

Koyukuk/Nowitna National Wildlife Refuge Fire Management Plan



KOYUKUK, NORTHERN UNIT INNOKO AND NOWITNA NATIONAL WILDLIFE REFUGE

WILDLAND FIRE MANAGEMENT PLAN

May 2010

REVIEW AND APPROVALS

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1.0 Introduction

1.1 Purpose of the Fire Management Plan (FMP)

This plan is written to meet Department and Service requirements that every area with burnable vegetation must have an approved Fire Management Plan. This document updates the FMP approved in 1995 for the combined Koyukuk NWR/Northern Unit of the Innoko NWR and the FMP approved in that same year for the Nowitna NWR and combines it with the other two units. The update incorporates changes in interagency policy and federal interagency FMP format guidelines.

The goal of wildland fire management is to plan and implement actions to 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. (095 FW 3.2)

This FMP identifies and integrates all wildland fire management and related activities within the context of an approved Comprehensive Conservation Plan (CCP). It defines a program to manage wildland fires and to assure that wildland fire management goals and components are coordinated. An approved FMP is a prerequisite for prescribed fire and the use of wildland fire for resource benefit on the Refuges.

1.2 General Description of the Area in the FMP

This plan applies to an area of approximately 7 million acres in west central Alaska approximately 300 air miles northwest of Anchorage, Alaska. The FMP area is part of the fire dependent interior Alaska boreal forest and tundra ecosystems. Interior Alaska's boreal forest ecosystem is part of the sub-arctic 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.

The Koyukuk, Northern Innoko, and Nowitna Refuges were established in 1980 as a result of the Alaska National Interest Lands Conservation Act (ANILCA). None of the refuges are exclusive tracts of federal land, rather, their boundaries encompass a complex pattern of Native corporation, State, private and federal lands. Non-federal lands comprise approximately 15% of the acreage within the Koyukuk NWR boundaries, totaling approximately 689,228 acres. Non-federal lands comprise approximately 48% of the acreage within the Northern Unit Innoko NWR boundaries, totaling approximately 363,882 acres. Non-federal lands comprise approximately 11% of the acreage within the Nowitna NWR boundaries, totaling approximately 231,412 acres. These acreages will undoubtedly change as various state, corporate and private land in-holdings are finalized. The complex nature of land status in many cases is the result of claims made under the Alaska Native Claims Settlement Act. For a detailed break-down of land status, reference tables 3-2 through 3-4 in the 2009 Revised Comprehensive Conservation Plan for the Koyukuk/Northern Unit Innoko/Nowitna NWR (CCP).

Table 1- Management Units included in the FMP area

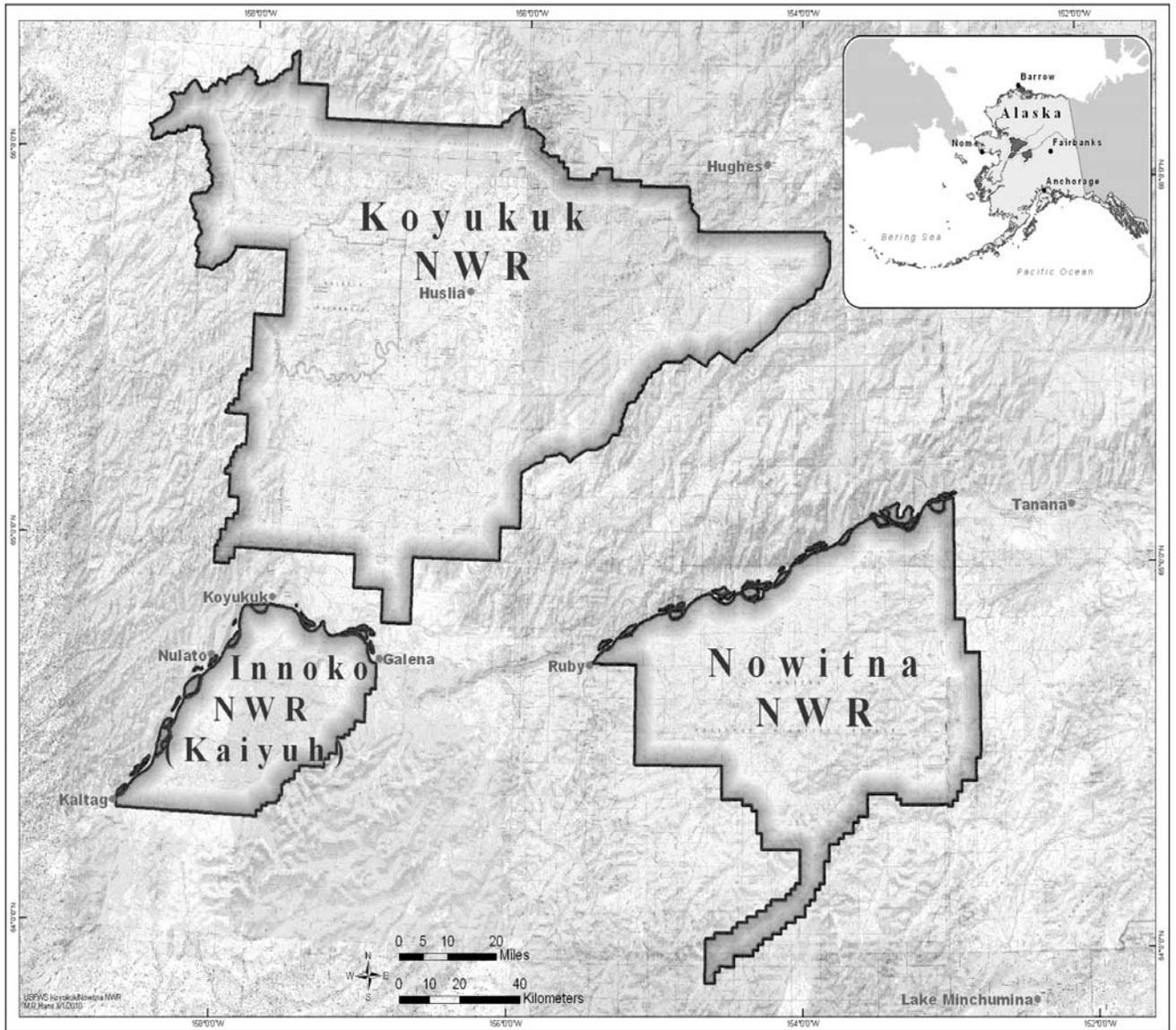
FWS Management Units within the FMP	Total Acres
Koyukuk National Wildlife Refuge	4,500, 000
Innoko National Wildlife Refuge – Northern Unit	751,000
Nowitna National Wildlife Refuge	2,051,000

The Koyukuk NWR begins seven miles north of Galena, Alaska and extends north about 90 miles, and east to west about 130 miles; it includes the 400,000 acre Koyukuk Wilderness area. The refuge is accessible by boat along the Koyukuk River and by floatplane on numerous lakes. It has no all-weather trails or roads. The Koyukuk Refuge is comprised of an oblong flood plain basin surrounded by high hills. The basin includes numerous lakes, marshes, rivers and streams. Water for the Koyukuk valley comes from geologic limestone formations in the Brooks Range which may contribute to the region's high productivity. Except for the dune area the major soil types are mineral soils 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 major rivers.

