves agency administrators in the Interior bureaus of the management responsibility and accountability for activities occurring on their respective lands.*

b. *Wildland fire suppression and other fire management activities provided on Native lands under the authority of the Alaska Native Claims Settlement Act, as amended (43 U.S.C. 1620(e)), will consider Native land managers on an equal basis with Federal land managers.*

c. *Each bureau will continue to use its delegated authority for application of wildland fire management activities such as planning, education and prevention, use of prescribed fire, establishing emergency suppression strategies, and setting emergency suppression priorities for the wildland fire suppression organization on respective bureau lands.*

Guidelines for determining appropriate suppression action are provided in the Alaska Interagency Wildland Fire Management Plan. The AIWFMP provides for a range of suppression responses to wildfire that protects human life and property and other identified resources and developments, balances suppression costs with values at risk and is in agreement with Refuge resource management objectives. The result is that developed areas and other high resource value areas are protected and the natural occurrence of fire in the ecosystem is maintained in remote areas with minimal cost-effective intervention.

The Alaska Wildland Fire Coordinating Group (AWFCG) is composed of representatives from all agencies responsible for land management and fire suppression in Alaska and has been given the authority to make broad scale changes in fire suppression management responses on a temporary basis. These decisions are based on factors such as severity of the fire season, demands on suppression resources and smoke management concerns.

The Refuge Fire Management Officer will take an active role in suppression activities on the Refuge in cooperation and coordination with services provided by Alaska Fire Service Galena Zone Office.

AIWFMP Suppression response levels

Four response levels were established in the plan. The ***critical management option*** is of the highest priority and requires aggressive suppression for all fires in the zone. The ***full management option*** requires aggressive suppression of all fires in the zone, but at a lower priority than critical protection areas. The ***modified management option*** requires containment action during the peak of the fire season and a monitoring response after a designated conversion date in the latter stages of the fire season, normally after July 10. The ***limited management option*** requires only a surveillance response as long as fires within this designation do not threaten to escape into higher priority areas; if a threat is ascertained, a containment response can be initiated to keep fires in the zone from burning into higher priority zones.

Escaped fires

An escaped fire is a wildfire that initial attack forces fail to contain or keep contained. It may be a limited or modified fire management option fire initially having surveillance action taken that later requires additional suppression action.

An escaped fire signifies that an extended effort will be required to suppress the fire. A Wildland Fire Situation Analysis (WFSA) must be prepared before extended attack forces are deployed. The Fire Management Handbook Chapter 3.4 describes the WFSA process. The Alaska Fire Service FMO and the Refuge FMO will jointly prepare the WFSA using the Alaska Fire Service's WFSA format. The WFSA lists suppression strategy alternatives, the pros and cons of each alternative and management constraints and priorities. The Refuge Manager or Acting Refuge Manager selects a preferred alternative and signs/dates the WFSA. The completed WFSA provides direction to suppression forces and specifies the scope of the effort required. Alternatives may include no action, efforts concentrated on a specific portion of the fire with certain limitations specified or full suppression. Limits may be placed on the number of crews committed to the fire, on the organizational level of suppression forces committed (for example, specifying an extended attack/Type III operation or a "short" Type II Overhead Team), on amounts of certain types of equipment and where it can be deployed or on suppression costs. A WFSA template is included in Appendix E.

Type I and Type II Incidents

The Alaska Fire Service–Galena Zone FMO along with the Refuge FMO will decide when it is appropriate to order a Type I or II Team. This decision will be based on the fire's size, location, threat to life and property, political sensitivity, organizational complexity, jurisdictional boundaries, values to be protected, fuel type, topography and agency policy. Incident complexity analysis will be based on Interagency Redbook criteria listed in Appendix N. Incident Complexity Analysis. The transfer of authority for suppression actions is done through the execution of a written delegation of authority from the Refuge Manager to the Incident Commander.

For large or complex fires requiring a Type I or Type II Overhead Team, Refuge staff will take an active role in providing direction to AFS and the Incident Management Team (IMT). Refuge staff (primarily the Refuge FMO) will help prepare the WFSA. The Refuge Manager will select a strategic alternative. Refuge staff will also have input into the Limited Delegation of Authority, which transfers authority for suppression to the Incident Management Team on the Refuge and provides specific guidance and constraints on the suppression effort. The WFSA will be re-validated periodically by the Refuge Manager or Acting Refuge Manager, the Alaska Fire Service FMO and the Incident Commander to ensure the alternative selected is still appropriate.

All Type I and Type II incidents occurring on the Refuge will have a line officer's representative designated by the Refuge to provide and maintain a conduit of communication between the Incident Management Team and the Refuge Manager, as well as between the local suppression agency and the Refuge Manager. The Refuge FMO will usually function as the line officer's representative, but in the case of multiple

incidents, other staff may also be assigned. Refuge staff will articulate Refuge resource management concerns and agency direction not tactical direction.

Fire season

Fires can occur on the Refuge between late April and mid October. Fire Program Analysis will eventually require the entire year to be broken down into two-week sensitivity periods and fire intensity levels.

Preparedness

The refuge will follow the guidelines set in the Koyukuk Preparedness Plan found in Appendix U. It is expected that all fireline-qualified personnel will maintain their fireline qualifications (see Training/Qualifications/Readiness section below). The fire cache located in Galena will be maintained to provide basic support of the Refuge's prescribed burning operations. The fire cache located in the Air Force Base building #1842 will be inventoried annually and maintained in a "fire ready" condition by June 1 of each year. The two water tanks (125 and 225 gallons) with pumps will be stationed at Quarters 1 and 4 during the summer fire season. The Refuge staff will discuss annually fire protection/suppression strategies prior to the onset of field operations.

A statewide Multi-Agency Coordination (MAC) group will be convened to implement a temporary change from the selected management options for a specific geographic area(s) during periods of unusual fire conditions (e.g. numerous fires, predicted drying trends, smoke problems, unusually wet conditions or suppression resource shortages). The MAC group will determine the duration and geographical extent of such changes.

Prevention

Prevention efforts will focus on outreach to the public during the fire season (airing prevention messages weekly on the local radio station, KIYU), reducing hazardous fuel accumulations around the administrative sites and completing a fire prevention analysis by the end of FY05. An annual assessment of hazardous fuels will be performed for all of the administrative sites each fall. Cabin permits will specify FIREWISE measures to be taken annually to protect each structure. FIREWISE brochures are available to the public. They are found in the Refuge information section of the front office.

Communicating information on the role of fire in the northern boreal forest is a high priority for the Region and the Refuge. The Region's "Role of Fire" (http://alaska.fws.gov/fire/role) describes the important role that wildland and prescribed fires play on the Refuge and can be an excellent reference for teachers. It is important to work with the local school systems providing teachers with reference materials and fire curricula. Participating in the Annual Science Camp provides an additional opportunity to reach youth interested in natural resource management.

All of the Refuge staff play an important role in furthering the Refuge's fire management program and educating the public regarding the role of fire in the Interior. Refuge fire

staff will meet residents of local villages at various times. These types of meetings provide a good opportunity to find out about individual preferences and understanding of fire.

Wildland Urban Interface

The Service is in the early stages of planning and developing a region wide risk assessment for national wildlife refuges in Alaska to be implemented over the next ten years. A risk assessment is designed to identify cultural resources, community values, cabins, historical resources, native allotments and other values at risk. After a determination of the level of risk, plans and strategies to protect those values are developed and funding requested. Fuel reduction projects go through multiple stages. Planning, environmental analysis, risk assessment, and mitigation are completed first. Secondly funding is requested, and if approved, the project is implemented. The focus is on using local labor from nearby villages. Thirdly the project is monitored. All of these identified steps add to the complexity of managing fire on refuge lands.

Five Villages, Kaltag, Galena, Koyukuk, Nulato, Huslia, Hughes are located near and/or have village corporation lands within the legislative boundaries of the the Koyukuk or Northern Unit Innoko Refuge. An interagency group developed a list of communities at risk for the State of Alaska. The community of Koyukuk has been identified as low, Huslia and Hughes at moderate, and Galena, Kaltag, and Nulato as high risk from wildland fire (Appendix V). Scattered cabins and a few cultural resource sites have been identified as values of risk from wildland fire. Not all sites have been assessed for the level of risk. In conjunction with other refuges and the regional office a cabin protection plan would be developed.

Other lands at risk include Native allotments. Alaska Native Claims Settlement Act (ANCSA) of 1971, as amended, [43 USC 1620(e)] provides for forest fire protection services from the United States at no cost to Native individuals or to Native Groups, Village and Regional Corporations organized under ANCSA, as long as there are no substantial revenues from such lands.

On the Koyukuk and Northern Unit of the Innoko there are 154 Native allotments encompassing nearly 15,674 acres. Another 7 allotments (628 acres) have been selected but not conveyed. An additional 13 allotments (1,241 acres) may be selected under the Veteran Allotment provisions. The refuge works closely with its neighbors and adjoining landowners in the selection of wildland suppression options. These values would be considered in developing a Wildland Fire Situation Analysis (WFSA) in determining the best fire incident management strategy to implement.

The refuge would take an active role in working with these communities to develop and implement plans to reduce the risk of wildland fire to life and

property. These actions should focus on reducing hazardous fuels, both in the village and adjacent to the community, assist in securing funding for fuels projects, help develop local infrastructure capacity to do fuels work, and support FireWise concepts such as promoting Firewise education and information in these communities.

Training/qualifications/readiness

Refuge staff involved with fire management activities will attend the formal fire training identified in an annual training needs assessment and/or in their Individual Development Plans. Training opportunities will be provided by Region 7 and outside of Region 7. The Refuge Manager and/or Deputy Refuge Manager and the FMO will assess the training/staffing needs of the Refuge annually.

An effort will be made by each Fireline-qualified individual to maintain their qualifications according to the specifications found in the Wildland and Prescribed Fire Qualification System Guide PMS 310-1 January 2000. This will include attending the Annual Fireline Refresher course and qualifying at the physical fitness level required by their respective fireline position. All fire training, qualifications and experience will be maintained in the Incident Qualifications and Certification System (IQCS).

All current fireline qualified personnel will be expected to be available for fire assignments within Alaska and the Lower 48 depending upon Refuge staffing needs, State and Federal Preparedness Levels and supervisory approval. The Supervisor and/or Refuge Manager will determine an individual's availability up to the time the Secretary of the Interior mandates that all fireline qualified personnel will be made available for fire assignments.

Federal interagency wildland firefighter medical qualification standards will be applied to all fireline personnel. See Appendix F for more detail.

Detection

Generally AFS will be responsible for all detection and surveillance flights. When Refuge land is affected by wildland fire, Refuge fire personnel will attempt to go along on the AFS flights. There may be some opportunities to use Refuge aircraft for detection purposes, especially during times of peak fire activity when AFS is unable to do a detection/surveillance flight or the Refuge feels it is important to monitor the status of a Refuge fire. All aircraft used during detection or surveillance flights will be certified by the Office of Aircraft Services (OAS). All pilots will be OAS certified.

Initial and extended attack

Once the Refuge and AFS mutually decides to utilize initial or extended attack, AFS will implement the attack strategy.

Air quality

The Alaska Department of Environmental Conservation (ADEC) is the regulatory agency responsible for air quality and smoke management on both State and Federal lands in Alaska. The Alaska Enhanced Smoke Management Plan June 2004 provides smoke management guidance – a copy is found in Appendix G. Concerns about public health related to air quality and visibility are considered in actions taken within all fire management option areas. Incident Commanders, the AFS and land manager/owner(s) of ongoing fires must consider smoke and its effects when preparing the Wildland Fire Situation Analysis and selecting and implementing a suppression strategy. During periods of extensive fire activity, the Multi-Agency Coordinating Group in conjunction with the ADEC may determine that new fire starts will be suppressed due to smoke and air quality concerns regardless of the fire management option.

Future areas of special concern

As soon as these areas become known, they will be identified on a GIS layer and their locations will be given to AFS. Currently all special concern areas (such as critical caribou habitat, peregrine nesting areas, archaeological/cultural/historic sites and administrative sites/cabins) have been identified and taken care of through the process of changing the fire management option to one that provides the level of suppression needed to protect the resource(s) at risk.

B. WILDLAND FIRE USE

All wildland fire use will comply with the interagency Wildland and Prescribed Fire Management Policy August 1998 and follow Service policy as outlined in the Service Fire Management Handbook Chapter 3.3. Natural-ignition fires play an important role in maintaining fire's natural role in the Interior Alaska boreal forest ecosystem. Wildland fire use is intended to benefit resource management and help accomplish the objectives outlined in the CCP/EIS/WR. The Refuge retains operational latitude to implement and manage a wildland fire use program.

Actions on wildland fires, specified in the Alaska Interagency Wildland Fire Management Plan, such as surveillance of limited fire management option fires, should not be construed as a substitute for a Refuge wildland fire use or prescribed fire program. However, the appropriate response to a wildland fire use fire may be surveillance and monitoring. The difference between a Refuge wildland fire use program and how fires are managed under the scope of the AIWFMP is the degree of involvement by Refuge staff and the level of monitoring done. Wildland fire use will generally involve a higher level of monitoring plus the Refuge Manager is actively involved. Although interagency cooperation and assistance is essential, authority for the operational control of wildland fire use activities lies with the Refuge.

Within the limited fire management option of both FMUs, fire often poses little if any threat to sensitive or valued resources. The detection of ignitions within this fire management option will initiate wildland fire use unless the Refuge Manager specifies otherwise. Ignitions within all other fire management options (e.g. modified and full management) will trigger the appropriate suppression responses. Wildland fire use will remain available in these fire management options

as an alternative response upon the request of the Refuge Manager. After the conversion date (usually July 10) fires in the modified fire management option will be considered for wildland fire use unless the Refuge Manager specifies otherwise.

Federal and Service policy requires that the following elements be in place before wildland fire use is implemented.

1. The Refuge has an approved fire management plan.

2. Applicable environmental and subsistence regulations are adhered to.

3. Fire management units are already established.

4. An implementation prescription is written.

5. Management oversight is provided.

The Refuge Manager decides whether or not to implement wildland fire use based on current fuel moisture contents; past, present and future weather conditions; general fire conditions across the State; available staffing; and, recommendation of the Refuge FMO. Appendix O Prescriptive criteria for wildland fires managed for resource benefit provides parameters under which wildland fire use may be implemented. The implementation path for wildland fire use is shown in Appendix S Wildland Fire Use Decision Matrix.

The over-riding factor in deciding to implement wildland fire use will be whether resource benefit(s) will occur. Resource benefits would be associated with: (1) the maintenance of fire-dependent ecosystems and their processes, (2). creation of early seral habit; and/or (3). reduction of hazardous fuel accumulations that would lead to catastrophic fire(s). The maximum manageable area (MMA) would be determined on the basis of past fire size in the affected area and proximity to areas of concern and/or full or critical fire management option areas. The MMA will have to be determined on a case by case basis depending upon the adjacent resources at risk. Specified trigger points will be identified in each WFIP and will vary from fire to fire. The following trigger points will be common to all WFIPs: (1).the fire burns into an extended dry period, fire behavior becomes erratic and control becomes difficult and (2) resources at risk are within 2 miles of the fire perimeter with the fire actively burning towards those resources. If the fire exceeds the MMA or the Refuge Manager determines through periodic reassessment that resource benefits are no longer occurring and/or management capability is inadequate to accomplish the fire use objectives, AFS is consulted and a WFSA is jointly prepared.

The Wildland Fire Implementation Plan will be used to formulate and select all responses to wildland fire use. A detailed description of the WFIP is available in the Service Fire Management Handbook Chapter 3.3 (see Appendix H).

Completion of the WFIP may entail as many as three distinct stages, depending on the nature and complexity of the incident.

Stage I is triggered by any wildland fire detection within the Refuge and consists of a fire situation report, decision criteria checklist and a recommended response action, the initial

go-no-go decision. If the decision is to manage the fire for resource benefit, proceed to Stage II.

Stage II provides managers with the information needed to continue managing an incident for resource benefit. This stage entails the prediction of direction, intensity and rate of spread as well as the identification of necessary short-term actions. Stage II also involves the initiation of periodic reassessment, including consideration of the incident's continued suitability for fire use as well as the possible need for long-term management actions. The periodic reassessment component may prompt the Refuge Manager to initiate WFIP Stage III.

Stage III provides the necessary information and planning for the management of more complex instances of wildland fire use for resource benefit. This stage results in the definition of the ultimate acceptable geographic size of the fire, represented by the Maximum Manageable Area (MMA) and the planning and documentation of the actions needed to strengthen and defend the MMA.

Staffing of wildland fire use fires will depend upon the complexity of the fire and the availability of qualified personnel. The minimum staffing for non-complex (requiring only WFIP Stages I and II) wildland fire use will consist of a fire use manager (FUMA) and part-time help from the Refuge Pilot and other staff as needed. The FUMA will either come from within the agency and region or from other federal agencies within Alaska. The recommended minimum staffing for a complex (WFIP Stages I-III) wildland fire use fire will be an Incident Commander Type 2 (ICT2) Safety Officer Type 2 (SOF2), Information Officer Type 2 (IOF2), Operations Sections Chief Type 2 (OSC2), Planning Section Chief Type 2 (PSC2), Long Term Fire Behavior Analyst (LTAN), Logistics Section Chief Type 2 (LSC2) and three positions to be determined after discussion with the ordering unit. Teams may pre-identify up to four shared positions in the seven core positions. Complexity can be determined by using the complexity analysis found in Appendix N. The total number of wildland fire use fires occurring on the Refuge at one time will depend upon overall fire activity on the Refuge, available staffing, a mutual assessment by the Refuge and AFS of the desired fire activity on the Refuge and the overall total resource benefits desired. If the complexity of a wildland fire use fire moves to a Type 2, a National fire use management team (FUMT) will be ordered through AFS Galena Zone.

The monitoring frequency of wildland fire use fires will be determined initially by the Refuge FMO and later in consultation with the FUMA and Refuge Manager. Monitoring guidelines will be established by the Refuge FMO and the FUMA and incorporated into the WFIP Stage III Monitoring Actions. Monitoring at a minimum should include photographs from each detection flight, fire perimeter growth maps, first and second order fire effects, fire behavior, weather and fuel moisture content for the Canadian Forest Fire Danger Rating System subterranean fuel types involved. See Section VI Monitoring and Evaluation for further detail.

The Refuge FMO will ensure that a complete project record will be compiled and retained for each wildland use fire on the Refuge. Each record will contain the following items:

1. All WFIP and/or WFSA document(s).

2. Monitoring summaries.

3. Funding codes used and cost.

4. Project maps.

5. Photographs/photo points.

6. Overall project summary including the narrative, daily log, periodic assessments, contacts, decision records, orders and what and how objectives were met.

In managing for wildland fire use resource benefit(s), the Refuge Fire Management Officer and the fire use manager will take into account both the short and long-term impacts of such activities upon all facets of Refuge use, including subsistence. Although there may be some short-term effects (to subsistence hunting and trapping) of wildland fire use, it is important to remember that the maintenance of fire's natural role in the boreal forest ecosystem is vital to the long-term viability of the Refuge's plant and animal communities. The Refuge Manager will in all cases consider the short-term impact of wildland fire use actions on subsistence activities. Managing for wildland fire use to benefit resources will not result in a significant increase in the number of Refuge acres burned.

C. PRESCRIBED FIRE

The purpose of a prescribed fire program is threefold: (1) to enhance and/or manipulate wildlife habitat (the Draft Koyukuk River Moose Management Plan has designated the highest priority to planning and implementing prescribed burns to maintain and/or improve moose habitat), (2) for hazard fuel reduction and (3) to maintain fire-related processes on a landscape basis. Specific goals of the program include:

1. Increase the production of forage utilized by big game species.

2. Increase new shoot production of graminoids and remove dead herbaceous growth along marsh margins to enhance known waterfowl nesting and muskrat habitat.

3. Increase edge effect and create vegetation mosaics by altering seral stages of vegetation and by breaking up large monotypic stands of black spruce.

4. Increase vegetative growth and diversity by removing dead and decadent old growth and recycling nutrients.

5. Reduction and removal of hazardous fuels, especially dead and decadent black spruce.

6. Restore fire's natural role in the Interior and maintain naturally-ignited fire as a dynamic ecosystem process.

7. Provide the public with interpretive opportunities to realize the effects of fire and the role of fire on the refuge by developing displays to be used at public presentations.

8. Provide opportunities for fire effects research.

Prescribed fire

Prescribed fire is an important habitat management tool on the Refuge. In many cases, it is the only cost effective and reliable means of habitat manipulation available. Prescribed fire may be implemented in any of the FMUs for the purposes of hazard fuel reduction, restoration of historic conditions or research. Wildlife habitat improvement and maintenance also benefits from prescribed fire actions. Prescribed fires within the Refuge must be conducted in accordance with a formal Prescribed Fire Plan. For prescribed fire within the Koyukuk Wilderness Area, the prescribed fire plan will contain a minimum requirement analysis (MRA).

Prescribed burn plans are written by Refuge FMO or Fuels Management Technician and reviewed by the Regional Fire Management Coordinator and approved by the Regional Chief of National Wildlife Refuge System. For informational purposes, copies of approved burn plans are provided to AFS and any other involved agency/party (such as the Alaska Department of Fish and Game, Gana A' Yoo or Doyon Limited). Execution and supervision of prescribed burn plans are the responsibility of the Refuge FMO. Local suppression resources (e.g. village EFF crews) may be utilized to supplement Refuge resources.

Monitoring and evaluation

Fuel moistures, weather and other appropriate prescription variables will be monitored pre-burn to ensure that desired conditions are present prior to initiating the burn.

All prescribed burns must have measurable objectives. Monitoring will be done to refine the prescription, if the need arises, and to document and verify that the stated objectives have been met. Both first and second order vegetation fire effects will be measured. The Refuge will use the Service Fire Effects Monitoring Reference Guide and regional monitoring standards when designing, implementing and refining monitoring protocols (see section VI. MONITORING AND EVALUTATION. Coordination with refuge biologists will be imperative for implementing a monitoring program. A plan for monitoring long-term effects will be written for the Refuge by the end of FY06 and included as an addendum to the FMP.

Primary fire behavior and environmental conditions that may need to be measured periodically during the prescribed fire operations are listed below:

Fire Behavior Measurements and Observations:

1. Rate of spread

2. Flame length
3. Flaming zone depth
4. Hours of active flaming/day

Environmental Conditions:

1. Temperature
2. Relative humidity
3. Midflame wind speed and direction
4. Estimate of atmosphere mixing and stability
5. Direction of smoke transport
6. Cloud cover
7. State of the weather
8. Fuel moisture
9. Duff moisture

Measurements should be obtained and recorded every hour during the active burning phase or as specified in the burn plan.

Evaluation of the burn should consist of a narrative of events that occurred during the operation, measurements taken during the burn, discussion of effects/results and at least a preliminary evaluation of whether the results accomplished the objective(s) stated in the burn plan. For prescribed burns that have fire effects objectives requiring longer-term studies, the evaluation and reporting schedule is also specified. Specific fire effects objectives will require specific means of measuring results and should be delineated in the prescribed fire burn plan. Frequently baseline pre-fire data will need to be obtained in order to establish measurable objectives.

Complexity, frequency and duration of monitoring activity will be dictated by burn objectives and will be specified by the prescribed fire burn plan.

Prescriptions

Prescribed fire burn prescriptions are not generic. Each plan will follow the prescribed fire plan format outlined in the Service Fire Management Handbook Chapter 1. Preparedness and Planning Exhibit 1-4-2 (see Appendix I). Each prescription needs to be tailored to specific needs. A detailed prescription is developed as a key part of each individual prescribed fire burn plan that focuses on site-specific objectives.

In general, prescriptions written for prescribed burns present a list of parameters (easily measured environmental conditions as mentioned above and time frames) within which the burn is allowed to proceed. A fire burning within these parameters can be reasonably expected to achieve the stated objectives without presenting a risk to adjacent resources.

Affected vegetation types

Over the long-term it is desirable to maintain a variety of seral stages across the whole Refuge. Within the next decade a desired future vegetative condition for the Refuge will be articulated based on an analysis of current vegetation and future habitat needs. Targeted vegetation types to burn at this time include black spruce forest, white spruce forest, broadleaf forest, mixed spruce/broadleaf forest, shrublands and graminoid-dominated openings. A description of these vegetation types is covered in section F. GENERAL REFUGE FIRE INFORMATION 4. Vegetation and fire effects.

Fire behavior parameters

Generally these include the type of fire, rate of spread, fireline intensity, flame length and energy release component. Fireline intensities that kill unwanted conifers and the above ground portion of herbaceous plants and deciduous shrubs are desirable. Fireline intensity, which is the measure or estimate of the heat per unit of length of fire edge per unit of time and expressed in BTUs/ foot/second can be correlated to the effect(s) fire will have on plant life and the likelihood of success in controlling a prescribed fire. Fires burning at high fireline intensities may cause unwanted plant mortality and be difficult or impossible for hand crews to control using direct attack. The Canadian Forest Fire Behavior Prediction System will be used to obtain estimates of the above fireline intensities. Fireline observation of flame lengths will validate these projections.

Overall, the duration of exposure should be relatively short unless exposure of bare mineral soil is desired. Smoldering fires are to be avoided, because duration of exposure to the flaming front affects the degree to which root systems are destroyed and usually creates an undesirable level of smoke.

Environmental parameters

Specific environmental conditions will be listed in each individual prescribed burn plan. They include soil moisture, 1-hour fuel moisture, 10-hour fuel moisture, 100-hour fuel moisture, woody live fuel moisture and litter/duff moisture.

Drought indices

The Canadian Drought Index (CDI) will be used to track drought conditions on the Refuge. The CDI will be used to determine whether or not prescribed burning can proceed. The Buildup Index (BUI) generated in the CDI system is a useful indicator of drying trends in the middle to deep portions of the organic layer of ground fuels and can help ascertain drought conditions. The BUI combines a Drought Code (DC) value and Duff Moisture Code (DMC) value, both of which are measures of subsurface drying of

organic fuels. The initial spread index (ISI) is an index of the fire weather index (FWI) system based on the fine fuel moisture (FFMC) code and the wind speed that provides a numerical rating of the relative expected rate of fire spread. The fire weather index combines the initial spread index and the buildup index to provide a numerical, relative rating of fire intensity. These codes and the Fine Fuel Moisture Code are started up each spring three days after the snow free date for each manual and remote automatic weather station.

Regional and National Fire Preparedness and Relative Fire Danger Levels will be used as trigger points in managing prescribed fires on the Refuge. Prescribed burning may be restricted when both the National and Regional Fire Preparedness Levels are at Level V. Prescribed burning may occur at National Fire Preparedness Level V and a Regional Fire Preparedness Level IV or lower upon receiving National Office approval. Burning at the Regional Fire Preparedness Level IV should be done with caution providing all contingency forces are available. No prescribed burning will occur at the HIGH (FFMC 87-90; DMC 80-90; DC 350-400; ISI 5-10; BUI 80-90;and, FWI 14-23) or VERY HIGH or EXTREME relative fire danger levels for Interior Alaska. Prescribed burning at the MODERATE fire danger level needs to be carefully assessed through the GO/NO GO checklist. ***Safety is the number one priority!*** These trigger points can be changed in the future by comparing seasonal risk analyses and historical weather information with historical fire activity levels and Canadian fire weather indices.