The Northern Unit of the Innoko NWR (referred to locally as the Kaiyuh Flats) begins about one mile southwest of Galena and south of the Yukon River, and extends about sixty miles to the southwest. The refuge is accessible by boat along the Yukon River and by floatplane on numerous lakes. It has no all-weather trails or roads. The Northern Unit of the Innoko 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 refuge.

The Nowitna Refuge is approximately 150 air miles west of Fairbanks in the central Yukon River Valley. The refuge is accessible by boat along the Yukon and Nowitna Rivers, and by floatplane on numerous lakes. It has no all-weather trails or roads. Its northern part is made up of wetlands, with numerous lakes and marshes in the Nowitna lowland, near the Yukon River, while its southern part is characterized by foothills along the northern edge of the Kuskokwim Mountains. The two areas are bisected from the center of the refuge to the eastern boundary by a band of vegetated sand dunes and bedrock hills. The lowest sites on the refuge (less than 200 feet) are found along the Yukon. The Kuskokwim Mountain foothills are the highest points at over 2,300 feet. To the east and west of the refuge are State of Alaska (State), village and Native Corporation, and Bureau of Land Management (BLM) lands.

Figure 1. Map of Koyukuk, Northern Unit Innoko, and Nowitna NWRs.



1.3 Significant Values to Protect

Koyukuk Refuge-

Section 302 (3) of ANILCA lists purposes for which the Koyukuk NWR was established and shall be managed:

- (i) “to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to 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”.

Northern Innoko Refuge-

Section 302 (3) of ANILCA also set forth the purposes for which the Northern Innoko Refuge was established. 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.”

Nowitna Refuge-

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

- (i) “to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, trumpeter swans, white-fronted geese, canvasbacks and other waterfowl and migratory birds, moose, caribou, martens, wolverines and other furbearers, salmon, sheefish, and northern pike.”

Section 602 of ANILCA designated the Nowitna River as a wild river in the National Wild and Scenic River System. The Wild and Scenic Rivers Act states that these rivers shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. Specifically, section 10 (a) of the Wild and Scenic Rivers Act states that: “Each component of the national wild and scenic rivers system shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system without, insofar as it is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values.”

Approximately 2,000 to 3,000 people live near or within the boundaries of the FMP area, mainly in the seven villages listed in the next paragraph. A few people live on Native allotments or on allotments or on homesteads. Subsistence activity by the village residents is the major public use of the FMP area.

The five villages of Kaltag, Galena, Koyukuk, Nulato, Huslia, and Hughes are located near and/or have village corporation lands within the boundaries of the Koyukuk or Northern Unit Innoko Refuge. The nearest villages to the Nowitna Refuge are Ruby and Tanana. Through an interagency risk assessment process, the village of Koyukuk has been identified as low risk, Huslia, Ruby, and Hughes as moderate risk, and Galena, Kaltag, and Nulato as at high risk from wildland fire. Scattered cabins and a few cultural resource sites have been identified as values of risk from wildfire.

Fire and flooding are two important disturbances that determine the overall health and vigor of the Refuges' ecosystems. Fire is the major recycler of nutrients. Flooding recharges floodplains with nutrients and provides a new seedbed for shrub and tree species. Fire creates and maintains the diversity of vegetative communities, seral stages, and wildlife habitats. This consideration and evaluation of the cost-effective appropriate management response has resulted in designation of large portions of the FMP area where natural fire is usually allowed to burn unless it threatens human life or property.

The Koyukuk refuge includes the 400,000 acre designated Koyukuk Wilderness area that surrounds the geologically unique Nogahabara Sand Dunes. Three Day Slough, in the western center of the refuge just south of the Nogahabara Sand Dunes, has one of the highest moose densities in Alaska.

The Nowitna River runs south to north through the entire length of the Nowitna refuge before emptying into the Yukon River. The river meanders for approximately 223 miles, forming a floodplain from 1 to 6 miles wide, except when it flows through the fifteen mile long Nowitna Canyon. The floodplain lowlands provide prime habitat for waterfowl, furbearers, and moose, as well as healthy populations of northern pike, whitefish, sheefish, and salmon. The Nowitna Wild River corridor contains 142,000 acres.

Other special values include:

- On the Koyukuk NWR and Northern Innoko NWR
 - Early successional habitats
 - Diverse system of wetlands
 - Peregrine falcon habitat
 - Nogahabara Sand Dunes
 - Subsistence harvest
 - Western Arctic caribou herd
- On the Nowitna NWR
 - Nowitna River and floodplain habitat
 - Resident sheefish population in Nowitna River
 - Agates on gravels bars along the upper Nowitna River
 - Palisades of the Yukon River – a rich area for paleontology
 - Boney Creek dissected bench lands
 - Waterfowl habitat
 - Furbearer habitat

Trapping activities can be disrupted by fire. The effects of fire on trapping vary and depend on fire intensity, which in turn, is directly related to multiple factors such as fuel type, fuel continuity, drought, and wind. Large catastrophic fires with few or no unburned inclusions have a long term negative impact

on furbearers due to their dispersal from the burned area, and consequently negatively affect trapping (especially when trap lines within the burn cannot be relocated). Smaller, less intense fires that leave unburned islands can provide ideal furbearer habitat. The blow down of dead trees can create a physical barrier for trappers.

A list of RAWS sites, repeater sites and FWS administrative cabins to be protected and their location are listed in Appendix A.

2.0 Policy, Land Management Planning, and Partnerships

2.1 Fire Policy

Since 2000, all federal agencies with wildland fire management responsibilities have been given specific direction regarding fire management goals as 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. The intent of the fire management programs described in this FMP is to follow the guidance established in these documents and in recent policy changes to contribute to the achievement of national, regional, State and Refuge goals.

The program'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 ecosystem.

2.1.1 Federal Interagency Wildland Fire Policy

This FMP implements these guiding principles of federal wildland fire policy:

- Firefighter and public safety is the first priority in every fire management activity.
- The role of wildland fire as an essential ecological process and natural change agent has been incorporated into the planning process.
- Federal agency land and resource management plans set the objectives for the use and desired future condition of the various public lands.
- Fire management plans, programs, and activities support land and resource management plans and their implementation.
- Sound risk management is a foundation for all fire management activities. Risks and uncertainties relating to fire management activities must be understood, analyzed, communicated, and managed as they relate to the cost of either doing or not doing an activity.
- Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives.
- Fire management plans and activities are based upon the best available science.
- Fire management plans and activities incorporate public health and environmental quality considerations.
- Federal, State, tribal, local, interagency, and international coordination and cooperation are essential.
- Standardization of policies and procedures among federal agencies is an ongoing objective.

Federal Wildland Fire Cost Effectiveness Policy-

Maximizing the cost effectiveness of any fire operation is the responsibility of all involved, including those who authorize, direct, or implement operations. Cost effectiveness is the most economical use of resources necessary to accomplish project/incident objectives. Accomplishing the objectives safely and

efficiently will not be sacrificed for the sole purpose of “cost-saving.” Appropriate oversight will ensure that expenditures are commensurate with values to be protected. Other factors besides those in the biophysical environment may influence decisions, including those from the social, political, and economic realms. (Interagency Standards for Fire and Fire Aviation Operations, Chapter 1).

2.1.2 National Fire Plan

This FMP meets the direction in the National Fire Plan because it emphasizes the following primary goals of the 10 Year Comprehensive Strategy and Cohesive Strategy for Protecting People and Sustaining Natural Resources:

- Improving fire prevention and suppression,
- Reducing hazardous fuels,
- Restoring fire-adapted ecosystems, and
- Promoting community assistance.

2.1.3 Department of the Interior (DOI) Policy

This FMP incorporates and adheres to DOI policy stated in 620 DM 1 (and 620 DM2 for Alaska) by giving full consideration to use of wildland fire as a natural process and as a tool in the land management planning process and by providing for the following:

- Wildland fires, whether on or adjacent to lands administered by the Department, which threaten life, improvements, or are determined to be a threat to natural and cultural resources or improvements under the Department’s jurisdiction, will be considered emergencies and their suppression given priority over other Department programs.
- Bureaus shall cooperate in the development of interagency preparedness plans to ensure timely recognition of approaching critical wildland fire situations, to establish processes for analyzing situation and establishing priorities, and for implementing appropriate management responses to these situations.
- Bureaus will enforce rules and regulations concerning the unauthorized ignition of wildland fires, and aggressively pursue violations.

This FMP implements the policy outlined in the following text from 620 DM 2.4 that sets out the lead role of Bureau of Land Management (BLM) for the DOI agencies in Alaska: “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.

Each agency in Alaska is responsible for administering its own fire management program. Each 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.

2.1.4 U.S. Fish & Wildlife Service (Service) Fire Policy

This FMP addresses a full range of potential wildland fires and considers a full spectrum of tactical options (from monitoring to intensive management actions) for wildfires in order to meet Fire Management Unit (FMU) objectives. It fully applies procedures and guidelines in the Service Fire Management Handbook and the Interagency Standards for Fire and Fire Aviation Operations (Red Book) and affirms these key elements of FWS fire policy (621 FW 1):

- Firefighter and public safety is the first priority of the wildland fire management program and all associated activities,
- Only trained and qualified leaders and agency administrators will be responsible for, and conduct, wildland fire management duties and operations,
- Trained and certified employees will participate in the wildland fire management program as the situation requires, and non-certified employees will provide needed support as necessary,
- Fire management planning, preparedness, wildfire and prescribed fire operations, other hazardous fuel operations, monitoring, and research will be conducted on an interagency basis with involvement by all partners to the extent practicable,
- The responsible agency administrator has coordinated, reviewed, and approved this FMP to ensure consistency with approved land management plans, values to be protected, and natural and cultural resource management plans, and that it addresses public health issues related to smoke and air quality,
- Fire, as an ecological process, has been integrated into resource management plans and activities on a landscape scale, across agency boundaries, based upon the best available science,
- Wildland fire is used to meet identified resource management objectives and benefits when appropriate,
- Prescribed fire and other treatment types will be employed whenever they are the appropriate tool to reduce hazardous fuels and the associated risk of wildfire to human life, property, and cultural and natural resources and to manage our lands for habitats as mandated by statute, treaty, and other authorities,
- Management response to wildland fire will consider firefighter and public safety, cost effectiveness, values to protect, and natural and cultural resource objectives,
- Staff members will work with local cooperators and the public to prevent unauthorized ignition of wildfires on FWS lands.

2.1.5 Regional or Refuge-specific Fire Management Policy

ANCSA [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.

The Alaska Interagency Wildland Fire Management Plan (AIWFMP), an interagency agreement regarding how fire management activities will be handled in the State of Alaska, is adhered to for wildland fire management on the Refuges.

Fire management activities regarding permitted cabins on FWS lands are addressed in the FWS Region 7 Cabin Policy.

2.2 Land / Resource Management Planning

2.2.1 Land Management Plans

Land and resource management goals and objectives are identified in the Revised Comprehensive Conservation Plan for the Koyukuk/Northern Unit of Innoko/ Nowitna National Wildlife Refuge, Environmental Impact Statement - Final, July, 2009 (CCP/EIS). These goals and objectives may be further supplemented by step-down plans (such as Habitat Management Plans) subsequently developed or to be developed.

2.2.2 Environmental Compliance

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

When there is an approved CCP that has met NEPA requirements, step-down plans that implement the decisions of the CCP (such as FMPs) are usually categorically excluded from further NEPA analysis, especially when any prescribed burning is done for habitat improvement or prevention purposes. Fire management activities were analyzed in the Koyukuk/Northern Unit Innoko/Nowitna NWR CCP/EIS completed in 2009. This FMP update is tiered to that NEPA-compliant document.

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).

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.

Site specific cultural resource information is available to the Fire Management Officer and Refuge Manager through the Regional Archaeologist regarding protection of cultural sites. This information will be referred to in all suppression responses affecting cultural sites to avoid impacting their values. If a new site is found during a suppression activity, the Regional Office Archaeologist will be notified immediately by the Refuge Manager or Deputy Refuge Manager.

2.3 Fire Management Partnerships

2.3.1 Internal partnerships

The Refuge Fire Management Officer (FMO) position based in Galena is shared among the Koyukuk, Nowitna, Northern Innoko, and Selawik National Wildlife Refuges. The Refuge FMO will take an active role in fire management activities on the Refuges in cooperation and coordination with services provided by the Bureau of Land Management Alaska Fire Service (AFS).

Regular contact is made with the Regional Fire Management Coordinator throughout the year to provide information on fire management activities and to obtain support to accomplish planned activities.

2.3.2 External partnerships

Collaboration with partners and neighbors is imperative to the success of the fire management program on the Refuges. The 2009 FMP was prepared in cooperation with Refuge neighbors and interested parties. Village Elders, the Alaska Department of Fish and Game and AFS also contributed to its development. Many Fish and Wildlife Service (Service) biologists, managers and fire management officers also contributed to it.

Interagency coordination is especially critical for successful implementation of the fire management program. The refuge works closely with its neighbors and adjoining landowners in the selection of wildland fire management options. All values are considered in an analysis to determine the appropriate management response to implement. These include the BLM, State of Alaska, DOYON Limited and Native corporations and/or tribal governments for the villages of Hughes, Huslia, Koyukuk, Nulato, Kaltag, Galena, Ruby, and Tanana. Contact information for these entities is listed in Appendix B.

Consultation and coordination with AFS includes a meeting scheduled each spring with AFS Galena and Tanana Zone FMOs and staff to discuss planned Refuge fire management activities. At that time memorandums of understanding and cooperative agreements will be updated as needed; Refuge equipment and personnel available for suppression will be identified; standard operating procedures regarding suppression responses and wildland fire for resource benefit will be discussed; other issues or concerns will be discussed; and, both agencies will become familiar with the other's concerns and issues. The Refuge FMO will take an active role in suppression activities on the refuge in cooperation and coordination with services provided by AFS Zone FMOs.