Phenologic parameters

Prior to green-up: In the shrub/grass fuel type, an early burn (April to mid-May) may be desirable where ground layer fuels are still relatively moist or on exposed sites where the snow has melted earlier than adjacent areas. Normally the only sites that will burn early in the spring are those dominated by grass. Southerly exposed broadleaf and shrubland sites can sometimes be burned from April to mid-May to remove leaf litter and dead downed material while there is still snow in adjacent spruce fuels.

Green-up through foliage maturation: Prescribed burn activities between early June and mid-July will be scheduled with caution. This is the peak of the fire season. Fires can quickly become difficult to control because of undesirable weather and fuel conditions. Pre-green-up fires should not be allowed to burn into this period, because they can cause problems.

Maturation of foliage: A very feasible time to burn in the black spruce fuel types is from mid-July to early September depending upon weather conditions and drought trends. The risk of problems occurring is reduced when the end-of-the-season weather event is imminent. Marsh margins can be burned between early August and early September once waterfowl broods have hatched and fledged. This is often the best time to burn shrubland and broadleaf forest sites if the summer has been somewhat dry.

Hazard and WUI fuels disposal

Prescribed fire can be used to dispose of fuels generated by hazardous fuel reduction activities, removal of hazard trees, general maintenance or construction activities. The Refuge FMO will review all hazard fuels disposal projects for complexity.

Contracts involving the generation and disposal of fuels will be developed in coordination with the Refuge FMO. All contracts and projects that produce vegetative debris will specify how and when to dispose of the debris. If fire is a potential disposal method, the Refuge FMO and the Regional Fire Management Coordinator must review and approve the contract stipulations related to debris burning. The project or contract must include funding for planning and conducting the debris burning including burn plan preparation and identify the qualified individual(s) responsible for the burning. Generally low complexity burns require a Burn Boss Type III and moderate complexity burns require a Burn Boss Type II. The contractor can provide the burn boss providing their qualifications can be verified or the Service can provide the burn boss.

Prescribed fire review

Planning review: All new or previously developed prescribed fire burn plans will be reviewed by the Regional Office during the scheduled year of implementation including a new signature page for previously developed plans. Burn plan review should be based on the complexity analysis:

i. Prescribed Fire Burn Boss Type 2 (RXB2) will review low or moderate complexity prescribed fire burn plans.

ii. A Prescribed Fire Burn Boss Type 1 (RXB1) will review high complexity prescribed fire burn plans.

iii. Depending upon the complexity of operations, prescribed fires involving the use of aircraft should be reviewed by either a RXB1 or RXB2 with operational aviation experience.

Prescribed fire burn plans will be written by the FMO, AFMO fuels management specialist or other fire staff member determined to be qualified by the FMO.

Operational review: For all prescribed fires not completed during the first burning period, the Refuge Manager or designated representative will certify in writing daily:

i. The prescribed fire is within prescription and is expected to remain so for the next 24 hours.

ii. Adequate funds are available to manage the prescribed fire.

iii. Sufficient fire management resources have been assigned or committed to manage the prescribed fire and implement the approved suppression alternative.

Suppression criteria: Prescribed fires will be suppressed on the Refuge if they threaten:

- To escape from predetermined units or from the Refuge, except where interagency agreements provide for certain fires to cross such boundaries.

- To exceed prescription and/or cannot be successfully managed under the existing prescribed burn plan.

The contingency section of each prescribed fire burn plan will clearly define what contingency actions constitute a significant departure from what was planned or expected and where conversion to a wildland fire is appropriate.

Policy allows the prescribed fire burn boss to take limited holding action(s) on prescribed fire outside of the planned perimeter. The limits of acceptable holding actions will be clearly stated in the prescribed fire burn plan. These limits may include:

1. Personnel requirements.

2. Locations i.e. acceptable area outside of the planned perimeter.

3. Cost limits.

4. Time constraints.

Once a prescribed fire is declared an unwanted wildland fire, a Wildland Fire Situation Analysis will be immediately completed by the Fire Management Officers from the Refuge and AFS - Galena or Tanana Zones to determine the appropriate management action to be taken. The completed WFSA is signed by the Refuge Manager. The fire may be placed under the management of an appropriate level Incident Commander. Transfer of authority to the Incident Commander is documented in a Limited Delegation of Authority. See page 36 of Appendix A. Alaska Interagency Wildland Fire Management Plan for further details.

Reclassification review

The Refuge Manager or designated representative will review all prescribed fires that are declared a wildfire. This review may be included as part of a regional or national level review if necessary. The purpose of the review is to determine why and under what circumstances a prescribed fire had to be declared a wildfire. It will identify the circumstances leading to the declaration of the fire, what actions were taken after declaration and possible future actions that need to be taken to avoid similar situations.

Air quality and smoke management

Since there have not been any recent prescribed burns on the Refuge, the following parameters will be followed unless the Alaska Department of Environmental Conservation requires more specific conditions to open burning permits.

- Materials burned are limited to natural vegetation.
- To the extent possible provide for optimum burning efficiency.
- Burning must not be conducted when smoke will have an adverse impact on people or residents.
- Prior notification must be given to the Alaska Department of Environmental Conservation, Alaska State Troopers, adjacent landowners and the Alaska Fire Service.
- The open burn permit is granted on either an individual or annual calendar year basis and must be re-applied for subsequent to each approval period. A report must be submitted at the end of each approval period to DEC specifying dates and acreage of all prescribed burns that occurred during that period on the Refuge.

Prior to each planned burn of greater than 40 acres, the Refuge FMO will submit the burn plan to DEC (State of Alaska Department of Environmental Conservation, Division of Air and Water Quality, 555 Cordova Street, Anchorage, AK 99501-(FAX) 907-269-7508). The burn plan will serve as the application to the DEC for written Open Burn Approval. Each Open Burn Approval will expire within five years of issuance. For further detail see Appendix G Alaska Enhanced Smoke Management Plan June 2004 (plan is under revision).

Emission calculations will be done using one of the emission models available at www.frames.gov/tools (e.g. SASEM, CONSUME, EPM - Emission Production Model, NPSPUFF or FOFEM plus hand calculations.

Qualifications needed

The following qualifications will be needed to accomplish the prescribed burning anticipated for the next five years: a minimum of one prescribed burn boss type 1 (RXB1), one prescribed burn boss type 2 (RXB2), one ignition specialist type 1 (RXI1), one ignition specialist type 2 (RXI2), one field observer (FOBS) or fire effects monitor (FEMO) and two to six firefighters (FFT2). See Appendix J for qualification requirements for each position.

Minimum documentation

The following minimum documentation will occur for each prescribed burn:

- Adding “burn day” information to the burn plan.
- A list of who participated in the burn.
- A list of who was contacted during the day of the burn.

- A copy of the weather forecast for the day of the burn and the projected weather for the next 3 days.
- A copy of the all fire behavior observations made during the burn.
- All post-burn observations.
- Photos taken prior to the burn, during the day of the burn and post burn.
- Any other correspondence pertaining to the burn.

A summary of all burn activity for the fiscal year will be completed by October 31 of each year and submitted to the Regional Fire Management Coordinator and AFS by November 5.

Annual prescribed burning activities

The following activities will need to be done each year prior to burning: (1) ensure that all prescribed fire burn plans are up-to-date and signed; (2) if needed, renew smoke management plans/permits; (3) review fire behavior and smoke dispersion model runs for each burn plan to determine whether or not they need to be updated; (4) maintain an "out-year" burn plan; (5) check "out-year" burn plan for NEPA and TES compliance; (6) check with Refuge biologist(s) regarding future prescribed burning opportunities; (7) make sure that the equipment needed to perform each burn is available and in good operational condition; (8) check availability and fireline qualifications of the staffing needed to accomplish each one of the burns, assess training needs of Refuge fireline personnel; and, (9) input burn plan information into FireBase, NFPORS, FMIS and FPA.

Long-term prescribed burn program

The Refuge does not have a long-term prescribed burn program established at this time. An interdisciplinary analysis of prescribed burning needs will be accomplished within the next five years.

D. NON-FIRE FUEL APPLICATIONS

Mechanical Fuel Reduction

The Refuge Manager may implement the use of power saws, mowers, hand tools or similar devices to mitigate hazard fuel buildup, mimic natural fire effects or recreate historical landscape/conditions in areas where prescribed fire would pose an unreasonable threat to life, property or resources. Each mechanical fuel reduction action must follow a written plan prepared by the Fire Management Officer (or designee) and approved by the Refuge Manager and the Regional Fire Management Coordinator. This plan will evaluate all possible options and long-term effects along with costs. Monitoring would occur to determine whether objectives were met. Established monitoring protocols described in the Fuel and Fire Effects Monitoring Guide will be followed. Implementation of each project will be the responsibility of the Refuge FMO.

E. EMERGENCY STABILIZATION AND REHABILITATION/RESTORATION

The objectives of emergency stabilization are: (1) to prescribe cost effective post-fire stabilization measures necessary to protect human life, property and critical cultural and natural resources; (2) to promptly stabilize and prevent further degradation to affected resources on lands within the fire perimeter or areas affected directly by wind or water erosion from the burned areas; and, (3) repair damages caused by fire suppression operations in accordance with approved land management plans and policies, and all relevant federal, state, and local laws and regulations.

The objectives of rehabilitation are: (1) to repair or improve lands damaged directly by the wildland fire and unlikely to recover naturally from severe wildland fire damage by emulating historic or pre-fire ecosystem structure, function, diversity and dynamics according to approved land management plans; (2) restore or establish healthy, stable ecosystems in the burned area, even if these ecosystems cannot fully emulate historic or pre-fire conditions as specified in approved land management plans; and, (3) repair or replace fire damage to minor operation facilities.

The procedures covered in the Service Fire Management Handbook Chapter 5 – *Interagency Burned Area Emergency Stabilization and Rehabilitation Handbook* will be followed for all burned area emergency stabilization and rehabilitation work. The following duties will apply to all emergency stabilization and rehabilitation work because the Emergency Stabilization and Rehabilitation (ESR) Plan preparation, review, approval and implementation requires immediate action and spans multiple program responsibilities:

1. **ESR Plan preparation** - Refuge Manager

2. **ESR Plan review**:

    - Compatibility and compliance - Refuge Manager
    - Fiscal - Regional Fire Management Coordinator

3. **ESR Plan approval**:

    - < $500,000 - Regional Director
    - > $500,000 - Chief, National Wildlife Refuge System
    - ESR Plan implementation - Refuge Manager
    - ESR Plan implementation oversight - Refuge Supervisor

F. REMOTE ACCESS WEATHER STATIONS (RAWS)

These sites will be used as needed to provide information when making decisions associated with fire suppression, wildland fire use and prescribed fire or making long-term weather predictions.

Currently there are three RAWS on the Refuge. They are located at (VABM "Octopus") LAT 66:00:00 LONG 157:34:33 (T7S, R6E, Sec. 12); (Cottonwood) LAT 65:20:20 LONG 155:56:56 (T2S, R14E, sec. 2; and, (Kaiyuh) LAT 64:25:24 LONG 158:06:06 (T12S, R4E, Sec. 29). The Bureau of Land Management maintains these sites annually.

V. ORGANIZATION AND BUDGET

A. REFUGE FIRE MANAGEMENT TEAM RESPONSIBILITIES AND QUALIFICATIONS

The FMO for the Refuge is a permanent full time shared position that also serves the Koyukuk, Nowitna, Innoko, Selawik and Yukon Delta National Wildlife Refuges. The staffing level is dependent upon the workload required to implement the fire management program. The Refuge fire management staff may participate in Refuge fire suppression assignments, including wildland fire surveillance/monitoring. The Refuge fire staff would also be available for Regional and National fire assignments during periods of high fire occurrence. Availability of any fireline qualified Refuge employee is based on the National planning level, the State planning level, Refuge staffing and supervisory approval.

Target staffing and qualifications for fire staff are in Table 2 below.

Table 2. Target Refuge fire staff positions and qualifications.

Staff Position	Target Qualifications
Fire Management Officer	Division/Group Supervisor (DIVS) Burn Boss Type 2 (RXB2)
Fire Ecologist (this would be a 4 year term position which would then be replaced by a AFMO)	*Field Observer (FOBS)* *Firefighter (FFT1)* *Ignition Specialist (RXI2) Prescribed Fire* *Holding Specialist* (HLDS) *Prescribed Fire*
Prescribed Fire/Fuels Specialist	*Field Observer* (FOBS) *Firefighter (FFT1)* *Ignition Specialist– (RXI2) Prescribed Fire* *Holding Specialist–(HLDS) Prescribed Fire*
Additional Refuge Staff	Firefighter (FFT2)

** Italics represents proposed positions to be filled at some future date to provide adequate fire staff for multi-refuge fire program, including prescribed fire program.*

Minimum fire qualifications position standards are being developed and will be implemented in the near future.

B. INTERAGENCY COORDINATION

Interagency coordination is critical for successful implementation of the Refuge fire management program, especially because fire suppression is delegated to another agency and fire has ecosystem-wide effects that affect neighboring land owners and managers: BLM, State of Alaska (Department of Natural Resources, Division of Forestry), Doyon Limited and Native corporations and/or tribal governments for the villages of Hughes, Huslia, Koyukuk, Nulato, Kaltag and Galena. Contacts are listed in Appendix L Contact List. The Alaska Interagency Wildland Fire Management Plan is an interagency agreement regarding how fire management activities will be handled in the State.

C. NORMAL UNIT STRENGTH/FIRE CACHE

Currently the normal unit strength for the Refuge consists of one individual, the FMO. Unique fire activities such as wildland fire use – Stage III or moderate/high complexity prescribed burns would involve additional staff from other refuges, AFS and/or from the National pool of fire resources. The Refuge maintains a fire cache of basic equipment for wildland fire suppression and prescribed fire use. Appendix M – Fire Cache Equipment lists the items maintained in the Refuge cache located in Galena. Additional fire equipment is available from the AFS Galena zone from about June 1 through August 15.

D. CURRENT AND FUTURE BUDGETS

The budget for FY04 was $119,000 funded by Preparedness (9131) plus $3000 for Wildland Urban Interface (9264). The 9131 budget also funds Refuge fire support activities (GIS and the Refuge Clerk). Future budget needs include funding a Refuge Fire Ecologist position and providing support to GIS and the Refuge Clerk. This would amount to an additional $100,000. Hazardous fuels will need approximately $2000 to $5000 annually (for the next five years) to maintain the seven administrative facilities/sites (Roundabout Repeater, Hog River Cabin, 3 RAWS stations and two Galena administrative sites). It is anticipated that 9264 (Wildland Urban Interface) funding will be needed in the future (next five years) to assist one or more villages with fuels reduction work. Those projects could each cost $100,000 to $200,000.

Fire Program Analysis (FPA) will eventually replace Firebase as the Service's fire budget analysis program. Alaska is one of four prototype areas currently working on the development of the FPA. The transition to the new program will begin with the implementation of Module I Preparedness and Planning in fiscal year 2005.

VI. MONITORING AND EVALUATION

A. INTRODUCTION

Monitoring and evaluation are the functions used to determine if the FMP is being implemented as planned to meet its goals and objectives. Wildland fire is one of the primary sources of disturbance on the Refuge. As such, it is integral to the management of the Refuge's wildlife and plant communities. Through monitoring and evaluation methods, we seek to better understand the relationships between fire and other refuge resources. Monitoring also helps us improve our wildland urban interface and hazardous fuels treatment techniques. It also provides documentation to show how we address our performance measures.

This chapter is divided into two primary sections: fire effects monitoring and implementation monitoring. Fire effects monitoring is focused on the ecological effects that result from fire management. Implementation monitoring covers the first five management components in this fire management plan (Introduction, Relationship to Land Management/Planning/Fire Policy, Wildland Fire Management Strategies, Wildland Fire Management Program Components and Organization and Budget) plus fire research. It provides guidance to insure that our actions within these areas meet the goals of the Refuge and are in compliance with other national and Service policies.

B. FIRE EFFECTS MONITORING

Fire effects monitoring applies to all aspects of the fire management program that involve changes on the ground. The goals of fire effects monitoring are:

- To understand the relationship of fire to the refuge resources, especially those dependent on early and advanced seral stage habitats.
- To determine the natural variability of fires on the Refuge, including occurrence, extent and severity.
- Establish long-term monitoring sites in vegetation communities or fuel types common to the Refuge and under-represented in existing state-wide monitoring efforts.
- Understand fire and treatment effects in different vegetation/fuel types to develop predictive capabilities for modeling fire distribution, spread and behavior.
- Refine fire regime and condition class maps of the Refuge as new information becomes available.
- Monitor the effectiveness of our treatments to insure that we have met our project objectives or can document unexpected results.

Until long-term monitoring plans are developed, fire effects monitoring is typically limited to collecting pre-burn or pre-treatment data, and for documenting effects within one year of the burn or treatment. Project plans should include discussions of which monitoring level would be implemented and should specify funding for monitoring to meet their objectives. The minimum variables of the three monitoring levels are described in Appendix K. An approved long-term monitoring plan must be completed if fire funding will be used to monitor sites beyond one year from the burn date.

Fire effects monitoring guidelines were developed to complement preliminary recommendations for monitoring by the IWFCG Fire Effects Task Group as well as Service monitoring guidelines. Although fire effects monitoring plans need to be designed to meet the specific objectives defined in burn or treatment plans, or in long-term monitoring plans, these guidelines describe the minimum set of variables to monitor in three levels of monitoring intensity (Levels I-III). Recommended protocols for collecting data for these monitoring variables are found in the

Service Fuel and Fire Effects Monitoring Guide (currently available at http://firer9.fws.gov/ifcc/monitoring/RefGuide).

Documentation of burn severity is a useful measure to understand fire effects and to protect vegetation response. Remote sensing techniques may be used to develop burn severity maps for fires greater than 300 acres. The normalized burn ratio technique developed by the National Park Service (NPS) is described on the FIREMON website currently available at http://fire.org/firemon/lc.htm. Developing burn severity maps may be applied under monitoring levels II or III described in Appendix K; however, because of the costs associated with this technique, Regional Office approval will be obtained prior to implementation. Ground-truthing methodology may follow either NPS protocols or a modified approach that allows for greater sample size depending on the objectives for monitoring.

C. IMPLEMENTATION MONITORING

The Fire Management Plan implementation is monitored for compliance with the National Fire Plan and resulting performance standards, National Wildlife Refuge System, Wildland Fire Management Program Strategic Plan (now in draft), Alaska Interagency Wildland Fire Management Plan, compatibility with refuge plans, support of the applicable National Wildlife Refuge System Strategic Plan "Promises" document and updates and national and regional policies of the Fish and Wildlife Service. The fire management staff will conduct annual reviews to determine if the FMP goals and objectives are being addressed.

The FMP outlines five management components: suppression, fire use, prescribed fire, non-fire fuels application, and emergency stabilization and rehabilitation; all require some level of monitoring and evaluation. These five components may have more specific plans that define implementation strategies, ecological effects of fire, and the relationship to monitoring goals. The goals listed in this chapter are not exhaustive and additional goals may be added as circumstances dictate. The Fire Management Officer and staff are responsible for the accomplishment and documentation of monitoring objectives.

Suppression*:* As described in Chapter IV.A., suppression activities can range from surveillance/ monitoring of limited fires to ground-disturbing suppression techniques to control of unwanted fires. Monitoring for any suppression level involves two phases. Phase one includes monitoring the fire while it is active. It documents the cause and location, size, fuels, management option (limited, modified, full and critical), spread potential weather, smoke characteristics, potential threats, tactics, constraints, public and firefighter safety, cultural resources and sensitive natural resources. Throughout the duration of the fire we will monitor spread, weather, fire behavior, smoke characteristics, potential threats, fire intensity and other information commensurate with the appropriate management response. The second phase includes the monitoring of post-fire ecological effects.

The Phase One implementation monitoring goals for suppression activities are:

- To ensure public and firefighter safety
- To determine if the suppression tactics being employed are compatible with the FMP, Refuge plans, and the smoke management plan.

- To determine if there are any critical sites or natural resources threatened.

- To gather daily situation data to validate or change the selected WFSA decision.

Phase Two monitors the effects the fire had on natural resources (see Fire Effects Monitoring). For fires where ground-disturbing suppression measures are taken to control the fire these additional monitoring objectives apply:

- Refuge fire staff will investigate the effects of firebreaks cut to mineral soil to determine if the risk of, or actual, erosion potential warrants stabilization measures. Surveillance of firebreaks will occur during the same season as the fire, if possible, and during the following summer.

- Firebreaks will be evaluated within one year of the fire to determine if rehabilitation activities are needed to meet refuge objectives.

Fire Use*:* Fire use involves two phases. Phase one is monitoring the fire while active and the second phase is monitoring the ecological effects of the fire. During phase one a three stage process is used to monitor the fire to determine if the fire meets planning and resource objectives. Specific guidelines are found in the Fire Management Handbook.

The implementation monitoring goals for wildland fire use are:

- To determine if the fire will remain within or exceed the Maximum Manageable Area.

- To determine short and long term implementation actions.

- To predict fire behavior and weather prognosis based on historical and current behavior and weather.

- Based on periodic fire assessments determine if current implementation actions are valid or need changing.

- To determine if the fire is meeting resource objectives as outlined in this fire plan.

- To provide a data platform from which to make decisions regarding risk, threats, and resource benefits.

Under phase two of wildland fire use, the same fire effects monitoring methods and procedures used above under suppression apply. A long-term plan, if needed, will be submitted to the Regional Fire Management Coordinator by February of the year following the fire.

Non-Fire Fuel Application*:* These are typically mechanical treatment activities designed to reduce the level of hazardous fuels or to alter vegetation structure and composition to meet Refuge resource objectives. The plan implementation monitoring goals for non-fire fuel applications are:

- To determine if non-fire fuel applications are compatible with Refuge goals and objectives.

- To determine if the fuel treatment(s) are meeting the treatment objectives.

Fuel treatment activities are project specific and will include monitoring of site characteristics that relate to fuel loading, vegetation change, residual vegetation density, and the anticipated amount of fuel reduction. Fuel treatment activities will constantly be monitored during the implementation phase as outlined in the project's monitoring specifications. Post-treatment assessment will include documentation of fuel reduction and vegetative change including whether the treatment met resource objectives. The level of post-treatment fire effects monitoring may be similar to that of suppression, wildland fire use, or prescribed fire; however, the treatment monitoring plan should specify the level and elements that will be monitored.

Emergency Stabilization and Rehabilitation*:* The implementation monitoring goals for emergency stabilization and rehabilitation are:

- To determine during a wildland fire event if stabilization efforts are required to prevent the further degradation of natural resources.

- To determine what actions of a non-emergency nature are required to rehabilitate a resource whether man-made or natural.

Due to varied fire characteristics and the conditions under which they burn, monitoring elements should be determined by incident specific attributes. Refer to the Interagency Burned Area Emergency Stabilization and Rehabilitation Handbook.

Prescribed Fires*:* The implementation monitoring goals for prescribed fire are:

- To determine if prescribed fires are compatible with refuge goals and objectives.

- To determine if prescribed fire plans are adequate to perform a prescribed fire.

Monitoring and evaluation are activities that must be accomplished before, during and after any prescribed burn or wildland use fire on the refuge to ensure the fire is burning within prescription, and to ascertain whether habitat/resource management objectives have been met. Monitoring activities are also important to ensure that the prescribed burn is accomplished safely and as a mechanism with which to make refinements for future prescribed burns. Prescriptions should be written so that fire behavior and environmental observations and measurements taken in the field can readily show whether the prescribed fire is in prescription or not. Prescribed fire objectives should be clearly written and measurable so that evaluation and determination of success can be readily accomplished. Some objectives may require more extensive pre-fire preparations and post-fire evaluation procedures than others. In addition to the Service's Fuel and Fire Effects Monitoring Guide, the National Park Service Fire Monitoring Handbook 2001 - Chapters 4 and 5 are a good reference when establishing a pre-burn monitoring program. The guidelines along with the recommendations of the AWFCG's Fire Effects Task Group (see Appendix K) should be followed when performing pre-burn surveys.

The primary fire behavior and environmental conditions that may need to be measured periodically during prescribed fire operations are listed in Table 3 below. Measurements should be obtained and recorded on a regular (every hour at a minimum) basis during the active phase of the burn or as specified in the burn plan. Periodic observations of fire behavior and environmental conditions may be entered on the Fire Surveillance Form (Appendix T).

Evaluation of the burn should consist of a narrative of events that occurred during the operation, measurements taken during the burn, discussion of effects/results, and at least a preliminary evaluation of whether the results accomplished the objective(s) stated in the burn plan. For prescribed burns which have fire effects objectives requiring longer term studies, the evaluation and reporting schedule should be described in the monitoring section of the burn plan. Specific fire effects objectives will require specific means of measuring results and should be delineated in the prescribed fire plan. In many cases, baseline pre-fire data will need to be obtained in order to establish measurable objectives.

Table 3. Fire behavior and environmental conditions.

Fire Behavior Measurements and Observations	Environmental Conditions
Rate of spread by fuel type. Measure of intensity by fuel type Fire character	Temperature Relative humidity Midflame wind speed and direction Estimate of atmospheric mixing, stability Direction of smoke transport Cloud cover State of the weather Fuel Moisture Duff Moisture

All activities involving fire must be in compliance with the Smoke Management Plan.

Post wildland fire monitoring: This type of monitoring will examine both short and long-term fire effects on vegetation. All post-fire monitoring will follow the monitoring protocols established in the Service Fuel and Fire Effects Monitoring Guide. Monitoring efforts will also comply with he AWFCG Fire Effects Task Group's list of minimum data to be collected post-fire. This information can be found in Appendix K.

***Fire research and monitoring*:** Interagency studies and research are encouraged on all prescribed burns planned on the Refuge and wildland fires that occur on the Refuge, as long as they do not adversely impact on-site fire management operations or management objectives. Monitoring schedules for prescribed burns will be specified in each burn plan. Long-term monitoring requires a written monitoring plan reviewed by the Regional Fire Ecologist and approved by the Regional Fire Management Coordinator along with adequate funding.

VII. PUBLIC SAFETY

Public safety is a critical concern of all aspects of the Refuge fire management program. Notification of the public is an initial step whenever fire suppression or prescribed fire activities are expected to occur. ***Safety of the public and fire management personnel takes precedence over all activities on the refuge***.

When a wildland fire occurs on the Refuge, the area in which the fire occurs will be checked for public users. If any are found, they will be contacted and advised of the fire hazard/danger. If a wildland fire occurs near an interior piece of property, the landowner will be advised of the situation. The Refuge staff will cooperate closely with the Alaska Fire Service and Alaska State Troopers in communicating and coordinating public notification, announcement of temporary flight restrictions and other emergency actions.

Notification lists are provided in all prescribed fire plans for prescribed burns on the Refuge. Prescribed fire burn plans include techniques/restrictions that try to direct smoke away from populated areas. Prior to ignition, all adjacent landowners and key public agencies in the area will be notified. A public service radio announcement will be aired on KIYU to notify the public of all prescribed burning and possible smoke hazard(s).

If smoke from a Refuge prescribed burn is transported into a populated area, the Alaska Department of Environmental Conservation will be notified and smoke control efforts will be immediately applied to the prescribed burn. Public health related to smoke exposure is an important concern of the Refuge. If smoke from Refuge fire activities presents a significant health hazard, the Refuge staff will take an active role in assisting the Alaska State Troopers and Alaska Fire Service in evacuating citizens who wish to be transported to an area outside of the hazardous particulate level area.

VIII. FIRE CRITIQUES AND ANNUAL PLAN REVIEW

The Refuge Fire Management Plan is updated every five years.

Refuge fire management option (fire suppression) maps are reviewed annually. Any changes in response levels or boundaries are submitted to AWFCG by March 15 of each year to allow for incorporation into the Alaska Fire Service's atlas and the map atlas held in the Alaska Interagency Coordination Center for the upcoming fire season.

All Type I and Type II fires that occur on the Refuge will have a debriefing scheduled prior to demobilization of the overhead team. The Refuge Manager and FMO and the Alaska Fire Service FMO - Galena Zone will attend the fire critiques. Other individuals may be requested to attend depending upon the complexity of the incident. Critiques on other fires may be scheduled if problems or events occur which warrant scheduling a critique.

IX. CONSULTATION AND COORDINATION

Consultation and coordination with the Alaska Fire Service is essential for all fire management activities that occur on the Refuge. A meeting will be scheduled each spring with the Alaska Fire Service – Galena and Tanana Zones to discuss upcoming fire management activities planned on the Refuge. At that time memorandums of understanding and cooperative agreements in effect will be addressed; Refuge equipment and personnel available for suppression will be identified; standard operating procedures regarding suppression responses and wildland fire use will be discussed; and, both agencies will familiarize themselves with each other's concerns and issues.

Regular contact is made with the Regional Fire Management Coordinator throughout the year to provide information on Refuge fire management activities and to obtain support to accomplish planned activities. The Regional Fire Management Coordinator reviews the Refuge fire management plan prepared by the Refuge. An annual Fire Management Accomplishments Report is prepared by the Refuge FMO to keep the Regional Fire Management Coordinator apprised of all Refuge fire management activities.

The Endangered Species Act Section 7 consultation along with cultural resources review and State Historic Preservation Officer approval will be handled through the Regional Office staff prior to implementation of any site disturbing project.

Appendix A. Alaska Interagency Wildland Fire Management Plan.

Appendix B. Enabling Legislation.

The following statutes authorize the Service to engage in wildland fire management and provide the means for managing wildland fires on and/or adjacent to refuge lands:

1. Protection Act of September 20, 1922 (42 Stat. 857; 16 U.S.C. 594). Authorizes the Secretary of the Interior to protect from fire, lands under his/her jurisdiction and to cooperate with other Federal agencies, States or owners of timber.

2. Federal Property and Administration Services Act of 1949 (40 U.S.C. 471 et seq.). Provides a system for the procurement, supply, utilization and disposal of property and services.

3. Economy Act of June 30, 1932 (47 Stat. 417; 31U.S.C. 1535). Authorizes Federal agencies to enter into contracts and agreements for services with each other.

4. Reciprocal Fire Protection Act of May 27, 1955 as amended by the Wildfire Suppression Act of 1989 (69 Stat. 66, 67; 42 U.S.C. 1856) (102 Stat. 1615). 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 fire when no agreement exists.

5. Wilderness Act of 1964, and as may be amended by ANILCA (see section 702 (7)). Provides direction for the use of fire in wilderness areas.

6. National Wildlife Refuge System Administration Act of 1966 as amended by the National Wildlife Refuge System Improvement Act of 1997 and the Refuge Recreation Act of 1962 (80 Stat. 927) (16 U.S.C. 68dd-68ee) (16 U.S.C. 460k-460k4). Governs the administration and use of the National Wildlife Refuge System.

7. National Environmental Policy Act of 1969. Provides the procedures for assessing environmental effects of specific actions.

8. Alaska Native Claims Settlement Act of December 18, 1971 (88 Stat. 668; 43 U.S.C. 1601). Alaska Native's lands are to continue to receive forest fire protection from the United States at no cost until they become economically self-sufficient.

9. Disaster Relief Act of May 22, 1974 (88 Stat. 143; 42 U.S.C. 5121). Authorizes Federal agencies to assist state and local governments during emergency or major disaster by direction of the President.

10. Federal Fire Prevention and Control Act of October 29, 1974 et seq. (88 Stat. 1535; 15 U.S.C. 2201). Provides for reimbursement to state and local fire services for costs of firefighting on Federal property.

11. Federal Grants and Cooperative Act of 1977 (Pub. L. 95-244, as amended by Pub. L. 97-258, September 13, 1982, 96 Stat. 1003; U.S.C. 6301-6308). Eliminates unnecessary administrative requirements of Government awards by characterizing the relationship between executive agencies and contractors, States and local governments and other recipients in acquiring property and services in providing U.S. Government assistance.

12. Alaska National Interest Lands Conservation Act of December 2, 1980 (94 Stat. 2371, 43 Stat. U.S.C. 1602-1784). Designates certain public lands in Alaska as units of the National Park, National Wildlife Refuge, Wild and Scenic Rivers, National Wilderness Preservation, and National Forest systems resulting in general expansion of all systems. Any contracts or agreements with the jurisdictions for fire management services listed above that were previously executed will remain valid.

13. Master Memorandum of Understanding Between the Alaska Department of Fish and game Juneau, Alaska and the U.S. Fish and Wildlife Service Department of Interior Anchorage, Alaska March 13, 1982. The Service agrees: 4. To manage the fish and wildlife habitat on Service lands so as to insure conservation of fish and wildlife populations and their habitats in their natural diversity.

14. Supplemental Appropriation Act of September 10, 1982 (96 Stat. 837). Authorizes the Secretary of the Interior and Secretary of Agriculture to enter into contracts with State and local government entities, including local fire districts, for procurement of services in pre-suppression, detection, and suppression of fires on any unit within their jurisdiction.

15. Wildfire Suppression Assistance Act of 1989, (Pub. L. 100-428, as amended by Pub. L. 101-11, April 7, 1989). Authorizes reciprocal fire protection agreements with any fire organization for mutual aid with or without reimbursement and allows for emergency assistance in vicinity of agency facilities in extinguishing fires when no agreement exists.

16. Final Report on Fire Management Policy by Interagency Fire Management Policy Review Team, May 5, 1989. Further clarifies procedural management of wildland and prescribed fires.

17. Koyukuk National Wildlife Refuge Northern Unit of Innoko National Wildlife Refuge Comprehensive Conservation Plan, Environmental Impact Statement, and Wilderness Review – Final October 1987. Addresses topics of resource management, visitor use, refuge operations and development in general terms.

18. National Wildlife Refuge System Improvement Act of October 9, 1997. Directs refuges to maintain the biological integrity, diversity and environmental health of the Refuge System.

19. Review and Update of the 1995 Federal Wildland Fire Management Policy, January 2001. Specifies a uniform wildland fire policy for all Federal agencies.

20. National Fire Plan 2000. Contains 5 key points that provide direction for all Federal agencies involved in wildland fire management.

21. Healthy Forests Restoration Act, December 3, 2003. Focuses on reducing the risk of catastrophic fire.

Appendix C. Key Points of the National Fire Plan, 2001 Federal Fire Policy Guiding Principles, A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy and Implementation Plan and U.S. Fish and Wildlife Service – National Wildlife Refuge System Wildland Fire Management Program Strategic Plan 2003-2010.

Key Points of the National Fire Plan (*NFP*)

1. Firefighting. Continue fighting fires and be adequately prepared.

2. Rehabilitation and Restoration. Restore landscapes and rebuild communities damaged by wildfires.

3. Hazardous Fuel Reduction. Invest in projects to reduce fire risk.

4. Community Assistance. Work directly with communities to ensure adequate protection.

5. Accountability. Be accountable and establish adequate oversight, coordination, program development, and monitoring for performance.

2001 Federal Fire Policy Guiding Principles (*Guiding Principles*)

1. Firefighter and public safety is the first priority in every fire management activity.

2. The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the planning process.

3. Fire management plans, programs, and activities support land and resource management plans and their implementation.

4. Sound risk management is a foundation for all fire management activities.

5. Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives.

6. Fire management plans and activities are based upon the best available science.

7. Fire management plans and activities incorporate public health and environmental quality considerations.

8. Federal, State, tribal, local, interagency, and international coordination and cooperation are essential.

9. Standardization of policies and procedures among federal agencies is an ongoing objective.

A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy and Implementation Plan (*10-Year Strategy*)

Primary Goals:

6. Improve Prevention and Suppression

7. Reduce Hazardous Fuels

8. Restore Fire Adapted Ecosystems

9. Promote Community Assistance

Guiding Principles:

1. Priority setting that emphasizes the protection of communities and other high- priority watersheds at-risk.

2. Collaboration among governments and broadly representative stakeholders.

3. Accountability through performance measures and monitoring for results.

U.S. Fish and Wildlife Service - National Wildlife Refuge System Wildland Fire Management Program Strategic Plan 2003-2010 (*Service Strategy*)

Goal A: Improve Fire Prevention & Suppression

Long Term Objectives:

a. Eliminate loss of life, and reduce firefighter injuries and damage to communities and the environment from severe, unplanned and unwanted wildland fires.
b. Improve Federal, state, and local firefighting resources capability and readiness to protect communities and the environment from wildland fires.
c. Reduce large fire suppression costs.

Goal B: Reduce Hazardous Fuel, and Restore and Rehabilitate Fire-Adapted Ecosystems

Long Term Objectives:

d. Treat hazardous fuels, using appropriate tools, to reduce the risk of unplanned and unwanted wildland fire to communities and to the environment.
e. Restore, rehabilitate, and maintain fire-adapted ecosystems, using appropriate tools, in a manner that provides sustainable environmental, social, and economic benefits, to conditions that meet the goals of refuge Comprehensive Conservation Plans and Habitat Management Plans.
f. Complete and amend all fire management plans to comply with Federal Wildland Fire Policy.

Goal C: Promote Community Assistance

Long Term Objective:

g. Increase capability of communities at risk to prevent losses from wildland fire and the potential to seek economic opportunities resulting from treatments and services.

Goal D: Improve Human Capital and Work Force Management

Long Term Objective:

h. Implement a wildland fire management program that meets the highest standards of professional capability and technical expertise.

Goal E: Improve Awareness and Outreach

Long Term Objective:

Public, non-governmental organizations, partners, and Service employees understand the role of fire in refuge and ecosystem management, and make informed decisions about its use.

Appendix D. Decision Criteria Checklist.

Back

Exhibit 3-3-3: DECISION CRITERIA CHECKLIST

Decision Element	Yes	No
Is there a threat to life, property, or resources that cannot be mitigated?		
Are potential effects on cultural and natural resources outside the range of acceptable effects?		
Are relative risk indicators and/or risk assessment results unacceptable to the appropriate Agency Administrator?		
Is there other proximate fire activity that limits or precludes successful management of this fire?		
Are there other Agency Administrator issues that preclude wildland fire use?		

The Decision Criteria Checklist is a process to assess whether or not the situation warrants continued wildland fire use implementation. A “Yes” response to any element on the checklist indicates that the appropriate management response should be suppression-oriented.

Recommended Response Action (check appropriate box)	NO-GO (Initial attack/suppression action)	
	GO (Other appropriate management response)	

Signature	Date

Appendix E. Wildland Fire Situation Analysis (WFSA).

U.S. Fish & Wildlife Service

Fire Management Handbook

[Introduction] [Gen. Instructions] [Complexity] [Pre-attack WFSA]

Home

What's New

Preparedness
Program Mgt.
FIREBASE
Prevention
Planning
Qualifications
Financial Mgt.

3.4 WILDLAND FIRE SITUATION ANALYSIS

3.4.1 INTRODUCTION

The WFSA is a decision process that employs a systematic and reasonable approach to determine the most appropriate strategy for a particular situation. Reasonable suppression alternatives are identified, analyzed and evaluated, and are consistent with the expected probability of success/consequences of failure. The agency administrator (Refuge Manager or acting Refuge Manager) shall approve the WFSA and any revisions. Evaluation criteria include anticipated suppression costs, resource impacts, and environmental, social, and political considerations. The evaluation of alternatives must clearly identify the point at which the failure of the alternative is imminent. This becomes the triggering mechanism for re-evaluation of the WFSA.

3.4.2 WFSA GENERAL INSTRUCTIONS

- FIRE SITUATION - This portion of the analysis is intended to provide basic information on the fire, including identification of fire, dates and times of the analysis, and the location of the fire.

Records & Reports

Prescribed Fire
Introduction
Operations
Smoke Mgt.

Wildland Fire
Preparedness
Operations
Fire Use
WFSA
Introduction
Gen. Instructions
Complexity
Pre-attack WFSA]
Business Mgt.
Reviews

Fire Trespass
Investigations
Cost Determinations
Civil Cases
Criminal Cases
Glossary
References

Rehabilitation

- Fuels: Type. Describe the fuels in the area in terms which will be useful for analysis purposes, i.e., mature sagebrush, young ponderosa pine, grass, etc.
- Fire Behavior: Current. Briefly discuss the fire weather in terms of temperatures, wind and daily patterns. Describe the fire in non-technical terms, such as creeping, spotting, crowning, etc. Discuss the flame lengths, rates of spread, etc. Predicted. Describe what the future course of the fire will be based on the predicted weather patterns, fuels and topography in the presence of the fire, and any other pertinent factors.

- OBJECTIVES AND CONSTRAINTS - Specify criteria which must or should be considered in the development of alternatives. Economic criteria might include closure of all or portions of the refuge, thus impacting concessionaire, or impacts to transportation or communications system. Environmental criteria might also include management objectives, airshed, water quality, etc. Social or external criteria would include any local attitudes toward fire or smoke that might affect decisions on the fire, safety, etc. Other criteria might include the 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.
- ALTERNATIVES - Develop alternative plans to control the fire. These will be the results you expect to achieve. All alternatives may have the same general plan, but may have different specific plans. Or there may be different general plans with similar specific plans. A map must be prepared showing each alternative. The map should be based upon the "calculation of probabilities" and include other relevant information. A "no suppression" alternative is not acceptable. An alternative which does not meet all "must" criteria is not acceptable.
  - Strategy. Briefly state the alternative strategies for management of the fire. Use geographic names, locations, etc. Roughly designate each strategy on a map.
    - Allow fire to play a natural role
    - Aggressive Attack
    - Sustained Attack
    - Other strategies as appropriate
  - Tactics. Briefly discuss tactical considerations, including general estimates of suppression forces required to accomplish the strategic plan.
    - Direct attack
    - Indirect attack
    - Parallel attack
    - Containment
    - Surveillance
    - Other tactics as appropriate
  - Resources: Include equipment, aircraft, and personnel resources.
  - Estimated Probability of Success. Base estimates for 0-100% for each alternative strategy.
  - Estimated Date of Control. Estimates for each alternative should be made based on predicted weather behavior factor, barriers, fuels, etc.,

and the effects of suppression efforts.

- ANALYSIS OF EFFECT - The analysis is based on the best estimates of the refuge, resource and fire managers. Fire effects may be negative, cause no change, or may be positive. Employ those evaluations most useful to the specific situation. Some examples: 1) a system which employs a "-" for negative effect, a "0" for no change, or 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. It may be that actual dollar values for resources are available. If so, these would be an especially valuable tool. Use those methods most useful to managers. Cost plus loss is the sum of losses from market elements, non-market elements, social elements, and suppression costs.
- EVALUATION -
  - Economic. Evaluate any economic criteria against each alternative. Include improvements, visitor use, concessions, fee enhancement, etc.
  - Environmental:
  - Soils. Identify any soil problems which may occur as a result of the fire (water repellency information, etc.).
  - Water/Watershed. Indicate decreases in water quality due to vegetation loss. Consider the potential for increased water yield as a result of vegetation losses.
  - Visual/Recreation. Loss of alternative vegetation, short-term blackened and charred landscape. Consider potential for more attractive views with introduction of vegetative mosaics.
  - Air Quality. Consider the problem of smoke in populated areas or during scenic periods of time. Analyze the vicinity of the fire for those areas where smoke could cause a hazard by obscuring highway or airport visibility. Off-site as well as on-site effects must be considered.
  - Wilderness. Values may include fire as a natural process. Does a wilderness or wilderness study area have a fire management plan allowing a fire to burn under certain conditions? Do managers want fire in the wilderness? Must fire be kept out of the wilderness to preserve wilderness characteristics?
  - Wildlife. Consider the damage done to wildlife due to loss of critical habitat or loss of cover. Positive benefits may include vegetation diversity, increased edges, and more vegetation available for wildlife because of sprouting in burning brush.
  - Fuel Reduction. If a serious hazard has built up and is identified, it may be advisable to allow the fire to remove the fuel.
  - Social:
  - Safety. No alternatives will be selected which endanger the lives of the public or of firefighters. Any fire or portion of a fire endangering human life will receive immediate, aggressive, and sustained attack.
  - Property and Improvements. Any fire or portion of a fire endangering property will receive immediate and sustained attack, consistent with public and firefighter safety.

- Political Consideration. Designate any concerns other public agencies may have in regard to one or all of the suppression strategies, or specify areas of specific concern to the other agencies. This could include such things as use of equipment in and around refuge boundaries, areas of cultural resources, etc.
- Other: Add any additional factors which may be unique to the area or situation, such as rare and endangered plants or animals, or by other considerations not previously mentioned.

- DECISION TREE - The Decision Tree is a discussion and justification as to why preferred alternative was selected based on the evaluation criteria.

A downloadable Wildland Fire Situation Analysis form in Wordperfect format is provided.

A computerized Wildland Fire Situation Analysis program - WFSA Plus - is an automated alternative to the manual form. The software and user's manual can be found on the WFSA web site.

3.4.3 A GUIDE FOR ASSESSING FIRE COMPLEXITY (Exhibit 3-4-1)

The linked questions are presented as a guide to assist the Refuge Manager(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:

- Analyze each element and check the response "yes" or "no."
- 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.
- 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.
- 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.

Rare 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.

3.4.4 PRE-ATTACK WILDLAND FIRE SITUATION ANALYSIS

The Pre-attack WFSA (Exhibit 3-4-2)is a WFSA that is completed by the refuge staff during the pre-attack planning process. It translates refuge fire management objectives into a concise action document which determines initial suppression strategy. To ensure that all important decision criteria are adequately addressed during the initial stages of a fire emergency, selective use of a pre-attack WFSA is recommended. Although this process applies in any refuge with identified suppression zones, it is most useful in those refuges, or portions of refuges, with only one viable suppression alternative. The pre-attack WFSA will serve as the framework for a WFSA if the fire exceeds the parameters of the selected alternative.

Back

Exhibit 3-4-1: WILDLAND FIRE COMPLEXITY ANALYSIS GUIDE

FIRE BEHAVIOR: Observed or Predicted	
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.	Yes/No
2. Potential exists for "blowup" conditions (fuel moisture, winds, etc).	Yes/No
3. Crowning, profuse or long range spotting.	Yes/No
4. Weather forecast indicating no significant relief or worsening conditions.	Yes/No
TOTAL	Yes/No

RESOURCES COMMITTED	
1. 200 or more personnel assigned.	Yes/No
2. 3 or more divisions	Yes/No
3. Wide variety of special support personnel.	Yes/No
4. Substantial air operation which is not properly staffed.	Yes/No
5. Majority of refuge initial action resources are committed.	Yes/No
TOTAL	Yes/No

REFUGE RESOURCES THREATENED	
1. Urban interface.	Yes/No
2. Refuge developments and facilities.	Yes/No
3. Cultural sites.	Yes/No
4. Restricted, threatened or endangered species habitat.	Yes/No
5. Unique natural resources, special designation zones, wilderness.	Yes/No

6. Other special resources	Yes/No
TOTAL	Yes/No

SAFETY	
1. Unusually hazardous fireline conditions.	Yes/No
2. Serious accidents or fatalities.	Yes/No
3. Threat to safety of refuge visitors from fire and related operations.	Yes/No
4. Refuge restrictions and/or closures in effect or being considered.	Yes/No
5. No night operations in place for safety reasons.	Yes/No
TOTAL	Yes/No

JURISDICTION	
1. Fire burning or threatening more than one jurisdiction.	Yes/No
2. Potential for claims (damages).	Yes/No
3. Different or conflicting management objectives.	Yes/No
4. Disputes over suppression responsibility.	Yes/No
5. Potential for unified command.	Yes/No
TOTAL	Yes/No

EXTERNAL INFLUENCES	
1. Controversial wildland fire policy.	Yes/No
2. Pre-existing controversies/relationships.	Yes/No
3. Sensitive media relationships.	Yes/No
4. Smoke management problems.	Yes/No
5. Sensitive political interests.	Yes/No
6. Other external influences.	Yes/No

TOTAL	Yes/No

CHANGE IN STRATEGY	
1. Change in strategy to control from confine or contain.	Yes/No
2. Large amounts of unburned fuel within planned perimeter.	Yes/No
3. WFSA invalid or requires updating.	Yes/No
TOTAL	Yes/No

EXISTING OVERHEAD	
1. Worked two operational periods without achieving initial objectives.	Yes/No
2. Existing management organization ineffective.	Yes/No
3. Overhead over extended themselves mentally and/or physically.	Yes/No
4. Incident action plans, briefings, etc. missing or poorly prepared.	Yes/No
TOTAL	Yes/No

Back

Exhibit 3-4-2: SAMPLE PRE-ATTACK WFSA

Region: 1 Refuge: Coot Creek NWR

Fire Name: Muck Creek Pre-Attack WFSA

Narrative: This is information to be used as pre-attack Wildland Fire Situation Analysis to provide guidelines to the Agency Administrator/Agency Advisor for development of a joint WFSA with the U. S. Forest Service and Fire Council under Unified Command Situations.

III. EVALUATION CRITERIA

For each category, develop the Agency Administrator's decisions on specific objectives, expressed as measurable criteria, to be used in the selection of the

preferred alternatives.

CRITERIA: Check those criteria which MUST be met:	MUST
Economic: Impoundment (Reservoir) Water Quality	X
Power Line Integrity - Utilities	X
Pintail Valley Complex	X
Concessionaire Facilities	X
Road and Trail Network	
Government Facilities	X
Environmental: Watershed Influences	
Threatened and Endangered Species	X
Soil Protection	
Overstory (Oak-Pine) Protection	
Wildlife Habitat	
Social: Airshed Quality	
Lakeshore Aesthetics	
Hunting, Fishing Habitat	
NEED Environmental Camp	X
In-Holder Developments	X
Crystal Creek Conservation Camp	X
General Outdoor Recreation	
Other: Archeological and Cultural Resources	X
Lighthouse Historic Building	X
Oil Wells	
Mineral Claims	
Neighboring Lands	

IV. ALTERNATIVES

	A	B	C	D
GENERAL PLAN OF CONTROL (STRATEGIC)	Full Fire Control 10 a.m. Control of all fires (lst burning period)	Confine within topographical break, with in 2nd burning period. Fire management using modified suppression	Confine within topographical break with in 3rd burning Fire management using modified suppression	Confine to Whiskey town lands. Fire management using modified suppression
SPECIFIC PLAN OF CONTROL (TACTICAL)	Direct Attack of Perimeter	Direct/Indirect Attack of Perimeter	Indirect Attack of Perimeter	Indirect Attack of Perimeter
PROBABILITY OF SUCCESS	97%	90%	75%	50%
ESTIMATED CONTROL TIME	<12 hrs.	24 hrs.	48 hrs	>48hrs

V. EFFECTS

	A.	B.	C.	D.
Final Estimated Size:	10	100	1000	10,000
MARKET ELEMENTS -				
Timber	n/c	+	-	---
Improvements	-	--	---	---
Recreation	n/c	++	++	---
Wilderness	n/c	n/a	n/a	n/a
Hunting	+	+	+++	++++
Fishing	n/c	-	---	___
Forage	n/c	-	---	___
Water	n/c	n/c	n/a	n/a

Sum of Resource Damage	$ 0	$ 0	$ -5	$ -11
NON-MARKET ELEMENTS				
Air	-	--	---	---
Visual	n/c	n/c	-	--
Fuels	n/c	+	++	++
T&E species	n/c	-	-	-
Sum of Resource Damage	$ -1	$ -2	$ -3	$ -4
SOCIAL ELEMENTS				
Firefighter safety	-	--	--	--
Employment	n/c	n/c	n/c	+
Public concern	+++	+	-	---
Public safety	+++	+	-	---
Cultural	+++	+	-	---
Other -	+	+	-	-
Sum of Social Damages	$ +9	$ +2	$ -6	$ -11
Sum of Losses	$ +8	$ +0	$ -14	$ -26
Suppression Costs	$ 2000/ac. 20k	$ 1000/ac. 100k	$ 225/ac. 225k	$ 225/ac. 2250k
Cost Plus Loss	$ n/a	$ n/a	$ n/a	$ n/a

VI. EVALUATION

Criteria (Section III)	A.	B.	C.	D.
Economic	Small impact. All-out suppression effort. Minimum damage to structures and developments.	Favorable for wildlife and hunting management. Better access for outdoor recreation. Likely to power facilities and/or threaten structures. Possible litigation for escapes.	Advantages in wildlife and hunting offset by forest and watershed damages. Direct threats to power facilities structures and human values. Improved access for general recreation. Possible litigation for escapes.	
Environmental	Little direct impact from fire. Full rehabilitation required.	Airshed impacted for short time. Some soil loss. Mosaic effect to fire/unburned islands. Fuel reduction. Potential impact to eagle nests. Full rehabilitation required.	Airshed impacts for 2 days. Some watershed damage. Fuel reduction of fine fuels, creates fire in large sizes, including snags. Potential impact to eagle nests. Extensive rehabilitation required.	Airshed impact for duration of incident considerable. Watershed damaged. Fuel reduction fire fuels offset by increase in large fuels and many snags. Potential impact to eagle nests. Conversion of wetland shrubs to meadow. Rehabilitation

				plan required for extensive work.
Social	Formal contract with contractors to be complied with. Public concerns satisfied. Cultural resources protected.	Unified Command in ICS. Partial closure of refuge where affected. Oil wells in area. Bulldozers restricted.	Unified Command in ICS. Resource advisor from FWS in plans. Refuge personnel fully committed. Closure of refuge where affected. Cultural resources protected, oil wells in area. Bulldozers restricted.	
Other		Press release at control.	Public information function mobilized. Other agencies fully informed.	

SELECT ALTERNATIVE

Selected Alternative: A then B then C then D

Justification: (document the rationale, criteria, value change, available resources, etc., for selection for this alternative)

1. Human values to risk from modified suppression actions
2. Potential watershed damage from high intensity fires.
3. Rehabilitation will be extensive on large fires.

4. Large scale forest fire will convert to chaparral type
5. Unified Command and USFS-NPS-FWS for incident manage incident.
6. Full suppression of wildland fire is the order.
7. Direct attack, going indirect when necessary for fire fighter safety to contain fire at smallest possible size, in the quickest time.
8. Constraints are placed on bulldozers. They are permitted by request for specific assignments only.
9. Rehabilitation will be done as specified in fire management plans, before personnel or equipment are released from fire.
10. Pre-attack guidelines are in the Fire Management Plan.

Public information direction (for keeping public informed of situation) shall be developed as appropriate:

1. Refer to the Fire Management Plan for specific direction.
2. Refuge Manager designate Information Officer.
3. Cooperation with Emergency Coordination Center for complex situations.

Appendix F. Federal Interagency Wildland Firefighter Medical Qualification Standards Introduction.

FEDERAL INTERAGENCY
WILDLAND FIREFIGHTER
MEDICAL QUALIFICATION
STANDARDS
INTRODUCTION

Introduction
The Federal Fire and Aviation Leadership Council authorized an interagency team to address a common perception that the present physical examination processes for employees who participate in arduous wildland fire fighting duties are not adequate.
The team underwent basic firefighter training, gathered information on the present procedures involved with physical examinations, reviewed relevant studies, interviewed fire managers and firefighters (both in an office setting and on the fire line) and discussed their findings.
It was the consensus of the team that the current physical examination process is inadequate for the intended purpose of reasonably assuring a level of employee health necessary so that the employee will not be at unnecessary risk, or put others at risk, in performing arduous duties associated with firefighting. There were very real questions concerning whether the physician was given enough information to make

a medically sound judgement of whether the individual being examined could safely perform the duties required by these positions. There was also the question of what relevant health factors should be assessed and what was the most effective and economic method of assessment.