The Alaska Wildland Fire Coordinating Group (AWFCG) is composed of representatives from all agencies responsible for land management and fire suppression in Alaska. The Refuge FMO represents the refuges at AWFCG meetings and participates as a member of AWFCG committees.

3.0 Fire Management Unit Characteristics

The Fire Management Units (FMU)s within this plan have been developed by Refuge Manager based on values at risk, the natural role of fire, wilderness management and wild and scenic river management direction, and overall management objectives for each refuge. FMUs are each further subdivided into areas managed under the various AIWFMP options. Areas within each FMU are contiguous. The lands adjacent to the Refuges have not been designated into FMUs at this time.

Table 2 – Fire Management Units in this FMP

FMU Name	Refuge	Acres	Options
Koyukuk Non-Wilderness	Koyukuk & Northern Unit Innoko	3,497,210	Full, Modified, Limited
Koyukuk Wilderness	Koyukuk	400,000	Limited
Nowitna Wild & Scenic River	Nowitna	159,627	Full, Limited
Yukon River	Nowitna	312,331	Full, Limited
Nowitna Uplands	Nowitna	1,586,091	Full, Limited

A map depicting the FMUs found in the FMP are located in Appendix C.

3.1 Area-wide Management Considerations

3.1.1 Fire Management Goals, Strategies, and Guidance from CCPs/similar plans

The following management goals and objectives relating to fire management are found in the current Koyukuk/Nowitna Comprehensive Conservation Plan (CCP) 2009:

Management Goal 2: Ensure the natural character, vigor, and species diversity of the refuge boreal forest and tundra ecosystems by perpetuating a fire regime both natural and prescribed, which maintains a mosaic of habitats native to interior Alaska.

Objective 1: Continue to implement the Refuge FMP and Communication Plans.

Rationale: Fire is the main driver of ecosystem change within the Refuge. New fire management practices need to be continually integrated into refuge habitat management. The FMP provides management strategies that enable the Refuge to conserve, protect, and enhance habitats. Objectives within the FMP address ecological relationships and human health and safety. Due to the important role that fire plays in refuge ecosystems, implementation of the FMP is fundamental in addressing Goal 2.

Objective 2: Continue to refine the understanding of the Refuge’s fire history by maintaining the most current fire history geographic information system (GIS) layer, incorporating information from other fire history studies, work collaboratively with other federal and State fire management agencies and universities, utilizing climate change research findings and the most current fire technology, taking advantage of local knowledge, and participating in studies of Alaska fire regimes.

Rationale: Fire is the Refuge’s dominant disturbance regime, resulting in major changes to and the renewal of wildlife habitat. Our current knowledge of interior Alaska fire regimes is rudimentary and will continue to evolve as new research is conducted, furthering our understanding of the inner workings of those regimes and how climate change will affect them.

Management Goal 3: Maintain a fire management program that helps achieve other refuge goals and objectives while providing for the protection of human life, private property, and identified cultural and natural resources.

Objective 1: Within one year of the final Plan being approved combine the Koyukuk, Nowitna, and Northern Unit Innoko fire management plans and incorporate changes resulting from this plan in a single fire management plan.

Rationale: Combining the Koyukuk, Nowitna, and Northern Unit Innoko FMPs simplifies the fire management program and eliminates redundancy. Using one document makes it more efficient for the fire management officer to manage the fire program. The new FMP would allow other agencies and the public to easily understand and follow the refuge fire management program.

Objective 2: Within five years of the final Plan being approved, contact the tribal and local governments in Galena, Hughes, Huslia, Kaltag, Koyukuk, Nulato, Ruby, and Tanana to assess the need for assistance in reducing hazardous fuel accumulations and develop a mitigation plan (i.e., Community Wildfire Protection Plan). Within 10 years of the final Plan being approved, evaluate the effectiveness of the fuel reduction projects implemented to-date in each village.

Rationale: A need to reduce hazardous fuel accumulations around some of the villages has been identified. Hazardous fuels reduction work will help protect villages from wildland fire and reduce the likelihood of a fire within or adjacent to the village, provided this work is maintained over time. Fuel reduction projects, already begun in some of the villages have served to strengthen relationships between the Refuge and village organizations and residents. Evaluating each fuels reduction project for the need for re-treatment will help the fire management officer determine the most effective means of treating hazardous fuel accumulations in the surrounding villages.

Objective 3: Within five years of the final Plan being approved, update the Refuge's GIS layer, which includes cultural resource values at risk.

Rationale: Up-to-date information is needed by the fire management officer, the refuge manager, and the protection agency to make informed decisions regarding the appropriate management response to each wildland fire start.

Objective 4: Continue to develop partnerships with other federal and State agencies and local governments to further the understanding of fire interactions in interior Alaska.

Rationale: Combining efforts to understand interior fire interactions is one way of gaining knowledge while dealing with limited staff and budgets. Cooperative work can diminish the separation that sometimes exists between agencies and local governments and build a healthy working relationship.

Objective 5: Upon funding, hire an assistant fire management officer to assist the refuge fire management officer with wildland and prescribed fire planning, monitoring and administration.

Rationale: At current personnel and funding levels, the refuge cannot fully implement the refuge FMP.

3.1.2 Fire Management Guidance and Standards from Other Sources

Structural fire suppression is the responsibility of local governments. We may assist with exterior structural protection activities under formal Fire Protection Agreements that specify mutual responsibilities, including funding. (Red Book 01-3)

These operational standards in the Service Manual (095 FW 3):

- An initial action and an appropriate management response is required for every wildfire on or threatening our lands.
- The range of appropriate management responses to wildland fires may include direct or indirect attack of high and/or low intensities, or surveillance and monitoring to ensure fire spread will be limited to a designated area.

- When specifically addressed in approved FMPs, we can use naturally ignited wildland fires to accomplish resource management objectives.

Each agency in Alaska is responsible for administering its own fire management program. The Regional Director retains overall responsibility for fire management activities on Service lands within the region. Each Refuge Manager retains overall responsibility for fire management activities on the refuge, including wildfire suppression, wildland fire managed for resource benefit, and prescribed fire activities.

The AIWFMP provides for a range of management responses to wildfire that protect human life and property and other identified resources/developments, and balance suppression costs with values at risk. It is congruent with Refuge resource management objectives. Its intent is to protect developed areas and other high resource value areas and to maintain the natural occurrence of fire in the ecosystem in remote areas with minimal cost-effective intervention.

Fires are classified either as wildfires managed under the AIWFMP and agency policies or prescribed fires, ignited to accomplish agency land and resource objectives. Prescribed fire may be used for reducing hazardous fuel accumulations, restoring historical conditions or for research. Prescribed burns require the Refuge Manager's approval of a prescribed fire burn plan. The target treatment area will be identified in the plan.

3.1.2.1 AIWFMP Suppression Response Levels

There are four management options established in the AIWFMP.

- **Critical** is of the highest priority and requires aggressive suppression for all fires in the zone.
- **Full** requires aggressive suppression of all fires in the zone, but at lower priority than critical protection areas.
- **Modified** 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.
- **Limited** 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.