Current Practices

The current practices used by the five wildland firefighting agencies vary widely, and none of these practices were viewed as acceptable neither from a good medical practice standpoint, nor from a potential legal standpoint considering changes in federal disability employment regulations brought about by the Rehabilitation Act of 1973 (Public Law 93-112).

At present, Department of the Interior land management agencies use a variety of government forms and provide varying levels of information to examining physicians in connection with firefighter physicals for present and prospective employees.

Information and forms provided by these agencies include:

BUREAU OF INDIAN AFFAIRS

Standard Form No. 78, Certificate of Medical Examination

- Appendix A-#6 STATEMENT OF PHYSICAL ABILITY FOR ARDUOUS/HEAVY PHYSICAL WORK
- 53 BIAM(manual) SUPPLEMENT 8, FOREST AND RANGE MANAGEMENT, Fire Management Operations

FISH AND WILDLIFE SERVICE

- Standard Form No. 78, Certificate of Medical Examination
- Form 1400-108, Physical Requirements for Firefighters and Smoke jumper Positions
- Explanatory material (pages 1.5-17 through 1.5-20) from the Fire Management Handbook.

2

BUREAU OF LAND MANAGEMENT

- Standard Form No. 78, Certificate of Medical Examination
- Form 1400-108, Physical Requirements for Firefighters and Smoke jumper Positions
- SPECIFIC INSTRUCTIONS TO PHYSICIAN

NATIONAL PARK SERVICE

- Standard Form No. 78, Certificate of Medical Examination
- Physician Response Memo
- PERSONAL HEALTH HISTORY QUESTIONNAIRE
- PHYSICAL EXAMINATION POLICY AND PROCEDURES
- Instruction letter to physician
- PRE-APPOINTMENT PHYSICAL EXAM REIMBURSEMENT VOUCHER

Once an examination is completed, the common practice is for the examination results to be forwarded to the Servicing Personnel Office of the employing agency. The Servicing Personnel Office reviews the Standard Form 78 to determine whether the examining physician has marked, in the conclusions block, either “No limiting conditions for this job” or “Limiting conditions as follows:” If “No limiting conditions for this job” is marked, the individual is either hired, or, in the case of a present federal employee, is allowed to participate in arduous duties. If “Limiting
conditions as follows:” is marked, the Servicing Personnel Office meets with agency management to determine whether a reasonable accommodation can be made.

U. S. FOREST SERVICE

The U. S. Forest Service currently has not initiated a medical review/medical clearance program for firefighters.

Perceived problems with the current practices include:

• Lack of consistency among agency programs even though wildland firefighters from different agencies frequently perform the same duties side by side.
• Lack of a formal documented waiver/accommodation process for firefighters who do not meet medical standards.
• Lack of a comprehensive medical history as part of the examination process.
• Examination form(s) which are inconsistent with needed elements of the examination.

3

Federal Interagency Medical Qualification Standards Program

Highlights

The medical qualification program presents several significant departures from current agency practice. These changes include:

Personnel Required to Administer the Program

Servicing Personnel Office(r) (SPO) - The servicing personnel office(r) is responsible for providing appropriate medical forms to GS/WG seasonal temporary position and permanent position applicants.

Fire Management Office(r) (FMO) – The fire management office(r) is responsible for providing appropriate medical forms to incumbent personnel and AD/EFF firefighters.

Central Medical Consultant (CMC) - A central medical consultant is needed to provide medical interpretation of the findings of medical examinations, medical histories, provide quality assurance/quality control on medical documents, and provide medical clearance determinations on the baseline, periodic, and exit examinations. This CMC should be a licensed medical care provider, with experience in occupational health and wildland firefighting. Training may be required in recognition of the medical conditions that may represent a substantial risk of harm in the performance of arduous wildland firefighting duties.

Medical Review Officer (MRO) - The Interagency Wildland Firefighter Medical Qualification Program includes the formal designation of a Medical Review Officer who can interpret adverse medical findings using actual knowledge of the condition under which wildland firefighters duties are performed. The designation of an MRO may be done on an agency or interagency basis, depending upon specific needs. The MRO must be familiar with wildland firefighter operations in order to render expert opinions relating to medical fitness. While the examining physician may see one or a few firefighters and can reasonably render a fitness determination when there are no potentially disqualifying medical conditions, the MRO will see and render a consistent medical recommendation on all firefighters who have any medical condition that may (or may not) be disqualifying. The examining person will be licensed to conduct physical examinations and familiar with general physical examination procedures while the MRO will be a board certified or board eligible occupational medicine physician with intimate knowledge of the conditions of employment.

Program Manager - The Interagency Wildland Firefighter Medical Qualification Standards program includes the formal designation of an overall Program Manager who will provide tracking and continuity to the second level review process. This individual will track and review incoming medical files for completeness, and control the flow of medical files to the MRO. This individual should have a background in wildland firefighting and expertise in safety. Ideally the Program Manager will be a member of the Interagency Medical Review Board. This position is a full time responsibility.

4

Interagency Medical Review Board - The Interagency Wildland Firefighter Medical Qualification Standards program includes the formal designation of a overall Interagency Medical Review Board (IMRB) that will provide a variety of professional expertise to the second level

review process. The Board members will ideally come from a variety of backgrounds including occupational safety, occupational medicine, wildland firefighting safety, management, union, human resources, etc. The board will take medical review findings from the MRO and determine, with input from the SPO and local management, whether any waiver or accommodation is pertinent to the individual case. The IMRB will consider the specific details of each second level review on a case by case basis, providing continuity to the overall program.

Timing (See next page for a quick reference chart)

Incumbents or Applicants for permanent positions Less Than 45 Years Old

A medical history and physical examination are to be conducted and the "Medical History, Examination, and Clearance Form" completed **every five years**. In those years in which an exam is not scheduled, an "Annual Medical History and Clearance Form" is to be completed by the firefighter. Every year, therefore, the appropriate form is to be completed and reviewed prior to scheduling an arduous duty performance test (currently the 'pack test'.)

Incumbents or Applicants 45 Years Old or Greater

A medical history and physical examination are to be conducted and the "Medical History, Examination, and Clearance Form" completed **every three years**. In those years in which an exam is not scheduled, an "Annual Medical History and Clearance Form" is to be completed by the firefighter. Every year, therefore, the appropriate form is to be completed and reviewed prior to scheduling an arduous duty performance test (currently the "pack test").

There are factors that may make a conventional medical examination impractical. The lack of adequate medical services, the distance from the employee residence to appropriate medical facilities, time sensitive hiring processes (especially during periods of "fire emergencies"), all create situations where the agencies may need to gather medical information within a very limited timeframe. In these situations, the "Annual Medical History and Clearance Form" may be used prior to scheduling an arduous duty performance test. Agencies may individually or collectively agree upon the terms and conditions of the use of this method. The Medical Standards Team cannot recommend the "Annual Medical History and Clearance Form" as a substitute for a scheduled medical examination/interim medical history program, but recognizing the logistics of hiring numerous firefighters in compressed timeframes and under difficult logistical circumstances, we feel that this form is the closest to a comparable substitute that we can provide.

5

MEDICAL STANDARDS EVALUATION PROCESS
QUICK REFERENCE CHART

MEDICAL STANDARDS EVALUATION PROCESS **The following chart is presented to summarize the requirements for firefighters who perform in arduous firefighter situations.**	Incumbent/ Applicant (permanent positions) < 45 years of age	Incumbent/ Applicant (permanent positions) = 45 years of age	Temporary positions < 45 years of age	Temporary positions = 45 years
Medical Clearance/Surveillance Examination (*Baseline*)	**Yes - initial**	**Yes - initial**	**No**	**No**

Medical Clearance/Surveillance Examination (*Periodic*)	**Every 5 yrs**	**Every 3 yrs**	**No**	**Every 3 yrs**
X. Annual Medical History and Screening **given on years that no examination is scheduled)** (	**Yes**	**Yes**	**Yes**	**Yes**
Medical Clearance/Surveillance Examination *(Exit)*	**Yes - for incumbents only**	**Yes for incumbents only**	**No**	**No**

6

Medical Standards

Medical standards were developed and validated by on-site visits to wildland and prescribed fire operations. The written and validated medical standards, including the medical examination elements, are shown in the medical standards section. These standards include the statement of medical fitness for the physiological element as well as a list of potentially disqualifying factors for use by the examining physician/CMC/MRO. Please note that the medical standard is a technical document designed for use by a medical provider and is subject to a case-by-case individualized assessment. The sample conditions listed in the individual standards should not be considered as automatic disqualifications but rather as typical conditions that may be of concern to the medical professional for safety or efficient job performance reasons.

Medical Examination and Forms

A consistent set of medical examination criteria, a medical examination form, and an annual medical history and clearance form were developed to provide uniform tools for agencies to use in the administration of the medical program. This allows for the comprehensive collection of medical data important to the determination of medical fitness for firefighter duties.

Baseline Exam: The baseline (or initial) exam is focused on the medical requirements to perform arduous firefighter duties and is more comprehensive than the periodic exams to allow for the collection of adequate data.

Periodic Exam: A focused periodic medical examination is to be conducted every five years on firefighters until they reach the 45 years of age. At age 45, the periodic medical examination is to be conducted every 3 years.

Exit Exam: The exit exam is performed when an incumbent terminates federal service as an arduous duty wildland firefighter.

Baseline/Periodic/Exit Medical Examination Form: The “Federal Interagency Medical History, Examination and Clearance” form is used, with some differences, for baseline, periodic, and exit medical examinations. The shaded area of the medical examination form is filled out by the firefighter prior to, or at the time of, the examination. The examining physician completes the medical information sections, standards review, and

clearance sheet during the course of the medical examination. After receipt of the blood and other test data, the examining physician forwards the completed medical examination form to the agency designated location for review.

Examination forms (Baseline/Periodic) revealing abnormal or suspect medical conditions will be forwarded to the MRO for further review and a medical fitness determination.

Annual Medical History and Clearance Form: An obligatory annual medical history questionnaire is required of firefighters in those years when an actual medical examination is not scheduled. This "Federal Interagency Annual Medical History and

7

Clearance" form will be reviewed by a physician or an allied medical care provider (e.g. registered nurse, nurse practitioner, or physician's assistant). The form is then submitted to the agency designated location for review and storage.

Qualification Review Process

The medical documents are reviewed in order for management to make a medical qualification decision. The medical qualification decision process is the same for all arduous duty wildland firefighters. However, there are factors that may make a conventional medical examination impractical (i.e. lack of availability of medical services, the distance from the employee residence to appropriate medical facilities, time-sensitive hiring processes, etc.).

XI. Baseline Examination

Applicants for permanent positions and incumbent arduous duty wildland firefighters, will receive a medical examination and clearance by an agency funded health care professional familiar with physical examination procedures and licensed to conduct a physical examination. This examination is mandatory. The examination will be completed and reviewed before the employee can perform arduous wildland firefighting duties. In the event that arduous wildland firefighting is a job requirement (e.g. essential job function), and the individual is a new hire, then the medical examination and clearance must be completed and reviewed after a formal job offer is tendered, but before the individual is hired. When the results of the examination are received, there is an initial decision point resulting in a "GO - NO GO".

Initial "GO" Decision - A "GO" decision means the individual is medically qualified, and they proceed to the next step in the process, usually the agency administered "work capacity test" and then into mandatory training and ultimately into unrestricted duty as an arduous duty wildland firefighter.

Initial "NO GO" Decision - In those limited situations where an applicant/incumbent has a medical condition that may preclude safe and efficient job performance, a second level of review may be used, depending upon employment status or past experience, to consider the specific aspects of the applicant's medical condition and the need for follow-up information from the applicant's medical care provider(s). The FMO/SPO may utilize the services of the Central Medical Consultant (CMC) to interpret the results of a medical examination where a NO GO determination is initially made. The CMC may request that the applicant/employee provide additional information from their personal physician (at the applicant's/employee's expense) to put the medical condition in perspective with the expected conditions of employment. The CMC will then make a second level review medical determination concerning clearance for arduous wildland firefighting duties and report the findings of this review to the FMO/SPO and Program Manager. For incumbents, if clearance is not granted, the Interagency Medical Review Board (IMRB) process is initiated. This level of review is initiated by the CMC/FMO/SPO coordinating with the Program Manager. The CMC will send the results of the medical examination to the Program Manager. The Program Manager would, in turn, review the materials for completeness and forward the case to the Medical Review Officer (MRO) for review and

8

recommendations. The MRO will prepare a summary of medical findings and recommendations which will be evaluated by the IMRB in determining whether any waiver and/or reasonable accommodation is feasible for the position in question. If no waiver or accommodation can be made that is consistent with safe and efficient job performance, then the individual is not medically qualified to perform as an arduous duty wildland firefighter. In the case of an applicant for a position, temporary or permanent, the agency is under no legal mandate to waive/accommodate the medical qualification standards program. At agency discretion, applicants not meeting the medical qualification standards may be reviewed on a case by case basis. An applicant may submit additional information in an effort to become cleared for duty in the following season, or in a later season during that year.

Periodic Medical Examination

Incumbent arduous duty wildland firefighters will receive a periodic medical examination and clearance by an agency funded health care professional familiar with physical examination procedures and licensed to conduct a physical examination **every five (5) years, until the age of 45, and thereafter every three (3) years.** This examination is mandatory. The examination will be completed and reviewed before the employee can perform arduous wildland firefighting duties. When the results of the examination are reviewed, there is an initial decision point resulting in a "GO - NO GO".

Initial "GO" Decision - A "GO" decision means the individual is medically qualified, and they proceed to the next step in the qualification process, usually the agency administered "work capacity test" and then into unrestricted duty as an arduous duty wildland firefighter.

Initial "NO GO" Decision - In those limited situations where an applicant/employee has a medical condition that may preclude safe and efficient job performance, a second level of review will be used to consider the specific aspects of the applicant's medical condition and the need for follow-up information from the applicant's medical care provider (s). The FMO/SPO may utilize the services of the Central Medical Consultant (CMC) to interpret the results of a medical examination where a NO GO determination is initially made. The CMC will review the examination or history to determine whether the medical condition identified during the examination or disclosed in the medical questionnaire is significant enough to warrant a second level of review. The CMC may request that the applicant/employee provide additional information from their personal physician (at the applicant's/employee's expense) in order put the medical condition in perspective with the expected conditions of employment. The CMC will then make a second level review medical determination concerning clearance for arduous wildland firefighting duties and report the findings of this review to the FMO/SPO and Program Manager. If clearance is not granted, the Interagency Medical Review Board (IMRB) process is initiated. This level of review is initiated by the CMC/FMO/SPO coordinating with the Program Manager. The CMC will send the results of the medical examination to the Program Manager. The Program Manager would, in turn, review the materials for completeness and forward the case to the Medical Review Officer (MRO) for review and

9

recommendations. The MRO will prepare a summary of medical findings and recommendations which will be evaluated by the IMRB in determining whether any waiver and/or reasonable accommodation is feasible for the position in question. If no waiver or accommodation can be made that is consistent with safe and efficient job performance, then the individual is not medically qualified to perform as an arduous duty wildland firefighter.

Annual Medical History and Screening

In those years in which an examination is not scheduled, an "Annual Medical History and Clearance Form" is to be completed by the firefighter. In addition, a specified medical screening is to be performed

and recorded by a health care professional. Any licensed or certified health care professional may perform the screening as long as the scope of practice delineated by their license or certification includes the required screening functions. This annual medical history and screen is mandatory. The annual medical history and screen must be completed and reviewed before the employee can perform arduous wildland firefighting duties. At the completion of the medical history review and screening by the local health care professional (LHCP), there is an initial decision point resulting in a "GO - NO GO".

Initial "GO" Decision - A "GO" decision by the LHCP means the individual is medically qualified, and they proceed to the next step in the qualification process, usually the agencyadministered "work capacity test" and then into unrestricted duty as an arduous wildland firefighter.

Initial "NO GO" Decision - In those limited situations where an applicant/employee has a medical condition that may preclude safe and efficient job performance, depending upon employment status, a second level of review may be used to consider the specific aspects of the applicant's medical condition and the need for follow-up information from the applicant's medical care provider (s).

For **Incumbents**: The FMO will utilize the services of the Central Medical Consultant (CMC) to interpret the results of a medical examination where a NO GO determination is initially made. The CMC will review the examination or history to determine whether the medical condition identified during the examination or disclosed in the medical questionnaire is significant enough to warrant a second level of review. The CMC may request that the applicant/employee provide additional information from their personal physician (at the applicant's/employee's expense) in order put the medical condition in perspective with the expected conditions of employment. The CMC will then make a second level review medical determination concerning clearance for arduous wildland firefighting duties and report the findings of this review to the FMO and Program Manager. If clearance is not granted, the Interagency Medical Review Board (IMRB) process is initiated. This level of review is initiated by the CMC/FMO coordinating with the Program Manager. The CMC will send the results of the medical examination to the Program Manager. The Program Manager would, in turn, review the materials for completeness and forward the

10

case to the Medical Review Officer (MRO) for review and recommendations. The MRO will prepare a summary of medical findings and recommendations which will be evaluated by the IMRB in determining whether any waiver and/or reasonable accommodation is feasible for the position in question. If no waiver or accommodation can be made that is consistent with safe and efficient job performance, then the individual is not medically qualified to perform as an arduous duty wildland firefighter.

For **Applicants**: The applicant is responsible for providing additional medical information from their personal physican to the Central Medical Consultant. If additional medical information is provided, The CMC will review the examination or history to determine whether the medical condition identified during the examination or disclosed in the medical questionnaire is significant enough to warrant a second level of review. The CMC may request that the applicant/employee provide additional information from their personal physician (at the applicant's expense) in order put the medical condition in perspective with the expected conditions of employment. The CMC will then make a second level review medical determination concerning clearance for arduous wildland firefighting duties and report the findings of this review to the FMO and Program Manager.

In the case of an applicant for a position as a temporary employee the agency will probably withdraw the job offer, as the time required to complete the medical review will preclude the applicant from participating in the current year's program. An applicant may submit additional information in an effort to become cleared for duty in the following season, or in a later season during that year.

Administrative procedures - The medical examination program uses, minimally, a two-tiered approach to the medical process. The first tier is the medical examination and clearance; a firefighter receives a medical examination by a qualified medical provider according to a specific preset examination protocol. This examination includes an initial assessment of medical fitness by the examining physician. In cases where the examining physician questions the medical fitness of the firefighter to perform the full range of duties of the position, the case is referred to a CMC and/or MRO for a second tier review. The CMC/MRO then renders a recommendation relating to the medical fitness of the firefighter. All pertinent information is provided to the CMC/MRO to allow meaningful recommendations to be made, including but not limited to: the medical history, the results of the physical exam, a description of critical job duties, potential exposures, and any information about known exposures. In addition, the CMC/MRO should be told of any occupational illnesses which could affect the screening of individual workers. The CMC/MRO may request supplementary information from the individual's personal care physician.

The most important characteristic of the two-tiered medical approach is that the examining physician concentrates on the patient examination and initial assessment of medical fitness, and the CMC/MRO concentrates on the relationship between the medical data provided by the examining physician and the known characteristics of the job.

11

Waiver/Accommodation Procedures - This program delineates a formal administrative procedure, consistent with the requirements of the Rehabilitation Act of 1973 as amended, for agencies to use when an individual fails to qualify medically for the position of arduous duty wildland firefighter. This procedure includes the consideration of medical waivers and reasonable accommodation. If the examining physician indicates that there is a potential disqualifying medical condition, and the CMC/MRO substantiates this potential disqualification, then the Waiver/Accommodation procedure shall be used in a fair and consistent manner to guide management in the disposition of the case. A flowchart delineating the steps and decision points for the Waiver/Accommodation process is provided on page 13. A narrative discussion of the decision points is also provided beginning on page 14.

12 13

Waiver/Accommodation Flowchart Narrative

Decision Point One - Waivers. Can the employee perform the essential functions of their position without accommodation and without endangering the safety or health of themselves or others?

The agency must waive a medical standard if an employee has consistently demonstrated the ability to perform his/her job in a satisfactory manner without an undue risk of harm to themselves or others. If a waiver is recommended by the Interagency Medical Review Board (IMRB) and granted by management, then the employee can return to work without restriction. Waivers are good only until the next examination or when other evidence arises indicating that the condition has changed.

Decision Point Two - Additional Medical Opinions. Is there a disagreement on the nature of the medical condition or diagnosis and its effect on the employee's capability?

If an employee fails to meet the medical qualification requirements, is not granted a waiver, and has a personal (non-occupationally induced) medical condition, an employee may obtain at their option another examination by a physician of choice at the employee's expense. If the medical condition is occupationally related then the medical examination, limited to the area of disqualification, will be paid for by the agency and will be conducted on official time. If there is still a disagreement about the condition, a third physician (acceptable to both the agency and the applicant or employee) will be

consulted. Medical information provided by an employee's physician of choice, at the employee's own expense will be appropriately considered by the IMRB as it develops recommendations to management. The employee will be allowed at least 30 days from the notice of failure to meet the physical qualifications, to provide this information to the agency.

Decision Point Three - Disability Determination. Does the medical condition result in an impairment of a major life function (including work)?

The Rehabilitation Act of 1973, as amended, prohibits employment discrimination against people with disabilities, and requires employers to hire (and retain) employees who, with or without the disability, would otherwise be qualified for the job. In doing so, the employer is required to provide "reasonable accommodation" to employees with disabilities. The first determination to be made in considering accommodation of the potentially medically disqualified employee is whether the medical condition is disabling. To make this determination, management must decide, with input from the IMRB, whether the condition results in an impairment of a major life function (including work). In the case of the major life function of working, management must determine if the potentially disabled employee is substantially restricted from working in either a class of jobs or a broad range of jobs in various classes compared to the average person in a comparable situation. If management determines that an individual is not disabled then the agency is under no obligation to accommodate the employee.

14 15

Decision Point Four - Qualified Disability Determination. Can the individual perform the essential functions of the job with or without accommodation?

If the potentially disqualified employee is considered disabled in the previous determination, then it is their responsibility to suggest an accommodation(s) to management that will allow the employee to perform the essential functions of their position. If there are no accommodation(s) suggested by the employee then the employee cannot perform the essential functions of their position with or without accommodation and the agency is under no obligation to accommodate the employee. It is important for the agency and employee to initiate a dialog so that all possible avenues of accommodation can be evaluated.

Decision Point Five - Undue Hardship Determination. Would accommodation cause undo hardship for the agency?

If the potentially disqualified employee has suggested an accommodation that would allow them to perform the essential functions of their position, then management must determine whether this accommodation would cause undue hardship to the agency. This undue hardship could be in the form of excess or unaffordable cost, or excessive or unacceptable loss of efficiency. If management determines that an accommodation would cause an undue hardship, then the agency is under no obligation to accommodate the employee.

Decision Point Six - Health and Safety. Would accommodation result in an undue risk of harm to the employee or others?

If the potentially disqualified employee has suggested an accommodation that would allow them to perform the essential functions of their position without undue hardship to the agency, then management must determine whether this accommodation would result in an undue risk of harm to the employee or others. This excessive safety or health risk could be in the form of potential sudden or subtle incapacitation while on the job, potential reaction(s) to medication(s) or other concerns. If management determines that an individual cannot be accommodated without undue risk of harm to themselves or others, then the agency is under no obligation to accommodate the employee.

Decision Point Seven - Other Options. After consideration of all available options for accommodating the medically disqualified employee at their present position, the IMRB may also evaluate other positions, locations, or alternatives identified by management. All of these options will be considered, and those that

provide an acceptable outcome in term of medical risk management will be forwarded for management consideration.

Appendix G. Alaska Enhanced Smoke Management Plan Procedures Manual June 2004.

Alaska's Enhanced Smoke Management Plan for Prescribed Fire Procedures Manual June 2004

Contact:
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ALASKA ENHANCED SMOKE MANAGEMENT PLAN

TABLE OF CONTENTS

Section

1. EXECUTIVE SUMMARY

The Alaska Department of Environmental Conservation (DEC) in coordination with the Alaska Wildland Fire Coordinating Group (AWFCG) has completed development of Alaska's Enhanced Smoke Management Plan (ESMP). The ESMP procedures manual and accompanying volume of appendices has been adopted by DEC and participating wildland owners and managers through a Memorandum of Understanding (MOU).

The ESMP helps fulfill Alaska's responsibilities for protection of air quality and human health under state and federal law and reflects the Clean Air Act requirement to improve regional haze in

Alaska's Class I airsheds. As Alaska develops its State Implementation Plan (SIP) for regional haze, changes may be necessary to address additional fire tracking and emission management needs based upon policies and guidelines developed by the Western Regional Air Partnership. The updated ESMP will be incorporated into Alaska's regional haze SIP. DEC welcomes the participation of AWFCG agencies and the public in the process to update the document.

Under state regulation all agencies, corporations and individuals that burn areas larger than forty acres of land a year, whether slash or *in situ*, require a Burn Plan and written approval from DEC.

The ESMP outlines the process and identifies issues that need to be addressed by DEC and land management agencies to help ensure that prescribed fire activities minimize smoke and air quality

problems. Adoption of this document enables the State to certify to the U.S. Environmental Protection Agency (EPA) that we are implementing a smoke management plan which addresses elements of the EPA's Interim Air Quality Policy on Wildland and Prescribed Fire, April 23, 1998 (EPA's Interim Policy). If states do not certify that a basic smoke management plan is being

implemented, EPA will not provide special consideration to particulate matter health standard violations attributed to fires managed for resource benefits. According to EPA's policy, the plan enables EPA to use its discretion in deciding to reclassify an area as non-attainment when fires cause or contribute to particulate matter air quality violations. If EPA does reclassify an area, then

states need to review the adequacy of an ESMP to make appropriate improvements in cooperation

with wildland owners/managers.

One of the purposes of the ESMP is to provide accurate and reliable guidance and direction to and

from the fire authorities who use prescribed fire as a resource management tool. This ESMP Procedures Manual does not substantially change the way fire authorities work with DEC. The ESMP simply describes and clarifies a relationship that already exists. Fire authorities and DEC working together effectively combine planned burning, resource management and development with smoke, public health and Class I area visibility goals.

The ESMP Appendices provide additional assistance for interagency sharing of information, the applicability and availability of current smoke management techniques, monitoring protocol, public education strategies, and emission reduction techniques. The ESMP Appendices include

up-to-date techniques and tools (e.g. monitoring equipment, modeling, emission factors) available
through the Western Regional Air Partnership and member organizations tasked with assisting states, tribes and land managers with smoke management.
Alaska's ESMP will be evaluated annually by the AWFCG and revised at least every 5 years, if necessary, in accordance with EPA's Interim Policy on wildland and prescribed fires. The ESMP

companion appendices will be updated as new information becomes available, but not more often
than once a year.

2. GUIDELINES, MEMBERSHIP CRITERIA, AND RESPONSIBILITIES

2-1. AWFCG

Guidelines

The AWFCG, formed in 1994 through consolidation of the Alaska Multi-Agency Coordinating Group and the Alaska Interagency Fire Management Council, provides a forum that fosters cooperation, coordination and communication for wildland fire and for planning and implementing interagency fire management statewide.
The objective of the group is to provide a forum for anticipating smoke intrusions, resolving ongoing
smoke management issues, and improving smoke management techniques. Members have the ability to modify the ESMP to better meet these needs, through participation meetings and periodic evaluation of the ESMP. Active participation by all named members in the ESMP is not mandatory. Participation by non-member organizations and any other officials who use fire as a resource management tool is encouraged. All burns must comply with existing regulation 18 AAC 50.040, 50.045, and 50.065.
Each of the member organizations will have a member representative who is in part responsible for communicating and supporting policy information to the Responsible Authority for pre-season
setup and any post-season accomplishment reporting. The representative is also the point of contact for communicating information between the group and the respective agency.

Criteria: AWFCG Membership

In order for a land manager, agency, or other type of fire authority to be a member, the representative must:
• be either landowners or agencies charged with the responsibility for fire management on their lands;
• have the authority to speak for their agency or company on fire and smoke management issues;
• have the authority to promote good smoke management practices, including ensuring that smoke management techniques and smoke mitigation methods are addressed and understood at the line authority level ("Responsible Authority");
• support alternative methods to burning and emission reduction techniques within their representative agency;

• be responsible for educating and disseminating smoke management and air quality

information to the member organization, thereby keeping their agency employees informed and in compliance with the requirements and procedures of the ESMP;
• be available to become involved with group issues; and
• attends meetings when they are scheduled.

Responsibilities: AWFCG

• Assist in developing ESMP policy;
• Clarify standards and definitions;
• Establish ESMP procedures;
• Determine appropriate boundaries for airsheds;
• Annually review and evaluate the ESMP results of the fall burning season;
• Provide smoke management support, information and training for members within their organizations; and,
• Prepare and distribute information within their agencies regarding open burning.

2-2. Responsible Authority for the Burn (Burn Boss, Fire Management Officer, etc.)

Guidelines: Responsible Authority

The Responsible Authority is the individual who is primarily responsible for a prescribed burn and has the greatest ability to affect its outcome (ignition scheduling, smoke management techniques, appropriate suppression, evaluates smoke impact on public, receives complaints etc.). The Responsible Authority is often the individual who submits the finalized Burn Plan to DEC. This person may also collect, review, and distribute any pre- and post-burn information to DEC. The Responsible Authority should be identified in the Burn Plan. The Responsible Authority is often the one who conducts public meetings and has the greatest ability to interact with the public and local community authorities on prescribed burning activities in their area.

Criteria: Responsible Authority

The Responsible Authority is the individual or group who:
• is the point of contact with line authority for conducting the burn;
• implements specific Burn Plan specifications identified in the Burn Plan;
• provides necessary Burn Plan information and data to DEC (often acts as lead liaison to DEC for the land manager/property owner);
• implements ESMP requirements for Burn Plans;

• considers the availability of suppression forces to react to potential prescribed burn escapes or significant smoke intrusions into populated areas (develops a contingency plan);
• coordinates Burn Plan smoke management implementation with local residents, fire districts, local air pollution control authorities (if any), and local government officials (if any);
• reports and documents where and when smoke intrusions occur and contacts DEC directly for assistance that may be needed (monitoring, public complaints, AQ advisory issuance, etc.); and
• reacts and responds to citizen complaints about smoke nuisances.

Responsibilities: Responsible Authority (Burn Boss, Fire Management Officer, etc.)

Prior to ignition, each Responsible Authority must:
• submit the Burn Plan to DEC to obtain a valid Open Burn Approval from DEC for any

prescribed burns greater than 40 acres. Burn Plans must include a section on smoke management contingency plans that discuss actions to be taken in the event of smoke intrusions;
• identify potential smoke sensitive areas and, if necessary, plan and conduct a public meeting to discuss the operating procedures and requirements for the upcoming burning season with concerned community members (depending on the nearness of fire to sensitive areas, like a hospital or a school, the Responsible Authority may want to monitor the area and set up an evacuation procedure);
• contact any AWFCG members or agencies that may be affected by this burn;
• use current weather factors, such as ground wind speed, direction, and ventilation factors, to evaluate smoke dispersion prior to ignition; and
• obtain the restriction/no restriction information from DEC at least one day prior to ignition scheduling. In some cases, restrictions may be in effect the day of the scheduled ignition. Contacting DEC as soon as possible prior to ignition scheduling is advisable in order to prevent unexpected ignition delays due to air quality concerns. DEC has the authority to deny ignition based on reasonable air quality considerations.
After Ignition, each Responsible Authority must:
• handle local coordination, local problem-solving and local communication within the burn's airsheds during the burn relative to smoke intrusions;
Page 7 of 29 Version 6/04/2004
• consider, recommend and be able to implement fire suppression actions to protect public health from smoke intrusions, if necessary;
• request or recommend monitoring assistance to protect public health, if necessary. DEC will work with the Responsible Authority to provide monitoring assistance, if requested (see "Emergency Monitoring Procedures, Section 5-4); and
• coordinate nuisance smoke complaint response with DEC if necessary.

2-3. DEPARTMENT OF ENVIRONMENTAL CONSERVATION (DEC)

Guidelines: DEC

DEC's mission is to protect human health and the environment, as well as protect visibility according to federal Regional Haze Rules. The DEC has statutes and regulations that must be taken into account in a Burn Plan, as well as during the burn process. DEC is primarily responsible for the development and implementation of the Enhanced Smoke Management Plan. DEC is responsible for reviewing Burn Plans and issuing Burn Approvals, ensuring that burn plans take into account state air quality regulations and ESMP guidelines. DEC provides the daily coordination and communication necessary to implement burning restrictions and assist with smoke management during the burn seasons. DEC may receive and process public complaints regarding smoke intrusions.

Criteria: DEC Coordination

The DEC is the agency that:
• evaluates burn plans for compliance with air quality regulations;
• issues written open burn approvals;
• provides technical assistance for Burn Plan Approval preparation;
• may take appropriate action as authorized under existing state statutes, rules and regulations for open burning violations;

• may deny burn ignitions based on air quality concerns. (See "Criteria for Denying Burns," Section 4); and
• coordinates with burn agencies that request monitoring assistance.

Responsibilities: DEC Coordination

The DEC staff must:

• notify all appropriate agencies, health authorities, news media, and the public-at-large when acceptable limits of smoke accumulation are threatened or exceeded;
• protect public health when air quality conditions deteriorate by ensuring that the burn agency/company adheres to the ESMP procedures;
• curtail burning in specific areas or request burn suppression actions when meteorological or existing air quality conditions so warrant;
• compile pertinent data for an annual emission inventory report to the Western Regional Air Partnership Fire Emission Joint Forum and EPA. This activity will require annual assistance from the Alaska Interagency Coordination Center at the end of the fire year. General information will be compiled from the AICC website at http://fire.ak.blm.gov/**.** Specific information required for compiling an electronic version for the annual emission inventory report can be obtained by calling AICC at (907) 356-5671;
• coordinate with AWFCG members to establish and facilitate support for smoke management techniques and mitigation strategies within the program;
• ensure that the Enhanced Smoke Management Plan is understood and communications are established among all land management agencies, the AWFCG and DEC;
• ensure that field oversight enforcement is conducted and is uniformly applied;
• facilitate AWFCG meetings to evaluate the program effectiveness, review policies, discuss new smoke management methods, and help solve agency smoke management issues;
• collect, review, summarize and distribute pre- and post-burn annual ESMP report for AWFCG, and EPA;
• keep records tracking emission sources and emission inventories for all burns occurring within the state, including wildfires;
• provide the Responsible Authority with technical assistance, training, site placement, and calibration of monitoring equipment if needed; and
• revise open burning regulations using standard state procedures, including a public review period. Regulatory revisions that apply to the Smoke Management Plan will be conducted in coordination with land managers.

3. OPERATIONS AND AUTHORIZATION TO BURN

3-1. Smoke Management Components in Burn Plans

This section is designed to give guidance on preparing smoke management information for the burn plan. Consideration of smoke management should be part of every burn plan. This is important for meeting public health and Class I area visibility goals as well as smoke management (or lack thereof) that may affect other burning in the area. These goals are discussed further in Section 5-1.

Evaluation of the potential for the smoke emissions from a project to disperse is probably the

single most important component of an effective ESMP. Land managers/owners may use diverse evaluation methods for small projects that will not impact any sensitive receptors or where potential impacts are easily monitored and mitigated. For large projects, the WRAP Fire Emission Joint Forum has state-of-the-art tools to help land managers/owners evaluate potential impacts. These tools can be accessed through the Western Regional Air Partnership web site at www.wrapair.org/.

The burn plan is evaluated by DEC for the potential of the project to contribute to unacceptable smoke impacts or particulate levels on smoke sensitive features. DEC is responsible for evaluating the potential impacts of multiple projects and authorizing only as many projects as the airshed can handle. If ignition approval of several individual projects, which might create unacceptable smoke impacts are requested at one time by different land managers, DEC will need to schedule/prioritize the burns in consultation with the land managers to minimize smoke impact.

When scheduling a burn and ignition time the Responsible Authority must base timing on existing air quality conditions and the ability of the airshed to disperse emissions (e.g., meteorological conditions). The expected amount of residual smoke from previous days' burning must also be evaluated prior to ignition.

Burns will be conducted only when good or excellent dispersion conditions are indicated. The Responsible Authority should contact the National Weather Service (NWS) forecasters for wind speed and direction estimates for the burn, an estimate of mixing heights, and residual smoke behavior on the night following the burn. The NWS forecast for smoke dispersion will generally integrate all pertinent weather information such as the timing of expected weather changes that may affect smoke dispersion.

Smoke Management Techniques

Below are some examples of smoke management techniques the Responsible Authority should consider to minimize emissions and smoke impacts:

• Use of ventilation factors, up-to-date weather data, weather forecasts
• Appropriate modeling with accurate weather data and emission factors
• Scheduling burns to be concluded using weather fronts bringing rain/snow
• Use of emission reduction techniques
• Burning when fuel moistures are low enough to prevent excessive smoldering

• Historic (e.g. over the last 10 years) emissions from burns in the area
• Emission projections based on sound data/science
• Identification of smoke sensitive features/receptors, and burning when wind direction and dispersion will mitigate impacts to sensitive features at other times
• Visual observations
• Monitoring
• Test burns (small piles)

Prior to each planned burn of greater than 40 acres, the Responsible Authority will submit their agency's Burn Plan to DEC. The Burn Plan will serve as the application for a DEC Open Burn Approval. Each Open Burn Approval will expire within one year of issuance. Each agency may continue to use its own established format, but each Burn Plan must contain the following information for each planned ignition/burn unit:

1. Indicate the location, duration, and inclusive dates considered for the burn:
Provide a legal description of the location to be burned and the expected duration of both single events and the entire burning project. Changes or additional information for the burn plan can be discussed at the time of DEC notification by phone. The applicant is required to call DEC at least one day prior to ignition, telephone 1-800-770-8818.
2. Identify the location of all sensitive features that might be impacted by smoke:
The Responsible Authority should list all population centers, including airports, medical facilities, schools (in session), and numbered Alaska highways and roads, that are within an appropriate radius of the project. The "appropriate radius" should include an adequate margin of safety to include all potentially impacted sensitive populations and activities.
3. Indicate how the public will be informed prior to, during, and after the burning:
A successful burn is one in which no complaints are received. The best way to do this is to make sure everyone around you knows when the burn will occur so that they can take steps to avoid the smoke. Your direct contact phone number should be publicized so the public can contact you if needed. The public must be notified at least three days prior to the burn through the local news media or the local Post Office.
4. Indicate how you will coordinate with other concerned agencies, including authorities of sensitive features:
Indicate how you will notify all concerned agencies, including authorities in control of sensitive features identified in Item 2 (such as the FAA, State Troopers, military, fire department, adjacent land managers, etc.) who are potentially affected by impaired visibility or adverse smoke impacts prior to ignition. Include a list of telephone numbers or email addresses of agencies that must be contacted prior to ignition.
Indicate if you obtained a permit and notified the Forestry Division of the Department of Natural Resources.

5. Indicate where the weather forecasts will be obtained and how it will be used to prevent smoke impacts:
Identify how the weather forecast will be obtained (e.g. through the NWS) during the open burn. Parameters that should be obtained are the predicted visibility, dispersion conditions, wind direction, and wind speed.
6. Indicate how weather changes will be monitored and what will be done to reduce or mitigate smoke impacts if unfavorable weather should occur after ignition:
Indicate how the weather forecast will be monitored throughout the open burn. Identify what you will do if a wind shift or other weather change begins to create an adverse smoke impact on sensitive features identified in Item 2. For example, if you expect an inversion to occur during the night, you would put the fire out at the end of the day.
If any safety hazard is present, or if requested by the authority of a sensitive feature, you must extinguish the fire as soon as possible.
7. Indicate what will be done to validate predicted smoke dispersion:
Indicate how you will predict smoke dispersion. If a recommended method (smoke bomb, test fire, etc.) fails to indicate that acceptable smoke dispersion will occur, no fires will be ignited. "Unacceptable smoke dispersion" is defined as an unacceptable decrease in air quality for any sensitive feature identified in Item 2.

8. Indicate what will be done to enhance the active fire phase and reduce the smoldering phase:

Indicate what emission reduction techniques will be employed to enhance the active fire phase and reduce smoldering. For example, pile burn material should be stacked in order to enhance oxygen flow to the flames.

For land clearing, indicate if you will conform to the following: berm piles should contain less than five percent of non-combustibles (soil, ice or snow); be readily extinguishable by the applicant within two hours; be loosely stacked to allow for natural draft; be cured for at least one year prior to ignition; and be no longer than 1000 feet between firebreaks.

9. Indicate how authorities in control of sensitive features will be contacted if visibility decreases:

Provide a contingency plan for smoke intrusion into populated areas, Class I areas, or other smoke sensitive features as notified in Item 2. Authorities having control over sensitive features identified in Item 2 must be notified if visibility is expected to be decreased to less than three miles for greater than 30 consecutive minutes and/or 180 minutes during a 24-hour period. Indicate how you will notify authorities of sensitive features if this occurs. If any safety hazard is present, or if requested by the authority of a

sensitive feature, you must extinguish the fire as soon as possible. [Depending on distance from sensitive areas the Responsible Authority may need to set up a monitor to measure and detect smoke intrusions.]

10. Identify alternative disposal options for material being open burned:

For fires other than fire fighter training, an evaluation of alternatives to open burning must demonstrate that open burning is the only feasible alternative. Identify other alternatives considered in place of burning (e.g. marketing timber with a lumber company) and why the alternatives were not used; or list any alternatives to burning that have been done to the burn units prior to ignition.

11. Indicate how you will coordinate with air quality authorities having jurisdiction:

Notify DEC by telephone prior to ignition (800-770-8818). Identify your name (Responsible Authority), location of burn, contact phone number, what your test burn was like, how long you expect the active fire phase and the smoldering phase to last, and what kind of notification procedures you have completed.

12. Pre-burn fuel loading.

Pre-burn fuel loading represents the amount of fuel present at the burn location and should be expressed as the weight of fuel per unit area in tons per acre.

13. Indicate whether the fire is considered “anthropogenic” or “natural”.

The WRAP document Policy for Categorizing Fire Emissions clarifies the relationship between what is considered a natural source of fire and what is considered a humancaused source. This document is available at

http://www.wrapair.org/forums/fejf/docs.html

14. Provide the approximate emissions expected for each burn and method used to estimate.

Emissions can be estimated by multiplying the approximate level of activity, which is the

amount of fuel consumed usually expressed in tons, by an emission factor which is expressed in pounds per ton of fuel. Emission factors can be found on EPA's website at http://www.epa.gov/ttn/chief/ap42/ch13/.

Items one through eleven are required in a Burn Plan under DEC regulation (see Appendix J for regulation); items twelve through fourteen are elements that are necessary for developing and tracking emission inventories for regional haze.

Page 13 of 29 Version 6/04/2004

3-2. Post-burn Reporting

Following a burn a post-burn report, maintained by the Responsible Authority, must be turned in to the DEC. A post-burn report must include the following information:

1. Date of burn.

Actual dates of the burn.

2. Burn location.

Provide the location of each burn to the nearest mile.

3. Area of burn.

Provide the total number of acres burned (entire unit, outer-most boundary).

4. Fuel type.

The fuel type optimally represents the predominant fuel or cover type consumed in the fire (e.g. sitka spruce).

5. Pre-burn fuel loading.

Pre-burn fuel loading represents the amount of fuel present at the burn location and should be expressed as the weight of fuel per unit area in tons per acre.

6. Type of burn.

Type of burn represents the predominant configuration of the fuel burned (e.g. pile, windrow, broadcast, underburn).

7. Emission reduction techniques used.

Describe any burning techniques applied that reduce the actual amount of emissions, for example, changing ignition timing to allow for more efficient combustion.

8. Public complaints (if any).

4. BURN RESTRICTIONS

If there is a need to issue burning restrictions based on air quality concerns in any part of the state, all AWFCG members will be notified as soon as possible. If there is residual smoke in the area, it is the responsibility of the Responsible Authorities to contact DEC prior to a scheduled burn to determine if a restriction is pending or in effect.

Burn Restrictions can be issued as follows:

- statewide,
- by airshed(s),
- by proximity to smoke sensitive feature,
- by time periods (e.g. Memorial Day weekend),
- by DEC authority (18 AAC 50.245),
- any combination of the above.

Any restrictions will be based on available monitoring or meteorological data. Generally, restrictions due to poor air quality are in effect for 24 hours. Restrictions for holiday weekends will be in effect unless there are compelling reasons why burning must occur.

The final responsibility for smoke management rests with the Responsible Authority that is doing the burning. The AWFCG members and Responsible Authorities are expected to curtail burning if, in their opinion, they are not getting adequate smoke dispersion, or if local weather factors or topographical features are such that smoke problems could result. Conversely, if local weather conditions appear to be more favorable for burning than what was forecast, Responsible Authorities should contact DEC to discuss options.

Criteria for Denying Burns: Prescribed burn ignitions may be denied if:

• there is a high probability that a significant amount of smoke will intrude into "sensitive areas," such as population centers;

• burning will not comply with the SIP or the federal Clean Air Act regarding visibility protection of Class I federal areas (see Appendix “Non-attainment and Class I Areas” map);

• any state or federal air quality regulations, laws, or rules would be violated;

• weather predictions indicate that smoke will not significantly disperse within approximately eight hours of ignition, and be dispersed by the next afternoon; or

• air quality is deteriorating and is expected to continue to deteriorate and result in an episode being called in the next 24-hour period, additional ignitions will be denied until conditions improve in the area.

5. AIR QUALITY MONITORING for Visibility in Class I Areas

5-1. Visibility and Regional Haze Goals

All states must develop programs to make "reasonable progress" toward meeting the visibility goals in the Class I areas as part of their air quality State Implementation Plans (SIPs). The DEC has the primary responsibility for SIP development.

One or more burns that consume 100 tons or more of material have the potential to significantly affect visibility over large areas. The cumulative effect of many smaller burns may also have an impact on visibility. The visibility portion of this plan concentrates on burns that consume 100 tons and greater in areas that may affect visibility at Class I areas in Alaska. Added control of small burns may be included in future plan amendments if that source is a significant contributor to visibility degradation, and if workable implementation thresholds can be established.

The provisions of this ESMP will be a significant step toward making "reasonable progress" to meet national visibility goals for Class I federal areas, and will balance the needs of various stakeholders in meeting the intent of Congress as stated in the Clean Air Act.

Responsible Authorities are encouraged to:

1. notify air quality managers of plans to significantly increase their future use of fire,

2. consider the air quality/visibility impacts of prescribed fire and take appropriate steps to minimize those impacts,
3. consider appropriate alternative treatments, and
4. participate in the development and implementation of State/Tribal ESMPs.

5-2. Creating the Emissions Baseline

The calculation of the emissions baseline is a central feature of the Regional Haze Rules because it provides the gauge by which success will be measured. The actual calculation of the emissions

baseline in Alaska is not yet complete. The resulting emissions baseline will be made available to the AWFCG as soon as it has been calculated. A draft copy of the Alaska Regional Haze Strategy is available from DEC. It is recognized that fire is part of the natural background condition for Alaska. As part of the baseline, the transport of smoke, dust, and emissions from Russia, China, Canada and northern Europe that impacts Alaska needs to be quantified. According to the Regional Haze Rule Section 51.308, each state that has Class I areas is required to include a projection of improvement in visibility expected through 2064 for the most and least impaired days. The WRAP will gather data from states for future analysis. The concept is that baselines for the most and least impaired days for visibility are used to establish potential control measures and projected emissions for each state. The projection of improvement must, at a minimum, be expressed in deciviews, but states may include other forms of projection as well. A regional analysis, such as the one WRAP is doing, is acceptable for an individual state's SIP. (from WESTAR website on templates www.westar.org/RHSIP/Final%20Documents/309%20templates.doc)

Preliminary Calculation for Estimating Rate of Progress for Denali National Park SIP
(from Summary of Scientific Knowledge and its Implications for Alaska's State Implementation Plan, DEC, October 2002).

Baseline Condition for 20% Worst Days (1995-1999) = 9.7 deciviews
Natural Condition for 20% Worst Days = 7.24 deciviews
Annual Rate of Progress = (current worst day conditions–estimated natural conditions)/ (2064-current year)
Annual Rate of Progress = (9.7-7.24) / (2064-2004)
Annual Rate of Progress = 2.46 deciviews/60 years = 0.04 deciviews
Preliminary 2004-2018 Progress Goal = 0.04 deciviews/year x 14 years = 0.574 deciviews

Best and Worst Days

The Regional Haze Rule bases progress from trends in the days with the highest 20% deciview reductions in visibility (worst) and the days with the 20% lowest deciview reduction. These have been calculated for each full year of analyzed data (1988-1999), and were used to compare everything from transport patterns to meteorology. In Alaska, at Denali National Park, the worst days are most frequently seen in the summer when fire appears to be the most significant source. The best days tend to occur in the autumn and winter (Fig.1).

Figure 1. Number of Best and Worst Days by Month (1988-1999 data)

5-3. Ambient Air Monitoring

"Ambient air monitoring" within the context of the ESMP refers to air quality monitoring done as a consequence of wildfire activity or in support of prescribed fire activities. All monitoring should be performed with an approved air monitoring sampler using standard operating procedures for operation, data collection and QA/QC. Samplers should be placed outside of the fire zone in a location which is representative of a smoke sensitive area, such as a hospital. Monitor site placement depends on the meteorology (primarily wind direction), area topography and the relationship of the smoke/airshed to the populated area. Monitoring may require the deployment of several samplers. Example: a land management agency is planning a large prescribed burn in heavy fuels inside the boundary of the management area. The closest community is fifteen miles away. Weather forecasts indicate that the winds should blow toward

the town, so a monitor in the town would be a good idea.
In all monitoring site-placement, the focus is protection of public health. The DEC Monitoring and Quality Assurance section may be requested to work with the Responsible Authority to identify appropriate monitoring sites.

5-4. Emergency Monitoring Policy

The DEC is willing to work with land managers to assess smoke impacts and protect public health through ambient air monitoring assistance. While DEC does not have funding to support wildfire activity, the air monitoring section does have trained staff who could be mobilized to support a fire event, either by evaluating smoke from a wildfire suppression effort or monitoring smoke impacts during a prescribed burn.

0
5
10
15
20
25
30
35
40
45
1 2 3 4 5 6 7 8 9 10 11 12
Month
Number
worst
best

Emergency response air monitoring support from DEC has been utilized once before on the Carla Lake Fire and was somewhat successful. As newer and more portable, real-time monitors become available, the ability to monitor smoke impacts becomes easier and more accurate.

6. AIR QUALITY COMPLAINT PROCEDURES

6-1. General Procedures

There may be occasional intrusions of smoke into smoke sensitive areas. The Responsible Authority and the DEC are responsible for complaint processing and smoke-intrusion reporting. Documentation of such occurrences will improve future prevention measures and properly inform responsible officials and the public.
The nature of the complaint will determine what procedure is to be followed to address the complainant. Every attempt should be made to resolve the complaint at the lowest possible agency level. Any member receiving complaints should handle the initial situation if they are knowledgeable of the Smoke Management Program.
Complaints can come in several forms. Historically, complaints have been received from the public at large where the basis for the complaint is an objection to seeing smoke, smelling smoke, and health concerns because of smoke. Local explanation of the program and resolution of the callers concerns will often solve the problem. The member receiving the call should attempt to explain the purpose and basis for the Smoke Management Program in order to inform the caller that a control program is in place in Alaska.
Complaints have also been received over the years that revolve around a specific prescribed burn. Any member receiving this type of call must make every effort to determine as much information about the burn as possible in order for proper follow-up to take place.
The following information needs to be collected in order for the organization to take proper and necessary follow up actions. Information to be collected includes:

• Name and phone number of the caller
• Location of the burn
• Time of day
• Any other comments that will aid in the follow up process.

Complaint reporting information should be forwarded to the appropriate agency representative (usually the Responsible Authority or DEC) as soon as possible. In every case the person receiving the call should attempt to explain the burn program to the caller.

DEC will forward complaints to the Responsible Authority for resolution if the complaint information suggests a prescribed burn is conducted during a restricted period or if smoke dispersion is less than adequate for the burn. The DEC will log all complaints received in the Complaint Automated Tracking System (CATS). For each complaint received by the Responsible Authority and DEC, pertinent data will be recorded along with the final resolution or actions taken to address the complaint. The Responsible Authority should forward any

complaints received to DEC when requested or at the end of the burning season. This information may be valuable for future use in contacting community residents prior to future planned burns.

6-2. Public Notification and Exposure Reduction

If smoke impacts develop and it becomes necessary to issue air quality notices (e.g. alerts, warnings, emergencies), DEC and the Responsible Authority should cooperatively determine a course of action.

Air quality **general advisories** include broad educational-type statements which advise people about the potential for smoke impacts in the area. The general advisory provides recommendations for persons with respiratory illnesses or heart disease, and suggests ways to limit exposure. “Advisory” status does not involve any required action on the part of the public or the burn agency. Advisories may be issued without monitoring data. When general advisories are issued by DEC, all AWFCG members will be advised.

According to 18 AAC 50.245, the DEC will, in its discretion, declare an air episode and prescribe and publicize curtailment action when the concentration of an air contaminant in the ambient air has reached, or is likely in the immediate future to reach, any of the concentrations established by the National Ambient Air Quality Standards (NAAQS). The concentrations are 150ug/m3 of particulate, PM_{10} (24-hour average). Federal standards for $PM_{2.5}$ are in place however Alaska has not yet adopted these standards in regulation. The federal standard for $PM_{2.5}$ is 40ug/m3.

The DEC will declare an air quality advisory when, in its judgment, air quality or atmospheric dispersion conditions exist that might threaten public health. If the DEC declares an advisory, the DEC will request voluntary emission curtailments from any permitted activity that might impact the area subject to the advisory, and publicize actions to be taken to protect public health (18 AAC 50.245, Eff. 1/18/96, Register 141).

Alert, warning and emergency categories each have corresponding 24-hour average particulate concentration levels and have required action statements that suggest ways that the general public and sensitive individuals can limit their exposure (for PM_{10} alert = 150 ug/m3, warning = 350 ug/m3, emergency = 420+; for $PM_{2.5}$ alert = 40/ugm3, warning = 150 ug/m3, emergency = 350 ug/m3). The notices will be based on real-time ambient monitoring, in combination with

weather forecasts. Alerts will not be issued based solely on visual estimations of smoke impacts, nor on suspected smoke impacts. The cooperating agencies should agree on trigger levels, communication strategies and contingency measures before the burn project is ignited.
If smoke intrusions are causing unacceptable area-wide impacts, including nuisance smoke, ignitions of any new open burning that could impact the area will be denied by DEC. Air quality advisories are appropriate for situations where the potential for multiple-day smoke impacts exists. The WESTAR Council produced a document (the 1995 Wildland Emergency Action Plan Implementation Guideline) that outlined an emergency action plan for implementation in urban areas where significant smoke impact from wildfires affected sensitive population groups.