The Critical management option was created to give the highest priority to suppression action on wildland fires that threaten human life, inhabited property, designated physical developments and to structural resources designated as National Historic Landmarks. Fires that threaten a critical site have priority over all other wildland fires. The fire management strategy of the Critical management option is to provide complete protection of the specific identified sites from fire. 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 is intended to be the most flexible option available to land manager. It provides 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. 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.

In the Limited management option fires will be allowed to burn while providing for protection of human life and site-specific values. Most natural ignitions will be managed for the purpose of maintaining fire's natural role in the ecosystem. Low impact or indirect suppression methods will be used whenever possible, if suppression action is needed. The intent is to reduce overall suppression costs through minimum resource commitment without compromising firefighter safety.

For a map displaying the fire management options for the refuges, see Appendix D.

3.1.2.2 Changing AIWFMP Management Options

The Refuge Manager can change the AIWFMP fire management option for the lands they manage due to changes in land use, protection needs, laws, mandates, or policies. Managers can authorize AFS to increase or decrease protection levels depending on the situation. A "Decision Criteria Record", Appendix E, must be completed to document and authorize the adjusted level of protection. During the next annual review, the selected fire management option area should be re-evaluated. 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).

3.1.2.3 Constraints on Specific Strategies

The following restrictions have been or may be imposed by the Refuges for incidents:

- A voluntary 2000 foot flight restriction for all refuges appears in Sectional Aeronautical Charts
- Restrictions may be placed on aircraft flying over certain waterfowl, waterfowl staging areas and/or raptor nesting areas depending upon time of year and number of flyovers required
- Aircraft operation at altitudes and in flight paths resulting in the herding, harassment, hazing or driving of wildlife is prohibited over Refuge lands. All aircraft except in the immediate fire vicinity and for take-off and landing should maintain a minimum altitude of 2000 feet AGL.
- Peregrine falcon nesting sites (known)
 - Located on interagency fire maps - Refuges will notify AFS of new ones
 - AFS will notify the Refuge immediately when fires are discovered near nest areas
 - Retardant use must be authorized by the Refuge Manager or their acting
 - Use Extreme care to NOT disturb nests in the critical period April 1 – August 15 so adults don't abandon eggs/their young
 - Keep all personnel away from nesting sites
 - Locate camps at least two miles from nesting sites
 - All aircraft are restricted within 1 mile horizontal distance and below 1,500 feet AGL
- Avoid black/grizzly bear encounters by emphasizing preventive measures
 - Keep a clean camp and exhaust all attempts to drive the bear away before destroying it
 - Whoever 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.
- Incident facility site selection
 - Locate base and spike camps, helispots and other facilities in natural clearings if possible
 - Minimize construction of helispots
 - Cut any opening created for facilities with an irregular pattern
 - Keep such areas clean
 - Prior to use, cover the vegetation layer in "high-use" cooking and eating areas with road-construction type filter cloth/other suitable fabric to prevent compaction and destruction
 - Locate latrines at least 200 feet from lakes, ponds and streams.
 - Keep areas clean to avoid attracting animals

- Locate camps away from known historic or archaeological sites
 - Artifacts **will not** be collected
 - Incident Commanders will notify the refuge promptly if any artifacts are found
- If an incident facility is needed on a Native allotment within the refuge, the Service will collaborate with the Bureau of Indian Affairs (BIA), compacted Tribe or land owner
- Any activity associated with a Native allotment must have the prior approval from the appropriate Tribe, agency or landowner
- The Service will discourage the use or removal of resources from a Native allotment.
- Incident facility site rehabilitation:
 - Use minimal disturbance-preventive rehabilitation
 - Dismantle and remove all tent and shelter frame materials
 - Spread local materials used for construction (logs and poles) throughout the site
 - Completely fill all fire and latrine pits
 - Remove all trash from campsites and fireline. Burnable trash may be burned on site.
 - Rehabilitation must be approved by Refuge Manager or Acting before demobilization.
- Fireline repair and stabilization:
 - Locate constructed lines dug to mineral soil or permafrost to limit erosion when possible
 - Meander obliquely to the slope fall line rather than run straight down fall lines
 - Avoid arrow-straight line location
 - Leave a buffer of vegetation immediately adjacent to water bodies
 - Avoid running lines directly into water bodies.
 - Prior to release of fireline resources, repair damage and take appropriate measures to control erosion control on all constructed lines
 - Build water bars as needed.
 - Replace organic material into lines with exposed mineral soil or permafrost
 - Use saw lines sparingly
 - Only where essential for holding and accessing hot perimeter
 - Only where essential for holding indirect attack line during firing operations
 - Direct attack black lining is possible on many fires without building saw lines

As soon as any areas of special concern become known, they will be identified on a GIS layer and their locations 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 dealt with through the process of selecting and/or changing the fire management option to provide the appropriate protection level for the values identified.

3.1.3 Common characteristics of the Fire Management Units (FMUs)

3.1.3.1 Climate regime, topography, soils, access, public use

The area has a continental climate with great seasonal temperature extremes, short warm summers and long cold winters. In summer the nearly continuous radiation heats the basins and river valleys (sheltered from coastal winds by surrounding hills) to the 80's and upper 90's ° F at times. In mid- winter when the sun is above the horizon for less than four hours, days are typically clear and cold with average highs of 25° F and average lows of -15° F, extreme lows of -70° F, among the coldest in North America. Lowlands and valleys become cold sinks. Galena, Alaska has a mean annual temperature of 25.2° F, a July mean of 60.1° F, and a January mean of -9.3° F. The frost-free period is normally about 100 days. Ice is present in lakes from early October to mid May.

A typical fire season begins in late April or early May when the snow cover disappears. It slows in late May or early June with green-up; at this time, fires are usually human-caused and of low intensity because of high relative humidity (RH) recovery 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.

Lightning causes approximately 95% of interior Alaska wildfires and lightning activity usually begins the first week in June. It may continue until the end of July or later. During the peak fire period (late June – end of July) lightning, dry fuel, and limited nighttime RH recovery (due to continuous daylight) combine, fire spread rates and fire intensity are typically high. August is usually wet, but drought can extend the active fire period. After August, new lightning fires are rare. Human-caused fires are also rare, but can occur through October, often related to hunting, fishing, and other outdoor activities. Problem fires in this late season are infrequent, associated with wind events.

3.1.3.2 Cover/habitat types, wildlife, T & E species, cultural resources

The most extensive vegetation is boreal forest with open or closed stands of black spruce, with poorly drained soils and/or permafrost close to the surface. White spruce stands are found along riparian areas and on well-drained, south aspects, occasionally mixed with white birch and aspen, balsam poplar, willow and alder. White birch and aspen commonly dominate following a fire. Willow, dwarf birch, Labrador tea, lingonberry, and alder are common. Feather moss carpets the ground on well-drained sites and in forests. Alpine tundra with dwarf willow, crowberry, and bearberry extends above tree line (approximately 2,000 feet elevation). Many low lying, poorly drained areas are treeless bogs consisting of sedges and aquatic forbs.

Six major vegetation classes (per Viereck) have been identified for the refuges, that include forest (closed and open needleleaf, needleleaf woodland, broadleaf forest, mixed forest), scrub (lowland, alluvial, and subalpine broadleaf), dwarf scrub (dwarf shrub-graminoid tussock peat land and prostrate dwarf shrub tundra), herbaceous (graminoid bog, marsh and meadow), scarcely vegetated areas (scarcely vegetated floodplain and scarcely vegetated scree), and water (clear/aquatic forb and turbid).

3.1.3.3 Fuel models, fuel conditions, and associated fire behavior characteristics

Fire is an integral part of northern boreal ecosystems. Plants and animals have adapted to fire over the eons. Climate change, especially in the interior, may alter some of these 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 open the semi-serotinous cones in its canopy and release seeds.

More fundamentally, fire plays a key role in 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 for 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. Fires burning in drought conditions remove more of the organic layer than those that burn in more normal conditions.

Before active fire suppression programs were implemented statewide in Alaska, about 2.5 million acres burned annually. As figure 3 demonstrates, this average has dropped to less than a million acres. However, large, high intensity fires still occur, in part due to efforts by land managers to allow wildland fires as a natural ecosystem function in some areas and partly due to lack of access. Interior Alaska historically experiences a widespread, serious fire season once or twice every decade.

3.1.3.4 Wildfire and prescribed fire history, fire effects

A fire history map and summary by decade of all Refuge fires listed from 1958 through 2009 is found in Appendix E. Approximately 43% of the Koyukuk and Northern Innoko Refuges and 40% of the Nowitna burned during this timeframe, which roughly equates to a 115-125 year fire cycle on the refuges. Prescribed fire has not been significant role historically.

Extreme fire seasons occur when lightning, drought, sustained high winds, low relative humidity (RH) and low fine fuel moisture (FFM) occur simultaneously. The climate and vegetation of the boreal forest produce high intensity crown fires. Drought is an important factor because the organic mat or active layer which covers the soil dries out to an extensive depth. Control of any ignition can be difficult even when factors such as wind, RH and FFM are not critical. When conditions are as described above, serious fire danger can result. Canadian fire scientists have investigated drought and developed a system called the Canadian Drought Index.

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 various environmental factors such as wind, slope, aspect, RH and FFM, fuel type, fuel continuity, period since last rain, change during the course of the fire. The various shapes of fires in the figure below indicate the dominance of different or similar factors in the fire's duration, as well as effectiveness of suppression methods.

Van Wagner (1983) lists five main types of fires: smoldering fires in deep organic layers, surface fires burning against (and into) the wind, surface head fires (burning with the wind), crown fires (advancing as a single front from surface to top of canopy), 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. The spread of most fires of any size in black spruce forests in Alaska is accelerated by torching of groups of trees and spotting.

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.

Vegetation classes on the Refuges have been correlated with the original 13 fuel models from the Northern Forest Fire Laboratory (NFFL - Anderson 1982), the new 40 fuel models developed by Scott and Burgan (Scott/Burgan 2005), the National Fire Danger Rating System (NFDRS -Deeming et al. 1978), and the Canadian Forest Fire Danger Rating System (CFFDRS -- Stocks et al. 1989). The

CFFDRS can be used to 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 CFFDRS is used for fire behavior prediction by the suppression agencies in Alaska. 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, which relates fire behavior outputs and resistance to control (Appendix P). The CFFDRS fuel type descriptors follow. The fire behavior likely to be encountered in each fuel type is discussed below (from BLM 1995, USDI 1982, and USFWS 1995).

C-1/Spruce Lichen Woodland:

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. This fuel type is composed of 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 a high intensity and low rate 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 lowest branches, which 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.

C-2/Boreal Spruce/White Spruce Forest

White Spruce usually grow on warm, frost free, well-drained sites along river corridors and on south facing slopes. White spruce can grow up to 130 feet tall and three feet in diameter. Paper birch and balsam poplar are often mixed in with the spruce. Spruce stands may be open and park-like or have a dense shrub layer of alder and rose. White spruce fires are generally slow spreading and burn with lower intensities than in black spruce. Smoldering fire 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 common except in young dense stands. Crowning occurs mostly under very dry conditions or near dead fuel jackpots. Dead and down woody fuels typically range from 4 - 8 tons/acre, but can be 3X that.

M -2 Boreal Mixed Hardwood Forest-Green, Hardwoods and Mixed Spruce/Hardwood

Aspen is most abundant on warm, well-drained sites, which often change to white spruce stands over time. Birch is adapted to cooler, wetter sites, especially moist flat lands, or east and west aspects; such sites commonly become dominated by black spruce over time. Young hardwood stands are often dense with little understory. In mixed spruce-hardwood forests, fire intensity generally increases with more spruce in the stand. Pure hardwood stands are often natural fuel breaks; because surface fuel loading is light (mostly compacted leaf litter) and fuel and soil moisture relatively high, typical fires are slow spreading and relatively low intensity. Running crown fires in spruce stands will normally drop to the forest floor when they encounter a hardwood stand.

Under very dry conditions or 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 5 - 14 tons/acre and increase with stand age.

M-2 Hardwood Forest) Brush and Shrublands: 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.

O-1a/Matted Grass and O-1b/Standing Grass

The term tundra means treeless, so basically these are arctic and sub-arctic grasslands. This is a common fuel type in areas where grasses and sedges dominate. Substantial accumulations of cured grasses and sedges result in fires with high rates of spread and high intensities, especially in windy conditions. Tussocks, which are pillars of grass or sedges that vary in height from 3 inches to four feet, 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.

For a complete description of Alaska fuel models and fuel model crosswalk, see the “Fuel model guide to Alaska vegetation” (Cella et al. 2008) http://fire.ak.blm.gov/administration/awfcg_committees.php. A map of fuel models found on the refuges is located in Appendix F.

3.1.3.5 Public and firefighter safety concerns or issues

Safety of the public and fire management personnel takes precedence over all activities on the Refuges.

When a wildfire occurs in an area where public use is likely, the areas will be checked for public users. If any are found, they will be contacted and advised of the fire hazard/danger. If a wildfire occurs near an interior piece of property, the landowner will be advised.

Incident Commanders, Burn Bosses, and fire line supervisors will ensure firefighters employ proper safety practices on incidents, including applicable use of personal protective equipment.

3.1.3.6 Ecological impacts of fire suppression

Ecological impacts of fire exclusion in the area have been minimal due to the short history and limited activity of effective fire suppression on the Refuges. Because fire has affected a significant portion of the refuge during the past 50 years, it is assumed that there has been no drastic alteration of fire’s natural role on the landscape of interior Alaska. A build-up of natural fuels has occurred in some areas due to the slow decomposition rate of organic matter. It is not known if this buildup is within the natural range of variability for boreal ecosystems. The overall effect of fire exclusion in these areas is a shift from earlier seral stages to later seral stages in the vegetation and a gradual increase in fuel continuity. How long this shift will take is not known, nor is the effect of climate change, which may have a more profound effect in arctic regions than in temperate regions. Concern about fire exclusion applies mainly to the areas with critical and full management option and to some degree to the modified management option.