The Responsible Authority should consult with DEC regarding appropriate short-term fire management response to abate verified impacts to smoke sensitive areas. Management responses should be implemented that will mitigate adverse impacts to public health. In some cases, immediate fire suppression or rapid “mop-up” may be required for prescribed burns that create severe air quality impacts.

7. PUBLIC EDUCATION

Public education and outreach prior to burn ignition greatly decreases public complaints and often significantly decreases potential public health impacts attributed to smoke intrusion. Every effort should be made by the Responsible Authority to involve the potentially affected community in an early and on-going discourse on the use of prescribed fires in their area. Public education and outreach often avoids conflicts which might not otherwise be identified, such as scheduling burns during scheduled athletic events, or burning during annual hunting/fishing opening dates, holidays or other special events.
Public education guidance should be cooperatively developed and/or distributed by the AWFCG for use by Responsible Authorities. Such guidance would discuss options available for adequate public education, including public meetings, public service announcements, news articles, and public comment periods. The FireWise campaign has been a successful public education process, and could easily be used as a pattern or as a vehicle to promote public education on prescribed burning objectives at a local/airshed level where appropriate. In addition, the National Wildland Fire Coordinating Group (NWFCG) and the EPA Wildland Fire and Air Quality Workgroup have both developed useful educational packages.

Other Public Education Suggestions:

• Seek out appropriate forums to provide written information about rules and regulations, provide on-site training sessions about safe and efficient burning techniques, and answer questions.
• Initiate contacts with local news media to generate feature stories about the prescribed fire program and burn regulations.
• Include appropriate information about prescribed fire in displays used at public gatherings, such as fairs.
• Provide press releases and public service announcements when needed.
• Coordinate with other agencies' public affairs offices to combine information about burning when appropriate.
• Develop brochures and other printed materials for distribution to appropriate sources and recipients.

8. FEES AND PROGRAM FUNDING

At the present time, DEC is funding the initial development of the ESMP, however, it may require a fee in the future. The ESMP is a required portion of the SIP, which outlines emission control strategies that Alaska must address in accordance with the CAA and Regional Haze Rules.

9. ENFORCEMENT

The implementation of the ESMP is usually done through regulation or through a Memorandum of Understanding between stakeholders. As the number, size or complexity of prescriptive fires increases, a state/tribe may find their ESMP needs to be revised to ensure protection of the National Ambient Air Quality Standards and to meet visibility goals.

Regulations currently exist that prohibit burning in a manner that adversely impacts public health or the environment (18 AAC 50.065. 50.110 and 50.245). Adherence to State of Alaska regulations is mandatory. It is the responsibility of DEC to enforce the regulations. Additional regulations may be promulgated if the State determines that present regulations are inadequate for protecting public health.

Unacceptable smoke impacts that occur because the Responsible Authority was negligent or failed to follow the open burning regulations may result in enforcement action. Should a member of the AWFCG fail to follow procedures, requirements or restrictions issued under the open burning regulation, it may be considered grounds for revocation of the annual permit.

A mechanism similar to the program used to enforce air quality regulations for industrial sources should be used to enforce wildland burning regulations or agreements. Such a program will provide:

- A process for notifying land managers of the unacceptable impacts
- An opportunity for the land managers to respond to allegations of unacceptable impacts
- The ability for DEC to take regulatory action, including cooperative agreements which may require ESMP revisions
- An appeal process

In addition, the ESMP program will be reevaluated if a Responsible Authority follows ESMP guidelines, but resultant smoke still violates the NAAQS or produces significant complaints.

10. PROGRAM EVALUATION

At a minimum, once every five years the effectiveness of the ESMP program should be evaluated to determine if it is preventing smoke intrusions and ensuring that regional haze goals are met. At a minimum, this review should take into consideration the number of nuisance or health impact complaints. The AWFCG should then consider which components of the ESMP need to be enhanced. If the level of activity or complexity of the projects is expected to increase,

this review should evaluate the potential of the program to remain effective in preventing smoke intrusions.

Changes to open burning regulations may occur if DEC deems it necessary. All changes to state regulations must follow standard procedure, including public comment periods. Regulatory changes that affect prescribed burning in the state will be done in coordination with the AWFCG members and any other affected parties. It will be up to DEC to ensure that stakeholders are informed of any anticipated changes. Changes to the ESMP MOU document can only be made

after contacting each signatory in writing.
The complaint logs will be used to assist in evaluating the program's effectiveness. As the complexity of a program increases, data used for the evaluation and revision of the ESMP will become more complex but periodic review can greatly assist land managers to successfully meet resource management and air quality objectives.

1. LIST OF ACRONYMS, ABBREVIATIONS and DEFINITIONS

ug/m3: micrograms per cubic meter
AQ: Air quality
AICC: Alaska Interagency Coordination Center
CAA: Clean Air Act
CFR: Code of Federal Regulations
DEC: Alaska Department of Environmental Conservation
ESMP: Enhanced Smoke Management Plan (includes Regional Haze requirements)
FEJF: Fire Emission Joint Forum of the Western Regional Air Partnership
IMPROVE: Interagency Monitoring of Protected Visual Environments
MM5: Meteorological Model, version 5 (high resolution data not yet available in Alaska)
NAAQS: National Ambient Air Quality Standards
PM: Particulate matter
PSI: Pollutant Standard Index
SIP: State Implementation Plan
WESTAR: Western States Air Resources Council
WRAP: Western Regional Air Partnership
Airshed is a geographical area where atmospheric characteristics are similar (e.g. mixing height and transport winds). (i)
Air Quality Advisory refers to a period where an air episode may warrant public notification. Air quality **advisories** are general, educational-type statements which advise the general public about the potential for smoke impacts and suggest ways to limit exposure. "Advisory" status does not involve any required action on the part of the public or the burn agency and often does not have monitoring data associated with it, though it may refer to weather forecasts.
Air quality alert, warning or emergency status refers to a period where an air episode is declared, as stated in 18 AAC 50.245. Valid air quality monitoring data and weather forecasts should be used to document air quality status and duration. Regardless of the source of the emissions, air episodes involve required actions on the part of the public (such as avoiding outdoor exercise) or land managers (such as avoiding additional emissions for the area).
Air Quality Index (AQI) is the standard index created by EPA to provide accurate, timely, and easily understandable information about daily levels of air pollution. The AQI converts the measured pollutant concentration in a community's air to a number on a scale of 0 to 500. http://www.epa.gov/airnow/factsht.html
Alternatives (or "burning alternatives") refer to mechanical, biological or chemical treatment methods of fuel reduction that do not include burning, such as chipping, grinding, logging, mechanical/hand thinning with removal, etc.
Ambient air is that portion of the atmosphere, external to buildings, to which the general public has access.

Ambient air monitoring refers to air quality monitoring done in support of prescribed fire activities or in response to wildland fire activities.

Anthropogenic emissions are produced by human activities. (ii)

Approval or open burn approval (or "permit") refers to the DEC written approval that is required if material from land clearing operations for agricultural, development, and forest or habitat management if the area burned, or the material collected to be burned, is 40 acres or greater per year. (18 AAC 50.065(g))

AP-42 Handbook is the EPA's Compilation of Air Pollutant Emission Factors for stationary point, area, and mobile sources. An emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. Emission factors are then used to estimate the magnitude of a source's pollutant emissions.(iii)

Burn plan is a strategic plan for managing a specific fire project to meet specific resource management objects. The plan includes the project objective, fire prescription (including smoke management components), personnel, organization, equipment, etc. It is used to apply for a DEC Open Burn Approval. (iv)

Burn restriction (see "Restriction").

Class I Area refers to an area set aside under the Clean Air Act (CAA) Section 162 to receive the most stringent protection from air quality degradation. This classification protects air quality in international parks, national parks greater than 6,000 acres in size, and national wildernesses greater than 5,000 acres in size, that were in existence on August 7, 1977.

Clean Air Act (CAA) means 42 U.S.C. 7401 – 7671q, as amended through November 15, 1990. (18 AAC 50.990(17)).

DEC Coordinator is responsible for coordinating all burning by members within the state, developing and maintaining the communication system to do so, and has state regulatory responsibilities for protecting public health.

Deciview is an atmospheric haze index that expresses changes in visibility as defined in 40 CFR 51.301. Under many circumstances, a change in one deciview will be perceived to be the same on clear and hazy days. (v)

Emission Factors are typically based on the EPA's AP-42 Handbook. Emission units are stated as "pounds of emission produced per ton of fuel consumed." An emission factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant. Emission factors are not yet available for accurately predicting emissions from burns in fuels such as Sitka spruce forests, tundra or deep duff layers commonly found in Alaska. Efforts are being made by the USDA

Forest Service, Pacific Northwest Experiment Station to conduct research that will lead to more accurate estimations of emissions factors for Alaska. (iii)

Enhanced Smoke Management Plan (ESMP) is the agreement and program plan developed and agreed upon by the AWFCG. The purposes of ESMPs are to mitigate the nuisance and public health/safety hazards (e.g., on roadways and at airports, and at smoke sensitive features) posed by smoke intrusions into populated areas, to prevent deterioration of air quality and NAAQS violations; and to address visibility impacts in mandatory Class I Federal areas in

accordance with the regional haze rules. (iii)
Fire Management options refers to a range of alternatives which defines the extent of fire activity and management acceptable or desirable on a given land area. (vi)
Fuel includes combustible vegetative matter such as grass, tundra, trees, shrubs, limbs, duff, and stumps.(iii)
Fuel loading is the amount of fuel present expressed quantitatively in terms of weight of fuel per unit area. This may be available fuel (consumable fuel) or total fuel and is usually dry weight. (ii)
Fuel type is an identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause a predictable rate of spread or resistance to control under specified weather conditions. (ii)
Inversion refers to a layer of air in which the temperature increases with height. The effect of various types of inversions is to greatly retard the dispersal of smoke. (vii)
Land manager/owner is the responsible Line Officer for the Federal agencies or designated individual in Federal, State, and private organizations who is authorized to make decisions concerning the management of specified land areas. (vi)
Member representative (or **Representative member** or **AQ Member)** means the individual who represents his or her organizational entity (agency or company) and is responsible for collecting and submitting pertinent agency burn information to the DEC Coordinator and AWFCG from their representative agency or company. They attend the annual meetings of the AWFCG.
Mixing height is measured from the surface upward, the height to which relatively vigorous mixing occurs in the atmosphere due to turbulence and diffusion. (viii)
National Ambient Air Quality Standards (NAAQS) are the standards established by the EPA for maximum acceptable concentrations of pollutants in the ambient air to protect public health with an adequate margin of safety, and to protect public welfare from any known or anticipated adverse effects of such pollutants (e.g. visibility impairment, materials damage, etc.) in the ambient air. (iii)

Natural background condition is an estimate of the visibility conditions at each Federal Class I area that would exist in the absence of human-caused impairment. (ix)
Non-attainment areas are areas that exceed the National Ambient Air Quality Standards (NAAQS) for certain "criteria pollutants" established by EPA or the States. Criteria pollutants have specific standards and exist for ozone, carbon monoxide, oxides of sulfur, oxides of nitrogen, lead, and particulate matter. (i)
Nuisance smoke is the amount of smoke in the ambient air at concentrations below the NAAQS which interfere with a right or privilege common to members of the public, including the use or enjoyment of public or private resources. Nuisance smoke is regulated by Alaska regulation 18 AAC 50.110, "Air Pollution Prohibited: A person may not cause or permit any emission that is injurious to human health or welfare, animal or plant life, or property, or that would unreasonably interfere with the enjoyment of life or property." (iv)
Open burning means the burning of a material that results in the products of combustion being emitted directly into the ambient air without passing through a contaminant outlet. (18 AAC 50.990(59))

Particulate matter (PM) refers to any airborne material, except uncombined water, which exists as a solid or liquid at standard conditions (e.g., dust, smoke, mist, fumes or smog). (iii)
PM_{10} refers to particles with an aerodynamic diameter less than or equal to 10 micrometers. Emissions of PM_{10} are significant from fugitive dust, power plants, commercial boilers, metallurgical industries, mineral industries, forest and residential fires, and motor vehicles. (iii)
$PM_{2.5}$ refers to particles with an aerodynamic diameter less than or equal to 2.5 micrometers. A measure of fine particles of particulate matter that comes from fuel combustion, agricultural burning, woodstoves, etc. (iii)
Prescribed fire is any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist. In a federal action National Environmental Policy Act requirements must be met prior to ignition. (vi)
Prescription is a written statement defining the objectives to be attained and may include, but is not limited to, temperature, humidity, wind direction, wind speed, fuel moisture, soil moisture, and fire behavior characteristics under which a fire will be allowed to burn. A prescription is generally expressed as acceptable ranges of the prescription elements. The extent of the geographic area to be burned may also be a prescriptive element.
Regional haze is defined in 40 CFR 51.301 and generally refers to concentrations of fine particles in the atmosphere extending up to hundreds of miles across a region and promoting noticeably hazy conditions, wide-spread visibility impairment, especially in mandatory Class I Federal areas where visibility is an important value. (iii)
Reporting acres are acres that are reported in the burn plan (pre-ignition and annual accomplishment). It should represent the acres from which smoke will be produced.

Responsible Authority (Burn Boss, Fire Management Officer, land manager, etc.) is the individual who collects, reviews, and disseminates pre- and post- burn information to the DEC Coordinator in the form of the Burn Plan and Accomplishment Report. This person is tasked with the responsibility of daily operations, coordinating burn information, providing smoke forecasting and air quality restrictions for their burns. This person(s) may also facilitate local area meetings to evaluate program effectiveness, and solve local issues related to their agency's burn plans. The Responsible Authority often has line authority and is the primary person with whom DEC will interact prior to, during, and after a burn. The Responsible Authority should be identified in the Burn Plan that is submitted to DEC. (i)
Restriction to burning occurs when an air quality episode is declared which covers the area of concern. Restrictions to burning can be issued for a maximum of twenty-four hours but may be renewed daily. The alert may be based on an assessment that inadequate air ventilation is available which would inhibit the dispersal of pollutants, such as inversions and low wind speeds. Regardless of the source of the emissions, public notifications will be issued when smoke is impacting the area. Persons with open burn approvals must curtail their fire if their portion of the airshed is becoming overloaded or local weather factors would create smoke problems, even though no other restrictions have been imposed, i.e. wind moving directly into sensitive areas, inversions, etc.
Smoke dispersion refers to the processes within the atmosphere which mix and transport smoke away from the source. This depends on three atmospheric characteristics: atmospheric stability, mixing height, and transport winds. (vii)

Smoke intrusion refers to smoke from a prescribed fire entering a designated area at unacceptable levels. (vii)
Smoke sensitive features are population centers, such as towns and villages, camp grounds and trails, hospitals, nursing homes, schools, roads, airports, Federal Class I Areas, etc., where smoke and air pollutants can adversely affect public health, safety and welfare. (iv)
Smolder means to burn and smoke without flame. (18 AAC 50.990(81))
State Implementation Plan (SIP) is a CAA Section 110 required document in which States adopt emission reduction measures necessary to attain and maintain NAAQS and meet other requirements of the Act (such as regional haze). (iii)
Transport winds is a term that refers to the wind speed and direction at the final height of smoke plume rise. (vii)
Violation of the PM NAAQS refers to 40 CFR Part 50, last revised in 1997, the daily PM_{10} standard is violated when the 24-hour concentrations exceeds 150 ug/m3 at any monitor within an area more than one time per year. The annual PM_{10} standard is violated when the arithmetic average of 24-hour concentrations for a period of one year exceeds 50 ug/m3 at any monitor within an area.

The NAAQS levels for $PM_{2.5}$ are set at a daily concentration less than or equal to 65 ug/m3 and an annual mean concentration of less than or equal to 15 ug/m3. The daily standard is violated when the 98^{th} percentile of the distribution of the 24-hour concentrations for a period of one year (averaged over three calendar years) exceeds 65 ug/m3 at any monitor within an area. The annual standard is violated when the annual arithmetic mean of the 24-hour concentrations from a network of one or more population-oriented monitors (averaged over three calendar years) exceeds 15 ug/m3. Compliance with the annual PM2.5 NAAQS is based on population-oriented monitors because the health information, upon which the standard is based, relates area-wide health statistics to area-wide air quality as measured by one or more monitors. (iii)
Visibility protection refers to Section 169A of the federal Clean Air Act (CAA) which establishes a national visibility goal to ". . . prevent any future, and remedy any existing, impairment of visibility in mandatory Class I areas." Alaska has four federal Class I areas that are national parks or wilderness areas (see map, Appendix B). (iii)
Western Regional Air Partnership (WRAP) is a voluntary organization comprised of western governors, tribal leaders and federal agencies, and is charged “to identify regional or common air management issues, develop and implement strategies to address these issues, and formulate and advance western regional policy positions on air quality. (x)
Western States Air Resources Council (WESTAR) is an organization which consists of fifteen states including Alaska. WESTAR was formed to promote the exchange of information between the States, serve as a forum for western regional air quality issues of common concern and share resources for the common benefit of the member states.
Wildland is an area where development is generally limited to roads, railroads, power lines, and widely scattered structures. The land may be neglected altogether or managed for such purposes as wood or forage production, wildlife, recreation, wetlands or protective plant cover. (iv)
Wildland fire is any non-structure fire, other than prescribed fire, that occurs in the wildland.(xi)
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REFERENCES

i EPA Interim Air Quality Policy on Wildland and Prescribed Fires
ii Smoke Management Guide for Prescribed and Wildland Fire, 2001 Edition. National Wildfire Coordinating Group, Fire Use Working Team. 226pp.
iii Idaho/Montana smoke mgmt operating guide/SMP
iv NWFCG Wildland Fire Policy 1998.
v Regional Haze Rules, 40 CFR Part 51, 1999.
vi Alaska Wildland Fire Management Plan 1998.
vii Washington state SMP
viii National Wildfire Coordinating Group. 1996. Glossary of wildland fire terminology. PMS 205. Boise, ID: National Wildfire Coordinating Group, National Interagency Fire Center. 162 p.
ix Policy for categorizing fire emissions. [online]. 2001. Natural Background Task Team, Fire Emissions Joint Forum, Western Regional Air Partnership. Available: URL [2001, Nov.].
x WRAP Charter, Purpose, p.1.
xi USDI and USDA Forest Service. 1998. Wildland and prescribed fire management policyimplementation
procedures reference guide. National Interagency Fire Center, Boise, ID. 81pp.

Appendix H. Wildland Fire Use Management.

Appendix I. Prescribed Fire Plan Format.

Back

Exhibit 1-4-2: PRESCRIBED FIRE PLAN FORMAT

COVER PAGE

Refuge or Station	
Unit	
Prepared By: Prescribed Fire Planner	Date:
Reviewed By: Refuge Manager	Date:
Reviewed By: Prescribed Fire Burn Boss	Date:
Reviewed By: Regional Fire Management Coordinator	Date:
Reviewed By: (Others)	Date:

The approved Prescribed Fire Plan constitutes the authority to burn, pending approval of Section 7 Consultations, Environmental Assessments or other required documents. No one has the authority to burn without an approved plan or in a manner not in compliance with the approved plan. Prescribed burning conditions established in the plan are firm limits. Actions taken in compliance with the approved Prescribed Fire Plan will be fully supported, but personnel will be held accountable for actions taken which are not in compliance with the approved plan.

Approved By:	Date:

PRESCRIBED FIRE PLAN

Refuge:			Refuge Burn Number:		
Sub Station:			Fire Number:		
Name of Area:			Unit No.		
Acres To Be Burned:			Perimeter Of Burn:		
Legal Description:	Lat.	Long.	T	R	S
County:					

Is a Section 7 Consultation being forwarded to Fish and Wildlife Enhancement for review ? Yes No (circle).

(Page 2 of this PFP should be a refuge base map showing the location of the burn on Fish and Wildlife Service land)

The Prescribed Fire Burn Boss/Specialist must participate in the development of this plan.

I. GENERAL DESCRIPTION OF BURN UNIT

Physical Features and Vegetation Cover Types (Species, height, density, etc.):

Primary Resource Objectives of Unit (Be specific. These are management goals):

1.

2.

3.

4.

Objectives of Fire (Be specific. These are different than management goals):

1.

2.

3.

4.

Acceptable Range of Results (Area burned vs. unburned, scorch height, percent kill of a species, range of litter removed, etc.):

1.

2.

3.

4.

II. PRE-BURN MONITORING

Vegetation Type	Acres	%	FBPS Fuel Model

Habitat Conditions (Identify with transect numbers if more than one in burn unit.):

Type of Transects:

Photo Documentation (Add enough spaces here to put a pre-burn photo showing the habitat condition or problem you are using fire to change/correct. A photo along your transect may reflect your transect data.):

Other:

III. PLANNING AND ACTIONS

Complexity Analysis Results:

Site preparation (What, when, who & how. Should be done with Burn Boss):

Weather information required (who, what, when, where, how, and how much):

Safety considerations and protection of sensitive features (Adjacent lands, visitors, facilities, terrain, etc., and needed actions. Include buffer and safety zones. Be specific, indicate on a burn unit map. Map should be a USGS quadrangle if possible, so ridges, washes, water, trails, etc. can be identified.)

Special Safety Precautions Needing Attention (Aerial ignition, aircraft, ignition from boat, etc.):

Media Contacts (Radio stations, newspaper, etc., list with telephone numbers):

Special Constraints and Considerations (Should be discussed with Burn Boss):

Communication and Coordination on the Burn (Who will have radios, frequencies to be used, who will coordinate various activities.):

IV. IGNITION, BURNING AND CONTROL

Scheduling	Planned or Proposed	Actual
Approx. Date(s)		
Time of Day		

Acceptable Range of Prescription Elements - Complete for Each Applicable Fuel Model

BEHAVE Fuel Model:	Low	High	Actual
Temperature			
Relative Humidity			
Wind Speed (20' forecast)			
Wind Speed (mid-flame)			
Cloud Cover (%)			
Wind Direction	Between:		
ENVIRONMENTAL CONDITIONS			
Soil Moisture			
1 hr. Fuel Moisture			
10 hr. FM			
100 hr. FM			
Woody Live Fuel Moisture			
Herb. Live Fuel Moisture			
Litter/Duff Moisture			
FIRE BEHAVIOR			
Type of Fire (H,B,F)			
Rate of Spread			
Fireline Intensity			
Flame Length			
Energy Release Component NFDRS Fuel Model Used:			

Cumulative effects of weather and drought on fire behavior:

Ignition Technique (Explain and include on map of burn unit. Use of aerial ignition must be identified in this plan. Last minute changes to use aircraft will not be allowed and will be considered a major change to the plan. This will require a resubmission):

Prescribed Fire Organization (See Section VII, Crew and Equipment Assignments. All personnel and their assignments must be listed. All personnel must be qualified for the positions they will fill.)

Other (If portions of the burn unit must be burnt under conditions slightly different than stated above, i.e., a different wind direction to keep smoke off of a highway or off of the neighbors wash, detail here.)

Prescription monitoring (Discuss monitoring procedure and frequency to determine if conditions for the burn are within prescription):

V. SMOKE MANAGEMENT

- Make any Smoke Management Plan an attachment.
- Permits required (who, when):
- Distance and Direction from Smoke Sensitive Area(s):
- Necessary Transport Wind Direction, Speed and Mixing Height (Explain how this information will be obtained and used):
- Visibility Hazard(s) (Roads, airports, etc.):
- Actions to Reduce Visibility Hazard(s):
- Residual Smoke Problems (Measures to reduce problem, i.e., rapid and complete mop-up, mop-up of certain fuels, specific fuel moistures, time of day, etc.):
- Particulate emissions in Tons/Acre and how calculated
  - Estimated before the burn:
  - Actual after the burn:

VI. FUNDING AND PERSONNEL

Activity Code:

Costs

	Equipment & Supplies	Labor	Overtime	Staff Days
Administration (planning,				

permits, etc.)				
Site Preparation Ignition & Control				
Travel/Per Diem				
Total				

VII. BURN-DAY ACTIVITIES

Public/Media Contacts on Burn Day (List with telephone numbers):

Crew & Equipment Assignments (List all personnel, equipment needed, and assignments. The following is not an all inclusive list for what you may need.)

- Burn Boss/Manager -
- Ignition Specialist -
- Ignition Crew -
- Holding Specialist -
- Holding Crew -
- Aircraft Manager -
- FWBS -
- Dispatcher-
- Other -

Crew Briefing Points (Communications, hazards, equipment, water sources, escape fire actions, etc. To be done by Burn Boss. Refer to Safety Considerations in Planning Actions and points listed below):

Ignition Technique (Methods, how, where, who, and sequence. Go over what was submitted in Section IV and any changes needed for the present conditions.) Attach ignition sequencing map if necessary:

Personnel Escape Plan:

Special Safety Requirements:

Go-No-Go Checklist:

Holding and Control:

- Critical Control Problems:
- Water Refill Points:
- Other:

Contingency Plan:

- Holding Plan Failure (Are there dedicated crews standing by to initial attack or will people doing other jobs be called upon to do initial attack, who must be called in case of an escape, what radio frequencies will be used, etc.)
  - Initial Escape
  - Escape Exceeding 1 Burning Period:
- Smoke Management Plan Failure
- Fire Behavior Outside Prescription
- Other

Mop Up and Patrol:

- Resources needed
- Duration

Rehabilitation Needs:

DI 1202 Submission Date:

Special Problems:

VIII. CRITIQUE OF BURN

Were burn objectives within acceptable range of results? (Refer to Section I):

What would be done differently to obtain results or get better results?

Was there any deviation from plan? If so, why?

Problems and general comments:

IX. POST-BURN MONITORING

Date: Refuge Burn Number:

Length of Time after Burn:

Vegetative Transects:

Comments on Habitat Conditions, etc.:

Photo Documentation:

Other:

X. FOLLOW-UP EVALUATION

Date: Refuge Burn Number:

Length of Time after Burn:

Vegetative Transects:

Comments on Habitat Conditions, etc.:

Photo Documentation:

Other:

Appendix J. Prescribed fire qualifications.

Prescribed Fire Burn Boss Type 1 (RXB1)

Required Training:

Advanced Wildland Fire Behavior (S-490)

Prerequisite Experience:

Satisfactory performance as a Prescribed Fire Burn Boss Type 2 plus satisfactory performance as an Incident Commander Type 3 plus satisfactory position performance as a Prescribed Fire Burn Boss Type 1 in representative fuel group(s)

Prescribed Fire Burn Boss Type 2 (RXB2)

Required Training:

Introduction to Wildland Fire Behavior Calculations (S-390)

Prerequisite Experience:

Satisfactory performance as an Ignition Specialist Type 2 + Satisfactory performance as an Incident Commander Type 4 + Satisfactory position performance as a Prescribed Fire Burn Boss Type 2 in representative fuel group(s).

Ignition Specialist Type 1 (RXI1)

Required Training: None

Prerequisite Experience:

Satisfactory performance as an Ignition Specialist Type 2 plus satisfactory position performance as an Ignition Specialist Type 1

Ignition Specialist Type 2 (RXI2)

Required Training: None.

Prerequisite experience:

Satisfactory performance in any Single Resource Boss position + Satisfactory position performance as an Ignition Specialist Type 2.

Fire Effects Monitor

Required Training:

Intermediate Fire Behavior (S-290)

Prerequisite Experience:

Satisfactory experience as a Firefighter Type 2 plus satisfactory position performance as a Fire Effects Monitor

Firefighter (FFT2)

Required Training:

Firefighting Training (S-130) and Introduction to Wildland Fire Behavior (S-190).

Prerequisite Experience: None.

Appendix K. AWFCG Fire Effects Monitoring Data List (Revised January 28, 2003).

Pre-burn Data Collection: Level I is the minimum amount of data to be collected; Level II provides for a moderate amount of data collection; and, Level III provides the most intense level of sampling.

Level I:

* General site characteristics (slope, aspect and landform)
* LAT/LONG
* Photo points or representative photo
* Vegetation class (Viereck Level V or Level IV plus ground cover or bare ground)

If data collection is within hours or during the day of burn add:

* Duff moisture
* Fire weather

Level II:

* General site characteristics (slope, aspect and landform)
* LAT/LONG
* Photo points
* Vegetation class (Viereck Level V or Level IV plus ground cover or bare ground)
* Duff depth
* Fuel model/type
* Tree density - live and dead
* Tree canopy height (ave. by class)
* Tree canopy closure (by class)
* Shrub canopy cover
* Species composition (herb/mosses/lichens - cover estimates)

If data collection is within hours or during the day of burn add:

* Duff Moisture
*Fire weather

Level III:

* General site characteristics
* LAT/LONG
* Photo points
* Vegetation class (Viereck Level V or Level IV plus ground cover or bare ground)
* Duff depth/moisture
* Fuel model/type
* Tree diameter - live and dead
* Tree density
* Tree canopy height (measured)

* Tree canopy closure (by class)
* Shrub canopy cover/density
* Species composition (herb/mosses/lichens - cover estimates)
* Stand age
* Active layer depth (season dependent)
* Brown's transects
* Tree cookies (optional for fire history)
* Ladder fuel height
* Height to live crown
* Soil type (dependent upon available soil expertise)
* Weather station (optional)
* Tree seedling/re-sprout density

Long range post-fire (with no pre-burn data):

Level I:

* General site characteristics
* LAT/LONG
* Photo points or representative
* Fire perimeter
* Vegetation class (Viereck IV) estimate of pre-burn vegetation
* Burn severity (ocular estimate for canopy, ground and surface)

Level II:

* General site characteristics
* LAT/LONG
* Photo points or representative
* Fire perimeter
* Vegetation class (Viereck IV) estimate of pre-burn vegetation
* Vegetation class (Viereck IV) current condition
* Burn severity (ocular estimate for canopy, surface and ground)
* Duff depth
* Fuel model/type
* Tree density - live and dead
* Tree canopy height (ave. by class)
* Tree canopy closure (by class)
* Shrub canopy
* Species composition (herb/mosses/lichens - cover estimate)
* More in-depth burn severity assessment than Level I

Level III:

* General site characteristics
* LAT/LONG

* Photo points or representative
* Fire perimeter
* Vegetation class (Viereck IV) estimate of pre-burn vegetation
* Vegetation class (Viereck IV) current condition
* Burn severity (ocular estimate for canopy, surface and ground)
* Duff depth
* Fuel model/type
* Tree density - live and dead
* Tree canopy height (ave. by class)
* Tree canopy closure (by class)
* Shrub canopy
* Species composition
* Stand age

* Active layer depth (season dependent)
* Brown's transect
* Tree cookies (optional for fire history)
* Ladder fuel height (if applicable)
* Height to live crown (if applicable)
* Soil type (depending upon available expertise)
* Weather information (optional)
* More in-depth burn severity assessment
* Tree seedlings/sprout density

Appendix L Contact List.

Local Government:

Hughes Village Council	(907) 889-2239
Huslia Tribal Council	(907) 829-2294
Huslia City Council	(907) 829-2266
Koyukuk Village Council	(907) 927-2253
Kaltag Tribal Council Office	(907) 534-2224
Nulato Village Council	(907) 898-2207
Nulato City Council	(907) 898-2205
Louden Village Council Inc.	(907) 656-1711
Ruby City Council	(907) 468-4401
Ruby Tribal Council	(907) 468-4479
Tanana City Council	(907) 366-7159
Tanana Native Council	(907) 366-7113

Native Organizations:

Dineega Corporation	(907) 468-4405
Doyon, Limited	(907) 459-2000
Gana-A' Yoo, Ltd.	(888) 656-1606
Tanana Chiefs Conference	(907) 452-8251
Tozitna Corporation	(907) 366-7255

Federal Organizations:

Alaska Fire Service Galena Zone	(907) 656-1222	
Alaska Fire Service Fairbanks	(907) 356-5600	1-(800) 258-7706
Bureau of Land Management NFO	(907) 474-2200	1-(800) 437-7021
Bureau of Indian Affairs	(907) 586-7404 (Steve Heppner)	

State of Alaska:

Dept. of Forestry Fairbanks (907) 269-8467 (Fire Program Mgr)
Alaska Dept. of Fish & Game Galena Office (Glenn Stout)
(907) 656-1345
Dept. of Environmental Conservation – Division of Air and Water Quality
(907) 269-3066

Appendix M Fire Cache Equipment.

Koyukuk/Nowitna NWR Fire Cache Inventory

1. Saws, Pumps and Premo Mark III:
    a. Premo Mark III Model 901-168AF
    b. Stihl 026 PRO chainsaw w/ 18" bar Serial #237582400
    c. Stihl 044 w/ 25" bar Serial #137295620
    d. Mark III Pump Kit Property #714593 (Tested 10/22/97)
    e. Shindaiwa Pump Model S25P Serial #0014729
    f. Waterous floating pump Serial #8862 Property #714594

2. Supplies/kits for above:
    a. 20 boxes (1000 ea) Grade "C" 100% Gycol for 30 sec. Delay spheres
    b. Saw kit for Stilh 026 (goggles, hardhat w/ face shield & ear muffs, leather gloves, cloth rag, star wrench, file gauge, 2.6 fl. oz. 2 cycle oil, spare chain (18" 66 533RS), 2 – 3/16" round files, 1 – 7/32" round file, 1 – triangular file, 1 – scrench, 2 – WSR6F spark plugs, 1 – 12"double taper wedge, 1 – grease gun, 1 – 28" pr. Chaps)
    c. Saw kit for Stihl 044 (hard hat w/ face screen and ear muffs, 2 – 7/32" round files, star wrench, scrench, small file gauge, 1 pr. ELVEX chaps, 3 – 12" double taper wedges, 18" handle single bit axe, 1 pr. Leather/cotton gloves, grease gun)
    d. Shindaiwa pump kit (1 – purge bottle, 1 –100' 1/8" nylon cord, 2 pr. ear plugs, 1 – 1" rubber gasket, 1 – 1" nozzle, 1 _CJ6 spark plug, 1 – combo screwdriver, 2 – red tags, 2 – white tags, 1 – 6" Crescent wrench, 1 Allen wrench, 1 spanner wrench, 1 spark plug wrench, 1 pr. pliers)
    e. 2 – 3/16" round files
    f. 1 – 7/32" round file
    g. 1 – 10" fine flat screwdriver
    h. 6 – 2.6 fl. oz. Bottles of 2 cycle engine oil
    i. 2 – clutch bearings for Stihl 026
    j. 2 – aluminum kickback plates for Stihl 026
    k. 1 – scrench
    l. 1 – D handle star wrench
    m. 1 – filing gauge
    n. 2 – 3/8-7 sprockets
    o. 4 - 1 gallon bottles of bar oil

p. 1 – 1.5 gal. (gas) x 2.5 qts. (oil) red plastic fuel can
q. 1 – 36" pr. of chaps
r. spare Mark III fuel can
s. 2 – spanner wrenchs

3. Hose
    a. 19 rolls 1" WAJAX STAYFLO 100 ft. NPSH
    b. 10 rolls 1" NPSH 100' Synthetic
    c. 10 rolls 1 ½"x50 ft. NH Imperial (rubber lined yellow synthetic)
    d. 10 rolls 1 ½"x100 ft. Synthetic, weeping NH
    e. 1 roll 1 ½"x100 ft. WAJAX STAYFLO 1990
    f. 1 roll 1 ½"x less than 100 ft. WAJAX STAYFLO w/o female end
    g. 8 ft. 1 ½" Synthetic/rubber NH w/ just female end
    h. 4 – 1 ½"x10 ft. hard rubber suction hose w/ one screen
    i. 1 – 2"x8ft. hard rubber suction hose w/ screen

4. Fittings
    a. 1 ½"x6" slip-on connector w/ ¼" valve
    b. 3 – 1" "Smokejumper Rookie Dragon Slayer" foam nozzle
    c. 1 – 1 ½" "Smokejumper Rookie Dragon Slayer" foam nozzle
    d. 1 - 1" compression sleeve
    e. 1 – 3 ft. length of ¼" i.d. Tygon tubing attached to 18" length of 5/8" poly pipe
    f. 1 – 1 ½" foam injector setup for a 5 gal. bucket
    g. 2 – 2" adjustable hose clamps
    h. 1 – 1" adjustable wire hose clamp
    i. 1 – 1" intake hose screen
    j. 2 – 1 ½"NP to 1 ½ "NH adapters
    k. 1 – 1" gated Wye
    l. 1 - 1" double female NH adapter
    m. 8 – 1 ½" NH x 1" NPSH adapters
    n. 1 – 1 ½" NH double male adapter
    o. 1 – 1 ½" NH double female adapter
    p. 2 – 1 ½" NH x 1" NPSH adapters
    q. 1 – 1 ½" NH double male adapter
    r. 5 – pr. 1 ½" hose caps (to cover both male and female ends)

5. Nozzles
    a. 1 – 1 ½" "Chief" nozzle
    b. 3 – 1" Forester nozzle

6. Miscellaneous
    a. 1 – 11/2" green tie down strap
    b. 1 – box of misc. hardware (do not know what it is for)
    c. 3 – Forester drip torches
    d. 3 – Cascade Fire Equipment Drip Torches
    e. 1 – WAJAX drip torch
    f. 1 – drip torch (no manufacturer label)
    g. 4 – "Gemtor Inc" hose carriers #597

h. 4 – "Hudson" backpack pumps
i. 1 – canvas collapsible bucket
j. 1 – hose reel (for an engine)
k. 1 – Pulaski guard (orange plastic)

7. Clothing
   a. 1 – 38R Nomex Jump Suit (yellow)
   b. 2 – 30x30 " Jeans
   c. 1 – 32x34 " "
   d. 3 – 14 1/2x32 Nomex shirts

8. Fire Packs
   a. 1 – Yellow top section (to 1980s style pack)
   b. 2 – Canteen holders

This inventory was done 6/28/02.

Appendix N Incident Complexity Analysis.

Appendix O. Prescriptive Criteria for wildland fires managed for resource benefit.

3. Refuge Preparedness Level One

Fire Weather Index (FWI)* is 0-3, Average Buildup Index (BUI)** is less than 70

i. New wildland fires caused by lightning may be managed for resource benefit in all AIWFMP fire management option zones.
ii. Existing fire use incidents will be monitored at least once every 10 days, if weather, fire behavior and flying conditions warrant.

4. Refuge Preparedness Level Two

FWI is 4-13, Average BUI is less than 90

i. New wildland fires caused by lightning may be managed for resource benefit in all AIWFMP fire management option zones.
ii. Existing fire use incidents will be monitored at least once a week.

3. Refuge Preparedness Level Three

FWI is 14-23, Average BUI is between 90 and 100

i. New wildland fires caused by lightning may be managed for resource benefit in all AIWFMP fire management option zones.
ii. Existing fire use incidents will be monitored every three days.

4. Refuge Preparedness Level Four

FWI is 24-28, Average BUI is between 100 and 110

i. New wildland fires caused by lightning may be managed for resource benefit only in Limited AIWFMP fire management option zones.
ii. Existing fire use incidents will be monitored daily.

5. Refuge Preparedness Level Five

FWI is greater than 28, Average BUI is greater than 110

i. New wildland fires caused by lightning may not be managed for resource benefit – all new ignitions will receive appropriate response according to AIWFMP fire management option zone guidance.
ii. Existing fire use incidents will be monitored daily.

* FWI – is a Canadian Forest Fire Danger Rating System index that represents the intensity of a spreading fire.

** BUI is a Canadian Forest Fire Danger Rating System index that represents the total fuel available for combustion. It includes a seasonal drought component.

Appendix P. Hauling Chart.

Appendix Q. Minimum Requirement Analysis.

ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

MINIMUM REQUIREMENT DECISION GUIDE

". . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act."

– Wilderness Act, 1964

Instructions and worksheets for the Minimum Requirement Analysis for actions, projects, and activities in Wilderness

Introduction

More than 100 million acres of Federal land are managed as wilderness, a Congressional mandate that began with the passage of the Wilderness Act in 1964. In partnership with the public, wilderness managers have a responsibility to preserve and protect wilderness values.

Simply designating a wilderness does not assure its preservation. Careful management is needed to minimize the impacts from human activities in wilderness, including grazing, access to private lands, mining, management of fish and wildlife, fire and recreation. These activities have the potential to negatively impact the values that we are charged with protecting.

This guide is provided to assist managers in making appropriate decisions about their administrative actions in wilderness. The guidance comes from the Wilderness Act, agency policies, and the experience of 35 years of wilderness management. The wilderness resource is fragile and can be lost through the erosion from seemingly inconsequential decisions.

From Legislative Mandate to Agency Policy

A clear understanding and appreciation of the purposes and definitions contained in the 1964 Wilderness Act are necessary before considering appropriate management actions in wilderness.

The purpose of the Act is stated in Section 2 (a), "to secure for the American people of present and future generations the benefits of an enduring resource of wilderness."

Section 4 (c) of the Act prohibits certain activities in wilderness by the public and, at the same time, allows the agencies to engage in those activities in some situations. Section 4 (c) states:

> "except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area."

In the above language, Congress acknowledged that even though certain activities are prohibited, there are times when exceptions to these prohibitions will need to be made for administration of the area. However, from the regulations, special orders, and internal agency policy contained in Appendix A of this guide, it is clear that the wilderness management agencies should not view the language in Section 4 (c) as blanket approval to conduct projects or allow activities without an analysis of (1) whether the project or activity is necessary to meet the minimum requirements for the administration of the area, and (2) which tool or method should be used to complete the project that results in the least impact to the physical resource or wilderness values.

Agency employees entrusted with management of wilderness should set the highest standard possible when reviewing management practices in wilderness. Wilderness is intended to be managed differently from other public lands and this difference needs to be demonstrated to the public.

A Word About Traditional/Primitive Tools and Mechanical Transport

There isn't an all encompassing definition of traditional or primitive tools, but generally defined they include a variety of non-motorized devices such as hand saws, axes, shovels, and certain tools that give a mechanical advantage such as wedges, block and tackles, and winches. The Wilderness Act prohibits the use of motorized equipment and mechanical transport, but not mechanized equipment. Technological advances have improved the efficiency and function of traditional tools over the years. These improvements don't eliminate them from consideration as traditional tools. The defining characteristic of traditional or primitive tools is the reliance on human or animal power.

Mechanical transport includes travel within the wilderness by motorized vehicle of any kind. It also includes mechanical devices that provide transportation such as bicycles.

The use of traditional tools has been a cornerstone of wilderness management philosophy since 1964. As a result, certain skills that almost certainly would have vanished, have been kept alive. So few opportunities still exist to perpetuate these skills that are an important cultural tradition in our country. This is one of the benefits of wilderness.

How to Use This Guide

This guide has been developed to help provide consistency to the way project proposals in wilderness are evaluated and to ensure that we constantly strive to maintain or improve wilderness character through the decisions that are made. The information in this guide needs to be accompanied by a clear understanding of wilderness values and the ability to translate that understanding to a variety of complex and/or difficult projects in wilderness.

The guide is not a NEPA document, decision document or policy, but rather a series of self-explanatory worksheets designed to assist in thinking through and/or documenting your analysis. The worksheets include a two step minimum requirements analysis: first, to determine if the project or activity proposed is the minimum necessary for administration of the area for the purpose of the Act, and second, to determine which tool(s) will have the least impact to the wilderness resource. The worksheets lead the wilderness manager through a series of questions to provoke thought and understanding about the necessity of the proposed project and the most appropriate tools to use.

The minimum requirements analysis is provided to stretch our imaginations for the least impactive way of administering the wilderness. The wilderness manager may authorize any of the generally prohibited activities or uses listed in Sec. 4(c) of the Wilderness Act if they are determined to be the minimum necessary to do the job and meet wilderness management objectives.

When deciding what projects or activities to undertake and tools to use, follow these steps:

1. Complete a minimum requirement analysis, Step 1 of the worksheets, for all proposed projects or activities. This step should not be used to justify use of motorized equipment or mechanical transport, but rather, to scrutinize the project or activity and make the best decision for wilderness in the long term.

2. Complete a "minimum tool" analysis for the project. This analysis can follow the attached worksheet or, if not, should at least address the same points. If the analysis shows a justifiable need for motorized equipment, it is important to have this analysis in writing to provide to the official(s) who can authorize the use of mechanical transport or motorized equipment in wilderness. For some units, this analysis may become an integral part of an environmental analysis required to document a decision to use motorized equipment.

Ongoing management practices, especially if they involve mechanical transport, motorized equipment, or structures, should be reviewed to determine if they are still necessary or the best way to complete the task at hand.

How Does the Minimum Requirements Analysis Tie to NEPA?

The minimum requirement analysis is intended to assist you in making a decision and the worksheets will document your analysis. This process does not take the place of NEPA.

If a formal decision under NEPA will be required to implement your project, consider formatting your minimum tool analysis so that it can be incorporated directly into your environmental analysis. The minimum requirements analysis will tie to your statement of Purpose and Need for the project in your environmental analysis.

Minimum Requirements Worksheets

STEP 1 - DETERMINING THE MINIMUM REQUIREMENTS
(a two part process)

PART A - Minimum Requirement Key to making a determination on wilderness management proposals

(This flow chart will help you assess whether the project is the minimum required action for administration of the area as wilderness. Answering these questions will help determine **IF** this action is really the **minimum required** action in wilderness.)

Guiding Questions

Use the available space or additional sheets as necessary.

Is this an emergency? (i.e. a situation that involves an inescapable urgency and temporary need for speed beyond that available by primitive means, such as fire suppression, health and safety of people, law enforcement efforts involving serious crime or fugitive pursuit, retrieval of the deceased or an immediate aircraft accident investigation.)	**Answer:**	**YES:** ☐	**NO:** ☐
	Explain:		

If **Yes**, then:
Document rationale for line officer approval using the minimum tool form and proceed with action.

If **No**, then:
⇓
go to next question

Does the project or activity conflict with the stated wilderness goals, objectives, and desired future conditions of applicable legislation, policy and management plans?	**Answer:**	**YES:** ☐	**NO:** ☐
	Explain:		

If **Yes**, then:
Do not proceed with the proposed project or activity.

If **No**, then:
⇓
go to next question

Are there other less intrusive actions that should be tried first? (i.e. signing, visitor education, or information.)	**Answer:**	**YES:** ☐	**NO:** ☐
	Explain:		

If **Yes**, then:
Implement other actions using the appropriate process.

If **No**, then:
⇓
go to next question

Minimum Requirements Worksheets

Can this project or activity be accomplished outside of wilderness and still achieve its objectives? (i.e. some group events.)	**Answer:**	**YES:** ☐	**NO:** ☐
	Explain:		

If **Yes**, then:

Proceed with action outside of wilderness using the appropriate process.

If **No**, then:

⇓

go to next question

Is this project or activity subject to valid existing rights? (i.e. a mining claim or right-of-way easement.)	**Answer:**	**YES:** ☐	**NO:** ☐
	Explain:		

If **Yes**, then:

Proceed to minimum tool section of this document, STEP 2.

If **No**, then:

⇓

go to next question

Is there a special provision in legislation (the 1964 Wilderness Act or subsequent wilderness legislation), that <u>allows</u> this project or activity? (i.e. maintenance of dams and water storage facilities with motorized equipment and mechanical transport or control of fire, insects and disease.)	**Answer:**	**YES:** ☐	**NO:** ☐
	Explain:		

If **Yes**, then:

The proposed project or activity can be **<u>considered</u>** but is not necessarily <u>required</u> just because it is mentioned in legislation. *Go to Part B, as needed.*

If **No**, then:

⇓

Proceed to Part B, Responsive Questions

Minimum Requirements Worksheets

PART B - Determining the Minimum Requirement

Responsive Questions for Minimum Requirements Analysis: Explain your answer in the response column. If your responses indicate potential adverse impacts to wilderness character, evaluate whether or not you should proceed with this proposal. If you decide to proceed, begin developing plans to mitigate impacts, and complete the Minimum Tool Analysis in this guide. Some of the following questions may not apply to your proposed project or activity.

	RESPONSIVE STATEMENT
EFFECTS ON WILDERNESS CHARACTER	
How does the project or activity benefit the wilderness resource as a whole as opposed to maximizing one resource?	
If this project or activity were not completed, what would be the beneficial and detrimental effects to the wilderness resource?	
How would the project or activity help ensure that human presence is kept to a minimum and that the area is affected primarily by the forces of nature rather than being manipulated by humans?	
How would the project or activity ensure that the wilderness provides outstanding opportunities for solitude or a primitive and unconfined type of recreation? (i.e. does the project or activity contribute to people's sense that they are in a remote place with opportunities for self-discovery, adventure, quietness, connection with nature, freedom, etc.)	
a) MANAGEMENT SITUATION	
What does your management plan, policy, and legislation say to support proceeding with this project?	
How did you consider wilderness values over convenience, comfort, political, economic or commercial values while evaluating this project or activity?	

b) SHOULD WE PROCEED?	c) YES: **(1) Go to Step 2**	d C :

Minimum Requirements Worksheets

STEP 2 - DETERMINING THE MINIMUM TOOL (the Minimum Tool Analysis)

These questions will assist you in determining the appropriate tool(s) to accomplish the project or proposed activity with the least impact to the wilderness resource. This analysis can be used as part of the NEPA process if desired. This analysis can be documented on the following form or on additional sheets. Directions are in **bold** type. Prompting questions are in *italics*.

Develop several approaches to resolve the issue or problem. At a minimum consider the following three methods:			
Alternative 1: An alternative utilizing motorized equipment or mechanical transport	**Alternative 2: An alternative using non-motorized equipment and non-mechanical transport.**	**Alternative 3: Variations of method 1 and 2, as appropriate.**	**Alternative 4: Other ideas?**
Describe the alternatives. Be specific and provide detail. *What is proposed?* *Why is it being proposed in this manner?* *Who is the proponent?* *When will the project take place?* *Where will the project take place?* *How will it be accomplished? (What methods and techniques will be used?)*			
Alt#1:	Alt#2:	Alt#3:	Alt#4:
Utilize the following criteria to assess each method (a brief statement should suffice) :			
Biophysical effects Describe the environmental resource issues that would be affected by the project. Describe any effects this action will have on protecting natural conditions within the regional landscape (i.e. insect, disease, or noxious weed control). Include both biological and physical effects.			

Alt#1:	Alt#2:	Alt#3:	Alt#4:

Minimum Requirements Worksheets

Social/recreation/experiential effects Describe how the wilderness experience may be affected by the proposed action. Include effects to recreation use and wilderness character. Consider the effect the proposed action may have on the public and their opportunity for discovery, surprise, and self-discovery.			
Alt#1:	Alt#2:	Alt#3:	Alt#4:
Societal/political effects Describe any political considerations (i.e. MOUs, agency agreements, local positions) that may be affected by the proposed action. Describe relationship of method to applicable laws.			
Alt#1:	Alt#2:	Alt#3:	Alt#4:

Health and safety concerns Describe and consider any health and safety concerns associated with the proposed action. Consider the types of tools used, training, certifications, and other administrative needs to ensure a safe work environment for employees. Consider the effect the proposed action may have on the health and safety of the public.			
Alt#1:	Alt#2:	Alt#3:	Alt#4:

Minimum Requirements Worksheets

Economic and timing considerations Describe the costs and timing associated with implementing each alternative Assess the urgency and potential cumulative effect from this proposal of similar actions.			
Alt#1:	Alt#2:	Alt#3:	Alt#4:
Formulate a preferred action. Be specific and describe in detail below.			
Choose a preferred alternative:			
Further refine the preferred alternative to minimize impacts to wilderness.			
What will be the specific operating requirements for the action? Include information on timing, locations, amounts, etc… Be as specific as possible.			

What are the maintenance requirements? Describe any ongoing or repeat efforts that will be necessary.
What standards and designs will apply?
Develop and describe any mitigation measures that apply.
What will be provided for monitoring and feedback to strengthen future effects and preventative actions to be taken to help in future efforts?

Minimum Requirements Worksheets

	Signature	Name	Position	Date
Prepared by:				
Recommended by:				
Recommended by:				
Approved by:				

(b) Minimum Requirements

Worksheets

(c)

(d) NEPA Worksheet

Note: This may not apply to your agency. Refer to your agency's policy on NEPA requirements before using this worksheet.

Determine the appropriate level of NEPA analysis and documentation. Answer the following questions.

Guiding Questions

Use the available space or additional sheets as necessary.

Is the action authorized by a previous NEPA document?	**Answer:** **YES:** ☐ **NO:** ☐ **Explain:**	

If **Yes**, then: Proceed with action, document approval for those actions requiring use of motorized equipment or mechanical transport with a letter of delegation from the appropriate line officer.

If **No**, then: ⇓ *go to next question*

Is the action of limited scope and duration and qualifies under one of the Secretary of Agriculture exemptions or Chief of the Forest Service exemptions for categorical exclusion without a case file?	**Answer:** **YES:** ☐ **NO:** ☐ **Explain:**	

If **Yes**, then: Proceed with action, document approval for those actions requiring use of motorized equipment or mechanical transport with a letter of delegation from the appropriate line officer.

If **No**, then: ⇓ *go to next question*

Is the action of limited scope and duration, has no extraordinary circumstances, and qualifies for a Chief of the Forest Service exemptions for categorical exclusion with a case file?	**Answer:** **YES:** ☐ **NO:** ☐ **Explain:**	

If **Yes**, then:

Scope interested publics and prepare Decision Memo for the appropriate line officer.

If **No**, then:

go to next question

Minimum Requirements Worksheets

Is the action likely to have significant adverse effects on the wilderness resource or human environment?

If **Yes**, then:	If **No**, then:
Proceed with an EIS and ROD for the appropriate line officer.	Scope interested publics and prepare an EA and Decision Notice for the appropriate line officer.

Answer:	**YES:** ☐	**NO:** ☐
Explain:		

APPENDIX A

Agency Policy related to minimum requirement/minimum tool

Bureau of Land Management:

Code of Federal Regulations 6303.1

How does BLM carry out administrative and emergency functions?
As necessary to meet minimum requirements for the administration of the wilderness area, BLM may:

(a) Use, build, or install temporary roads, motor vehicles, motorized equipment, mechanical transport, structures or installations, and land aircraft, in designated wilderness;

(b) Prescribe conditions under which other Federal, State, or local agencies or their agents may use, build, or install such items to meet the minimum requirements for protection and administration of the wilderness area, its resources and users;

(c) Authorize officers, employees, agencies, or agents of the Federal, State, and local governments to occupy and use wilderness areas to carry out the purposes of the Wilderness Act or other Federal statutes; and

(d) Prescribe measures that may be used in emergencies involving the health and safety of persons in the area, including, but not limited to, the conditions for use of motorized equipment, mechanical transport, aircraft, installations, structures, rock drills, and fixed anchors. BLM will require any restoration activities that we find necessary to be undertaken concurrently with the emergency activities or as soon as practicable when the emergency ends.