Ground disturbance impacts resulting from past suppression activities have been documented on some other refuge fires. They are usually associated with line construction by heavy equipment or use of fire

retardant. The greatest potential for impacts throughout interior Alaska is from line construction which thaws permafrost and initiates problem erosion or from aerial delivery of retardant that enters streams, lakes or wetlands, killing fish.

3.1.3.7 Fire Regimes and Fire Regime Condition Classes

Vegetation in all the FMUs is considered to be in Fire Regimes III (35-100+ year frequency and mixed severity) or Fire Regime IV (35-100+ year frequency and high severity).

Vegetation in all FMUs is considered to be in Fire Regime Condition Class (FRCC) 1 (the natural range of variability). Large-scale maps of FRCC are on file at the Refuge offices, and may be in the form of a Geographic Information System map layer and hard copy.

3.2 Fire Management Unit – Specific Descriptions

3.2.1 Koyukuk Non-Wilderness FMU

3.2.1.1 Characteristics of the FMU

- Access primarily via aircraft - limited boat access possible along the Koyukuk River.
- Vegetation - dominated by black spruce and mixed conifer/hardwoods.
- Dominant topographic features – Yukon and Koyukuk Rivers
- Other features - Kaiyuh Mountains, Pilot Mountain, Kaiyuh Flats, Roundabout Mountain, Takhokhdona Hills, Hochandochtla Mountain, the Zane Hills, Purcell Mountain foothills
- Annual Precipitation – averages 15-18 inches, including up to 3-5 feet of snow.
- Active fire season - May through August.

3.2.1.2 FMU Values to Protect

- Doyon Limited and Native village corporation land.
- Native allotments.
- Hog River Administrative Cabin.
- Repeater sites on Roundabout, Tough and Totson Mountains.
- RAWS sites.
- Winter trails from Galena to Huslia, Koyukuk to Huslia, Huslia to Hughes, and Nulato to Sommers Cabin.

3.2.1.3 FMU Management Direction and Constraints

Use of aerial retardant or heavy equipment is not allowed without the permission of the Refuge Manager (or Acting Refuge Manager), except in life threatening situations.

Full: Two parcels along the Yukon River that contain tracts of Native (selected and conveyed) lands.

- Protect Native and Corporation lands using aggressive suppression to minimize uncontrolled fire.
- Consider fire for resource benefit strategies only if no initial attack is initiated and/or suppression forces are not available.

Modified: Parcels around full protection areas in north central and southern boundary areas of the refuge.

- Protect identified resources and prevent fire from spreading into **Full** areas.
- The intent is to balance acres burned with suppression costs and to accomplish land and resource management objectives (maintenance of fire dependent ecosystems and early seral habitat).

- Prior to the conversion date (usually July 10), fire for resource benefit strategies may be used at the discretion of the land manager.
- After the conversion date, the default action is confinement and/or routine surveillance to ensure that identified values are protected and that adjacent higher priority areas are not threatened.
- After the conversion date, fire for resource benefit strategies may also be used.

Limited: applies to most of the FMU, the more remote, pristine natural areas of the Refuge.

- Allow fires to spread while providing protection for human life and site-specific values.
- Manage most natural ignitions to maintain fire's natural role in the boreal spruce ecosystem, to provide an array of early seral and seral habitats, and reduce the risk of catastrophic wildfires.
- If management action is needed, use low impact suppression methods including minimum impact suppression tactics (MIST) whenever possible.

3.2.1.4 FMU Safety Considerations

- Difficulty of movement in marshes/wetlands.
- Entrapment in flashy fuels, lack of adequate safety zones.
- Repeater locations/radio dead spots.
- Hazards from predatory animals, remote camp locations.
- Reliance on aircraft for tactical and logistical support.

3.2.2 Koyukuk Wilderness FMU

3.2.2.1 Characteristics of the FMU

- Access - Foot and aircraft, boat on the southern boundary.
- Dominant topographic feature - Nogahabara Sand Dunes.
- Koyukuk and Kateel Rivers form border between this FMU and non-wilderness FMU.
- Vegetation - black spruce and mixed conifer/hardwoods.
- Annual precipitation - averages 15-18 inches, including up to 3-5 feet of snow.
- Active fire season - May through August.

3.2.2.2 FMU Values to Protect

- Prehistoric cultural sites.
- Koyukuk Wilderness character and value.
- Winter moose habitat, especially in Three Day Slough riparian area.
- Allowing a natural fire regime to maintain the fire-dependent ecosystems.

3.2.2.3 FMU Management Direction and Constraints

Use of aerial retardant or heavy equipment is not allowed without the permission of the Refuge Manager (or Acting Refuge Manager), except in life threatening situations.

Fire line rehab (per plan approved by the Refuge Manager) **must be completed before final demobilization.**

Limited: the entire FMU, the most remote, pristine and natural areas of the Koyukuk Refuge.

Section 4 (d)(1) of the Wilderness Act contains a 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..” Thus, a Minimum Requirements Analysis (MRA) is not needed for suppression activities.

- Allow fires to spread while providing protection for human life and site-specific values.
- Manage most natural ignitions to maintain fire’s natural role in the boreal spruce ecosystem, to provide an array of early seral and seral habitats, and reduce the risk of catastrophic wildfires.
- If management action is needed, use low impact suppression methods, including minimum impact suppression tactics (MIST) whenever possible.
- Construct fire lines to minimize erosion and follow natural contours wherever possible.
- Use direct attack to the maximum extent possible.
- If prescribed fire is determined to be the minimum requirement for administering the area as wilderness, and necessary to accomplish the refuge purposes, the Refuge Manager may approve a prescribed fire burn plan to mimic the historic role of fire or reduce unnatural hazardous fuels.

3.2.2.4 FMU Safety Considerations

- Difficulty of movement in marshes/wetlands.
- Entrapment in flashy fuels, lack of adequate safety zones.
- Repeater locations/radio dead spots.
- Hazards from predatory animals, remote camp locations.
- Reliance on aircraft for tactical and logistical support.

3.2.3 Nowitna Wild and Scenic River FMU

3.2.3.1 Characteristics of the FMU

- Access – aircraft and boat.
- Dominant topographic feature - Nowitna River.
- Other features - Nowitna River Canyon, the Sulatna River, the Big Mud and Little Mud Rivers, Grand Creek, and the surrounding lowlands.
- Vegetation - riparian sedges, grasses, forbs, and shrubs, stands of mature white spruce, black spruce and upland mixed conifer/deciduous forest.
- Fuels: C-2/Boreal Spruce, M-2/Boreal Mixed Woodland-Green and O-1a Matted Grass and O-1b Standing Grass.
- Annual precipitation – averages 15-18 inches, including up to 3-5 feet of snow.
- Active fire season - May through August.

3.2.3.2 FMU Values to Protect

- Intermixed DOYON Regional Corporation land and Native allotments.
- Critical year-round moose habitat.
- Resident sheefish habitat in the Nowitna River.
- The character of the Nowitna River, a “wild river” under the federal Wild and Scenic Rivers Act, and its corridor.

3.2.3.3 FMU Management Direction and Constraints

Use of aerial retardant or heavy equipment is not allowed due to the proximity to the Nowitna River.

Full: One parcel in the northern-most portion.