National Park Service:

Director's Order #41:
Wilderness Preservation and Management

C. Wilderness Management Issues

2. Application of the Minimum Requirement Concept

. . . except as necessary to meet the minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and

safety of persons within the area) there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, not other form of mechanical transport, and no structure or installation within any such area.

– The Wilderness Act: Section 4(c)

All management decisions affecting wilderness must be consistent with a minimum requirement concept . . . . When determining minimum requirement, the potential disruption of wilderness character and resources will be considered before, and given significantly more weight than, economic efficiency and convenience. If a compromise of wilderness resource or character is unavoidable, only those actions that preserve wilderness character and/or have localized, short-term adverse impacts will be acceptable.

– NPS Management Policies: 6.3.5 Minimum Requirement

The National Park Service will apply the minimum requirement concept to all administrative activities that affect the wilderness resource and character. The application of the minimum requirement concept is intended to minimize impacts on wilderness character and resources and must guide all management actions in wilderness.

Wilderness managers may authorize (using a documented process) the generally prohibited activities or uses listed in Section 4(c) of the Wilderness Act if they are deemed necessary to meet the minimum requirements for the administration of the area as wilderness and where those methods are determined to be the 'minimum tool' for the project. The use of motorized equipment and the establishment of management facilities are specifically prohibited when other reasonable alternatives are available. The minimum requirements process cannot be used to permit roads or inappropriate commercial enterprises within wilderness unless these are authorized by specific legislation.

The minimum requirement concept is to be applied as a two-step process that documents:

> (1) A determination as to whether or not a proposed management action is appropriate or necessary for the administration of the areas as wilderness, and does not pose a significant impact to the wilderness resources and character; and,
>
> (2) If the project is appropriate or necessary in wilderness, the selection of the management method (tool) that causes the least amount of impact to the physical resources and experiential qualities (character) of wilderness.

It is important to understand the distinctions between the terms "Minimum Requirement," and "Minimum Tool."

> Minimum Requirement is a documented process the NPS will use for the determination of the appropriateness of all actions affecting wilderness.

Minimum Tool means a use or activity, determined to be necessary to accomplish an essential task, which makes use of the least intrusive tool, equipment, device, force, regulation, or practice that will achieve the wilderness management objective. This is not necessarily the same as the term "primitive tool," which refers to the actual equipment or methods that make use of the simplest available technology (i.e., hand tools).

Park managers will apply the minimum requirement concept when making all decisions concerning management of the wilderness area. This includes decisions concerning administrative practices, historic properties, proposed special uses, research, and equipment use in wilderness.

Planned administrative actions that may result in an exception to a prohibited use (i.e., chainsaws, aircraft use, radio repeater sites, rock drills, patrol structures, weather stations), or have the potential to impact wilderness resources and values must be consistent with an approved wilderness management plan and be documented in accordance with the park's minimum requirements process. The minimum requirements process will be conducted through appropriate environmental analysis (e.g., categorical exclusions, environmental assessment/ FONSI, or an environmental impact statement/Record of Decision).

When determining the minimum requirement for a proposed action, the manager will strive to minimize the extent of adverse impact associated with accomplishing the necessary wilderness objective. The determination as to whether or not an action has an adverse impact on wilderness must consider both the physical resources within wilderness, and wilderness characteristics and values. These characteristics and values include: the wilderness's primeval character and influence; the preservation of natural conditions (including the lack of man-made noises); cultural resource values, the assurance of outstanding opportunities for solitude; the assurance that the public will be provided with a primitive and unconfined type of recreational experience; and the assurance that wilderness will be preserved and used in an unimpaired condition.

Managers must give appropriate consideration to the aesthetic values of wilderness as well as the physical resource. These factors take precedence over cost or convenience in determining minimum requirement. National Parks with wilderness must have a documented process for applying the minimum requirement concept. Reference Manual #41: Appendix F includes examples of "decision trees," which may be adopted or referred to as a procedure by which alternatives can be assessed and final management decisions developed. These decision tree examples do not alleviate a park's responsibility for providing adequate environmental compliance documentation for individual projects.

U.S. Fish and Wildlife Service:

Refuge Manual
8. Wilderness Area Management

8.5 Definitions.

A. Minimum tool. The minimum action or instrument necessary to successfully, safely, and economically accomplish wilderness management objectives.

8.8 Administrative guidelines.

A. Use of motorized equipment. Motorized equipment may be used in special circumstances if it is the minimum tool necessary to accomplish a task safely and without long term impairment of the area's wilderness character. However, except where Congress specifically authorizes such uses in the establishing laws or in other acts modifying the Wilderness Act such as ANILCA, the use of motor vehicles, motorized equipment, mechanical transportation, and the landing of aircraft would not be used in the routine administration of wilderness. The determination of when motorized equipment constitutes the minimum tool will be left to the refuge manager. Some examples of special situations are given below:

(1) Emergency situations involving the public's health and safety, including search and rescue operations.

(2) Activities essential to accomplishing refuge objectives. For example, if bighorn sheep tanks dry up and the only means of supplying water is by trucking it into the tanks or, where grazing is permitted, bringing a veterinarian in by truck to treat seriously ill cattle.

(3) In the control of fire, insects, diseases, or other hazards.

C. - Final paragraph related to wildfire management and minimum tool:

While an aggressive approach to wildfire control on certain wilderness areas may be in order, the method(s) utilized should be the "minimum tool." The minimum tool may include, but is not limited to, lookout towers, tool caches, firebreaks, motorized land, water or air equipment, and chemical retardants. In conducting wildfire control activities, care must be taken to ensure that control methods do not harm the refuge and wilderness area more than the wildfire itself. For example, extensive bulldozed firebreaks on a hillside that result in permanent scars and soil erosion may have a far greater adverse effect than the temporary effect of fire. These kinds of situations should be carefully analyzed and adequately provided for in the refuge management plans.

Forest Service:
2320 Manual Direction

2326 - USE OF MOTORIZED EQUIPMENT OR MECHANICAL TRANSPORT IN WILDERNESS

1. Accomplish management activities with nonmotorized equipment and nonmechanical

transport of supplies and personnel.

2. Exclude the sight, sound and other tangible evidence of motorized equipment or mechanical transport within wilderness except where they are needed and justified.

2326.03 Policy

2. Do not approve the use of motorized equipment or mechanical transport unless justified as described in 2326.1. For definition see 2320.5.

2326.1 - Conditions Under Which Use May Be Approved. Allow the use of motorized equipment or mechanical transport only for:

1. Emergencies where the situation involves an inescapable urgency and temporary need for speed beyond that available by primitive means. Categories include fire suppression, health and safety, law enforcement involving serious crime or fugitive pursuit, removal of deceased persons, and aircraft accident investigations.

2. Aircraft or motor boat use established before the area was designated as wilderness by the Act of 1964 or subsequent wilderness legislation.

3. Exploration and development of valid existing mineral rights (FSM 2323.7).

4. Access to surrounded State and private lands and valid occupancies (FSM 2326.13).

5. To meet minimum needs for protection and administration of the area as wilderness, only as follows:

a. A delivery or application problem necessary to meet wilderness objectives cannot be resolved within reason through the use of nonmotorized methods.

b. An essential activity is impossible to accomplish by nonmotorized means because of such factors as time or season limitations, safety, or other material restrictions.

c. A necessary and continuing program was established around the use of motorized equipment before the unit became a part of the National Wilderness Preservation System, and the continued use of motorized equipment is essential to continuation of the program.

d. Removal of aircraft wreckage when nonmotorized methods are unsuitable.

Specify, for each wilderness, the places and circumstances in which motorized equipment, mechanical transport, or aircraft are necessary for protection and administration of the wilderness and its resources in the forest plan.

The Line Officer approving the use of motorized equipment, aircraft, or mechanical transport shall specify what uses of that equipment are suitable and will have the least lasting impact to the wilderness resource. Schedule use of this equipment to minimize impact on wilderness visitors.

Code of Federal Regulations:
CFR 292.6
Commercial enterprises, roads, motor vehicles, motorized equipment, motorboats, aircraft, aircraft landing facilities, airdrops, structures, and cutting of trees.

Except as provided in the Wilderness Act, subsequent legislation establishing a particular Wilderness unit, or 294.2(b), 294.2(c), and 294.2(e), paragraphs (c) and (d) of this section, and 293.7, 293.8, and 293.12 through 293.16, inclusive, and subject to existing rights, there shall be in National Forest Wilderness no commercial enterprise; no temporary or permanent roads; no aircraft landing strips; no heliports or helispots, no use of motor vehicles, motorized equipment, motorboats, or other forms of mechanical transport; no landing of aircraft; no dropping of materials, supplies, or persons from aircraft; no structures or installations; and no cutting of trees for nonwilderness purposes.

APPENDIX B

DEFINITIONS

Mechanical Transport
Any contrivance which travels over ground, snow, or water, on wheels, tracks, skids, or by flotation and is propelled by a nonliving power source contained or carried on or within the device. *Source: 36 CFR 293.6a*

Mechanical Transport

Any contrivance for moving people or material in or over land, water, snow or air that has moving parts and is powered by a living or non-living power source. This includes (but is not limited to) wheeled vehicles such as bicycles, game carriers, carts and wagons. "Mechanical transport" does not include wheelchairs when used as necessary medical appliances, not does it include skis, snowshoes, sleds, travois, non-motorized river craft including driftboats, rafts, or canoes, or similar primitive devices. *Source: National Park Service Director's Order #41*

Minimum Tool
The least impactive method, equipment, device, force, regulation, practice, or use that will meet the management objective in a wilderness context. This represents the "how" question that must be asked to ensure that the process to implement the minimum required action will minimize impact on social and biophysical wilderness values. Minimum tool is not synonymous with primitive tool. In some cases the minimum tool could be a motorized tool or a form of mechanical transport.

Minimum Requirement
An action that is determined to be absolutely necessary but results in the least discernible impact on all the wilderness values and is the least manipulative or restrictive means of achieving a management objective in wilderness. This represents the "why" and "is it necessary" questions that must be answered before deciding that an action, that could potentially leave a mark of human influence in wilderness, is necessary.

Motorized Equipment
Machines that use a motor, engine, or other nonliving power sources. This includes, but is not limited to, such machines such as chain saws, aircraft, snowmobiles, generators, motor boats, and motor vehicles. It does not include small battery or gas powered hand carried devices such as shavers, wristwatches, flash-lights, cameras, stoves, or other similar small equipment. *Source: FSM 2320.5, 36 CFR 293.6b*

Permanent Improvement
A structural or non-structural improvement that is to remain at a particular location for more than one field season. Permanent improvements include such items as trails, toilet buildings, cabins, fences, tent frames, fire grills, and instrumentation stations. Permanent improvements may be allowed in wilderness, subject to a minimum requirement analysis. *Source: FSM 2320.5*

Primitive Skills
The proficient and safe use of primitive tools and methods of transportation.

Primitive Traditional Tool
Implements, devices, equipment, and tools that originated in the pre-motorized or pioneering era such as the axe, cross-cut saw, hammer, wrench, hand winch, pulley, packstring, oar-powered or paddle-powered water craft, and skis. Modern versions of these tools and other hand or stock operated tools, that are powered by a living source, are also included.

Temporary Structure
Any structure that is easy to dismantle, that could be removed completely from a site between periods of actual use, and that must be removed at the end of each season of use. *Source: FSM 2320.5*

Untrammeled
Not confined, not restrained, free from hindrances. *Source: American Heritage Dictionary*

Wilderness Appropriate Response
The minimum required action and the minimum tool selected by managers to respond to a wilderness issue, need, opportunity, or threat.

Wilderness Values
The recognized reasons for wilderness to exist and be preserved. Wilderness has natural values that are vital to the health of our planet as well as the enjoyment of those visiting them. Wilderness values include things such as watersheds for cities, benchmark for scientific research, critical habitat for wildlife, genetic material for plant and animal diversity, undisturbed geological resources, sanctuary from the pressures and pace of modern society, and a repository for cultural resources. The public values of wilderness include, but are not limited to, opportunities for scientific study, education, solitude, physical and mental challenge and stimulation, inspiration, and primitive recreation experiences.

OTHER RELEVANT TERMS

The following definitions are straight out of the dictionary but may be useful for the reader to help put the minimum tool/minimum requirement in context.

Appropriate
Especially suitable or compatible.

Minimum
The smallest quantity, number, or degree possible or permissible.

Necessary
That must be done; undeniable; mandatory; required; indispensable; inherent in the situation.

Requirements
Something needed; a necessity; something obligatory or demanded, as a condition; something required.

Tool
Something used in performing an operation; a means to an end.

APPENDIX C

REFERENCES

Arthur Carhart National Wilderness Training Center, Wilderness *Box Land Ethics Secondary Curriculu*m, pages 233-240, 1998.

Arthur Carhart National Wilderness Training Center, *Wilderness Tools and Equipmen*t, 1993

Birkby, Robert C., *Lightly on the Land - The SCA Trail Building and Maintenance Manua*l, The Mountaineers, 1996.

Hallman, Richard G., *Handtools for Trail Wor*k, USDA Forest Service, Missoula Technology and Development Center, 1988.

Hendee, John C., George H. Stankey and Robert C. Lucas, *Wilderness Managemen*t, North American Press, 1990.

Jackson Albert, and David Day, *Tools and How to Use The*m, Knopf, New York, 1978.

Kringler, Harry, *Solar Powered Water Pumping Systems for Remote Site*s, USDA Forest Service Engineering Notes, Volume 18, May-June.

Miller, Warren, *Crosscut Saw Manua*l, USDA Forest Service, Missoula Technology and Development Center, 1988.

Mrkish, Dan and Jerry Oltman, *Hand Drilling and Breaking Rock for Wilderness Trail Maintenanc*e, USDA Forest Service, Missoula Technology Development Center, 1984.

Proudman, Robert, *AMC Field Guide to Trail Building and Maintenanc*e, Appalachian Mountain Club, 1977.

Topkins, Peter and C. Bird, *The Secrets of the Soil: New Age Solutions for Restoring Our Planet*, Harper and Row, New York, 1989.

USDA Forest Service, *Alaska Region Trail Construction and Maintenance Guid*e, Alaska Region, R10-MB-158, 1991.

USDA Forest Service, *Bear Proof Food Locke*r, Missoula Technology Development Center, 1996.

USDA Forest Service, *Blasting and Explosive*s, Missoula Technology Development Center, 1997.

USDA Forest Service, *Boulder Buste*r, Missoula Technology Development Center, 1998.

USDA Forest Service, *Forest Service Explosive*s, Missoula Technology Development Center, 1992.

USDA Forest Service, *Forest Service Manual 2320, Part 2326,* 1990.

USDA Forest Service, *Geosynthetics for Trails in Wet Area*s, Missoula Technology Development Center, 1995.

USDA Forest Service, *Gravel Bags for Packstoc*k, Missoula Technology Development Center, 1995.

USDA Forest Service, *Hand Drilling and Breaking Rock for Wilderness Trail Maintenanc*e, Missoula Technology Development Center, R1-84-09, 1984.

USDA Forest Service, *Hand Tools for Trail Work, Parts 1 and* 2, Missoula Technology Development Center, 1988 and 1997.

USDA Forest Service, *Hazard Tree Felling with Explosive*s, Missoula Technology Development Center, 1994.

USDA Forest Service, *Leave No Trace Campfires and Firepan*s, Missoula Technology Development Center, 1997.

USDA Forest Service, *Lightweight Camping and Stock Equipmen*t, Missoula Technology Development Center, 1993.

USDA Forest Service, *Low Impact Food Hoist*s, Missoula Technology Development Center, 1994.

USDA Forest Service, *Minimum Tool Evaluation Guid*e, Intermountain Region, 1994.

USDA Forest Service, *Minimum Tool Evaluation Guide (draft*), Rocky Mountain Region, 1997.

USDA Forest Service, *Moose Creek Ranger District, "A Way of Life*", Northern Region, Nez Perce National Forest, Moose Creek Ranger District, R1-91-27a.

USDA Forest Service, *New Explosives for Trail Constructio*n, Missoula Technology Development Center, 1994.

USDA Forest Service, *Obliterating Animal Carcasses with Explosive*s, Missoula Technology Development Center, 1995.

USDA Forest Service, *Packstock Gear Drawing*s, Missoula Technology Development Center, 1993.

USDA Forest Service, *Process for Making Requests for Using Hand Held Power Tools Along the Appalachian National Scenic Trail in Designated Wilderness Areas in the National Forests following Catastrophic Storm Event*s, Southern Region.

USDA Forest Service, *Rock Carriers for Trail Wor*k, Missoula Technology Development Center, 1995.

USDA Forest Service, *Stock-Drawn Equipment for Trail Wor*k, Missoula Technology Development Center, 1996.

USDA Forest Service, *Techniques and Equipment for Wilderness Horse Trave*l, Missoula Technology Development Center, 1988.

USDA Forest Service, *Techniques and Equipment for Wilderness Travel with Stoc*k, Missoula Technology Development Center, 1993.

USDA Forest Service, *Trail Construction and Maintenance Noteboo*k, "Missoula Technology Development Center, 1996.

USDA Forest Service, *Tree Saver Stra*p, Missoula Technology Development Center.

USDA Forest Service, *Use and Care of Primitive Tools (courses*), Northern Region, Ninemile Wildlands Training Center.

USDA Forest Service, *Wilderness Access Decision Too*l, Northern Region and Wilderness Inquiry, Arthur Carhart Wilderness Training Center.

USDA Forest Service, *Wilderness Tools and Equipmen*t, Northern Region, Ninemile Wildlands Training Center, 1992.

USDI National Park Service, *Wilderness "Minimum Requirement" Decision Tre*e, Shenandoah National Park.

USDI National Park Service, *Process for Determining Minimum Requirement,* Grand Canyon National Park.

USDI National Park Service, *Minimum Requirement Concept and Analysis Worksheet*, Rocky Mountain National Park, 1998.

Volunteers for the Outdoors, *Adopt-a-Trail Handbook. A guide to volunteer trail maintenance in the Southwest.* New Mexico Natural Resource Department, 1984.

Appendix R. Koyukuk and Northern Unit Innoko Fire Regime and Condition Class.

Appendix S. Wildland Fire Use Decision Matrix.

Appendix T. Fire Surveillance Form.

Appendix U. **Koyukuk Preparedness Plan**

Preparedness Level 1.

Fire danger is low to moderate. There has been no significant fire activity locally, regionally or nationally. Local, regional and national resources are available. There are no fires burning on the Refuge. The Canadian Buildup Index (BUI) average is less than 70.

Refuge Management Action:

There will be no restrictions on prescribed burning. If prescribed burning is taking place, the FMO must ensure there are adequate available regional contingency suppression resources.

Normal non-fire staff assignments on the Refuge are unrestricted. The Refuge fire staff is available for "callout" if no prescribed burns are in progress on the Refuge.

The AICC Situation Report and weather forecasts are not monitored. The Kaiyuh, Cottonwood and Koyukuk RAWS are monitored periodically to determine BUI.

Any new wildfire starts on the Refuge will receive appropriate management response as outlined in the AIWFMP and the Koyukuk Fire Management Plan.

Preparedness Level 2.

The fire danger is moderate. There is some local or regional fire activity. Local, regional and national suppression resources are still available, although some local or regional resources are committed to fire assignments. Numerous small fires may be occurring within the region. Small fires may be occurring on the Refuge. The Canadian Buildup Index is less than 90.

Refuge Management Action:

There are no restrictions on prescribed burning. If prescribed burning is taking place, the FMO will ensure there are adequate local and regional contingency suppression resources available.

There are no restrictions on non-fire staff prescribed burn assignments. Fire monitors will be assigned monitoring duties if fires occur on the Refuge. Fire staff is available for regional "callout" if no prescribed burns are in progress.

The AICC Situation Report and weather forecasts are monitored daily by the FMO or designate.

The Kaiyuh, Cottonwood, and Koyukuk RAWS will be monitored daily by the FMO or designate if a prescribed burn is in progress.

Any new wildfire starts on the Refuge will receive appropriate management response as delineated in the AIWFMP and the Koyukuk FMP.

Preparedness Level 3.

The fire danger is high. There is a moderate amount of local and regional fire activity. Some local and regional resources are committed to fir assignments and national resources are still available. At least one Type II fire and numerous small fires are occurring in the region, resulting in increased commitment of resources. Small fires may be occurring on the Refuge. The AICC Situation Report Preparedness Level 3 will determine when this level goes into effect on the Refuge. The Canadian Buildup Index (BUI) is greater than 90.

Refuge Management Action:

There will be no new prescribed burns at Preparedness Level 3 prior to the modified management option evaluation date. After the conversion of modified to limited management option, ignition of prescribed burns will be allowed as long as adequate regional contingency suppression resources are available. Research oriented prescribed burns will be permitted if their focus is to help the fire community to better understand prescribed burning parameters, indices and fire effects.

Refuge fire staff will be available for "callout" in the region if no prescribed burns are in progress on the Refuge. Fire monitors will be assigned monitoring duties if fires occur on the Refuge.

The AICC Situation Report and weather forecasts will be monitored daily by the FMO or designate.

The Kaiyuh, Cottonwood, and Koyukuk RAWS will be monitored daily by the FMO or designate.

Limited management option wildfires occurring on the Refuge will be monitored daily.

All new wildfire starts on the Refuge will receive the appropriate management response as outlined in the AIWFMP and the Koyukuk FMP.

Preparedness Level 4

The fire danger is very high. There is a moderate to high level of local and regional fire activity. Most local and regional resources are committed to fire assignments and national resources are in short supply. Multiple Type II fires and numerous small fires are occurring in the region, resulting in near total commitment of resources. Small fires and/or Type II fires may be occurring on the Refuge. The AICC Situation Report Preparedness Level will determine when this level goes into effect on the Refuge. The Canadian Buildup Index (BUI) average from local RAWS is greater than 90.

Refuge Management Action:

No new ignitions of prescribed burns will be allowed. Ongoing prescribed burn activity will be phased down and curtailed when it is determined or anticipated that insufficient regional contingency suppression resources are available for support.

The Refuge fire staff will be available for "callout" in the region if no prescribed burns are in progress and fire activity on the Refuge does not require their support. Fire monitors will be assigned monitoring duties if fires occur on the Refuge. Refuge activities may be reduced due to high fire danger or adverse smoke conditions.

The AICC Situation Report, weather forecasts and the Kaiyuh, Cottonwood, and Koyukuk RAWS will be monitored daily by an individual designated by the FMO.

Limited management option fires burning on the Refuge will be monitored daily by aerial surveillance.

All new wildfire starts on the Refuge will receive the appropriate management response as outlined in the AIWFMP and the Koyukuk FMP.

Preparedness Level 5

Fire danger is extreme. There is major local and regional fire activity. There is a shortage of local and regional resources. Type II or larger fires and numerous small fires are occurring locally and in the region. At least one Type II or larger fire is occurring on the Refuge. The AICC Situation Report Preparedness Level determines when this level goes into effect on the Refuge. The Canadian Buildup Index (BUI) average from local RAWS is greater than 110.

Refuge Management Action:
No prescribed burns will be allowed.

All Refuge fire staff will be available for "callout" locally. Non-fire Refuge activities will be limited depending upon smoke conditions and fire locations. If Type II or larger fires occur on the Refuge, the FMO will not be available for other assignments and will function as the Refuge Manager's liaison with AFS. An information officer will be requested. Fire monitors will be assigned monitoring duties. Refuge staff may be assigned resource advisor duties for large fires occurring on the Refuge. Additional fire staff will be requested if the Refuge fire staff cannot adequately monitor and/or handle the existing fires on the Refuge.

The FMO will designate someone to monitor the AICC Situation Report, weather forecasts, and the Kaiyuh, Cottonwood, and Koyukuk RAWS twice daily.

Limited management option wildfires occurring on the Refuge will be monitored daily.

All new wildfire starts on the Refuge will receive the appropriate management response as outlined in the AIWFMP and the Koyukuk FMP.

Appendix V. Wildland Urban Interface Preliminary Risk Assessment

Wildland Urban Interface (WUI) fire risk assessments will be conducted and prioritized in collaboration with all federal, state, and local agencies, as well as Native entities, for all communities in Alaska. All communities (defined as communities by the State of Alaska) where assessed for risk from wildland fire in a collaborative effort among federal, state, local and Native entities in 2001 and updated in 2005. The following criteria were used in the community assessments: Ground fire encroachment threat; Crown fire encroachment threat; Fire behavior potential; Values at risk; and Infrastructure. These ratings where combined to determine an overall Wildland fire risk rating of low**,** moderate**,** or high for each community. As more detailed assessments are accomplished the overall wildland fire risk may change.

Six communities in or near the Koyukuk and Northern Unit Innoko National Wildlife Refuge have been identified as being potentially impacted by wildland fire occurrence on the refuge. These communities and risk ratings are as follows:

Community	Population	Ground Fire Encroachment Threat	Crown Fire Encroachment Threat	Fire Behavior Potential	Values at Risk	Infra-structure	Overall Wildland Fire Risk
Kaltag	251	Yes	Yes	High	Moderate	High	High
Galena	592	Yes	Yes	High	Moderate	High	High
Koyukuk	100	Yes	No	Moderate	Moderate	High	Low
Nulato	347	Yes	Yes	Moderate	High	High	High
Huslia	77	Yes	No	Moderate	Moderate	High	Moderate
Hughes	283	Yes	No	Moderate	Moderate	High	Moderate

The cost to conduct a detailed assessment is estimated at $5,000. The cost includes risk assessment, mitigation plan and NEPA requirements. Implementation costs for fuels treatment are estimated to be $2,000 per acre for hand thinning and piling of slash, plus an additional $500 per acre to burn the slash piles. Mechanical treatments are estimated to cost in the range of $300 to $500 per acre depending on type of treatment, machinery used and site conditions. The size of the treatment unit around a community depends on the findings of the risk assessment and the mitigation elements developed in collaboration with the community. To fully implement fuel treatments for these communities would cost $30,000 for the planning and $600,000 for treatments. Treatment cost is based on 40 acres per community.

Native allotments receive full wildland fire protection. These allotments are surrounded by Service lands. Risk assessments and treatment options for Native allotments would be developed in conjunction with the allotment owners, the Bureau of Indian Affairs and/or the local compacting Tribal entity. Most Native allotments are isolated, remote parcels and very few have full-time occupied dwellings, therefore the risk for wildland fire entering an allotment is higher than may be for a community. Treatment costs around allotments would be the same as for community protection, however, the values to be protected would generally be lower primarily due to lack of residences. The cost to fully implement allotment fuels treatment projects could potentially be shared by the Bureau of Indian Affairs. If the treatment was on Service lands, the cost to the Service would be much higher. Native allotments average 160 acres. Assuming a 300-foot border around an allotment, approximately 36 acres would be treated to reduce the risk of wildland fire for a single allotment. Including all status there are 154 Native allotments. If each allotment was treated separately 5,544 acres would need to be treated. The planning cost per allotment is estimated at $1,000. A total of $154,000 in planning cost would be required. Full implementation of the WUI treatment for Native allotments would cost approximately $13, 860,000.

Cabins and cultural resources are other values at risk from wildland fire on Service lands. An assessment of all cabins and cultural sites has not been completed as of July 2005. Typically, one or two acres of hazard fuel treatment are required per cabin or cultural resource site. The cost to implement cabin or cultural resource site fuels treatment is estimated at $6,000 per site. The cost includes planning, NEPA, treatments, and monitoring activities.