- Protect Native allotments and DOYON Corporation lands using aggressive suppression to minimize the presence of uncontrolled fire.
- Consider fire for resource benefit strategies only if initial attack is not initiated and/or suppression forces are not available.

Limited: the remainder of the FMU.

- Allow fires to spread while providing protection for human life and site-specific values.
- Manage most natural ignitions to maintain fire's natural role in the boreal spruce ecosystem, to provide an array of early seral and seral habitats, and reduce the risk of catastrophic wildfires.
- If management action is needed, use low impact suppression methods including minimum impact suppression tactics (MIST) whenever possible.

3.2.3.4 FMU Safety Considerations

- Difficulty of movement in marshes/wetlands.
- Entrapment in flashy fuels, lack of adequate safety zones.
- Repeater locations/radio dead spots.
- Hazards from predatory animals, remote camp locations.
- Reliance on aircraft for tactical and logistical support.

3.2.4 Yukon River FMU

3.2.4.1 Characteristics of the FMU

- Access – aircraft or boat.
- Dominant topographic features - the Yukon River and its islands.
- Other features - Deer Creek, and the adjacent lowlands.
- Vegetation - dense mature stands of white spruce along the Yukon.
- large grassy lakes bordered by mature willow.
- mixed stands of white birch, cottonwood, and white spruce.
- black spruce dominated muskeg.
- Fuels: C-2 Boreal Spruce, C-1 Spruce Lichen Woodland, M-2 Boreal Mixed Woodland-Green, and O-1a/Matted Grass O-1b/Standing Grass.
- Annual precipitation - averages 15-18 inches, including up to 3-5 feet of snow.
- Active fire season - May through August.

3.2.4.2 FMU Values to Protect

- The Palisades of the Yukon.
- Mature white spruce along the Yukon River and on its islands.
- DOYON Regional Corporation land.
- Native allotments.
- Critical year-round moose habitat.

3.2.4.3 FMU Management Direction

Use of aerial retardant or heavy equipment is not allowed due to the proximity to the Yukon River.

Full: Two parcels along the Yukon River

- Protect Native allotments and DOYON Corporation lands by suppressing all wildland fires.

- Consider fire for resource benefit strategies only if initial attack is not initiated and/or suppression forces are not available.

Limited: the remainder of the FMU

- Allow fires to spread while providing protection for human life and site-specific values.
- Manage most natural ignitions to maintain fire's natural role in the boreal spruce ecosystem, to provide an array of early seral and seral habitats, and reduce the risk of catastrophic wildfires.
- If management action is needed, use low impact suppression methods including minimum impact suppression tactics (MIST) whenever possible.

3.2.4.4 FMU Safety Considerations

- Difficulty of movement in marshes/wetlands.
- Entrapment in flashy fuels, lack of adequate safety zones.
- Repeater locations/radio dead spots.
- Hazards from predatory animals, remote camp locations.
- Reliance on aircraft for tactical and logistical support.

3.2.5 Nowitna Uplands FMU

3.2.5.1 Characteristics of the FMU

- Access - aircraft
- Dominant topographic features - maze of upland lakes in the west, mountainous area adjacent to Nowitna Canyon, and drainages of the Little Mud and Big Mud Rivers and Grand Creek.
- Vegetation - stands of mixed white birch and white or black spruce
 - muskeg dominated by black spruce
 - alpine shrub fields
 - lichen dominated rock fields.
- Fuel types: C-2 Boreal Spruce, C-1 Spruce Lichen Woodland, O-1a/Matted Grass O-1b/Standing Grass and M-2 Boreal Mixed Woodland-Green.
- Annual precipitation - averages 15-18 inches, including up to 3-5 feet of snow.
- Active fire season - May through August

3.2.5.2 FMU Values to Protect

- Hill 2321 repeater
- Round Lake Administrative Cabin
- Round Lake RAWS.
- Native allotments.

3.2.5.3 FMU Management Direction

Use of aerial retardant or heavy equipment is not allowed without the permission of the Refuge Manager (or Acting Refuge Manager), except in life threatening situations.

Full: one parcel east of the Nowitna River.

- Protect Native allotments and DOYON Corporation land by suppressing all wildfires
- Consider fire for resource benefit strategies only if initial attack is not initiated and/or suppression forces are not available

Limited: the remainder of the FMU, which includes the most remote areas of the Nowitna refuge

- Allow fires to spread while providing protection for human life and site-specific values.
- Manage most natural ignitions to maintain fire's natural role in the boreal spruce ecosystem, to provide an array of early seral and seral habitats, and reduce the risk of catastrophic wildfires.
- If management action is needed, use low impact suppression methods including minimum impact suppression tactics (MIST) whenever possible.

3.2.5.4 FMU Safety Considerations

- Difficulty of movement in marshes/wetlands.
- Entrapment in flashy fuels, lack of adequate safety zones.
- Repeater locations/radio dead spots.
- Hazards from predatory animals, remote camp locations.
- Reliance on aircraft for tactical and logistical support.

4.0 Wildland Fire Operational Guidance

The policy and procedures in the corresponding chapters of the current edition of the Red Book are part of this FMP, and must be followed.

Structural fire suppression is the responsibility of local governments. We may assist with exterior structural protection activities under formal Fire Protection Agreements that specify mutual responsibilities, including funding. (Red Book 01-3)

4.1 Management of Unplanned Ignitions

Unplanned ignitions can occur on the Refuges between late April and mid-October, most as a result of lightning from mid- June to early August.

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

- Will the safety of firefighters and the public be provided for?
- Can we accomplish the specified fire objectives?
- Are there any unique environmental or fuel conditions that could stop implementation of the selected management response?
- Are there any other constraints to implementing the selected management response?
- Number, location, and size of fires in the area and current and predicted fire behavior.
- Extended drought.
- Smoke substantially impacting the ability to suppress higher priority fires.
- Smoke creating a safety hazard for travel.
- Smoke creating a health hazard in populated areas. Document and confirm complaints.

All unplanned ignitions in Critical, Full or Modified (until the conversion date) management option areas and those ignitions in Limited that fail to meet wildland fire used for resource benefit objectives will be suppressed through the selection and implementation of a suppression-oriented management response. In selecting a suppression 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 response 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.

Suppression Response Direction

All wildfires will be managed by a qualified Incident Commander (IC) responsible to

- Assess the fire situation and make a report to dispatch as soon as possible.
- Use guidance in this FMP or a delegation of Authority to determine and implement an appropriate management response.
- Determine organization, resource needs, strategy and tactics.
- Brief incoming and assigned resources on the organization, strategy and tactics, weather and fire behavior, LCES, and radio frequencies.
- Order resources needed for the suppression response through the designated dispatch office.
- Manage the incident until relieved or the incident is under control.

The FMP and a delegation of authority can provide a general strategy to an IC, who has discretion to select and implement appropriate tactics within the limits described for the FMU(s). All resources, including mutual aid resources, will report to the IC (in person or by radio) and receive an assignment prior to tactical deployment.

Surveillance and monitoring status will be assigned to fires occurring in limited management option areas. Protocols of the AIWFMP (pp. 26-27) will be followed. Most of these fires will be managed for resource benefit.

Within the limited fire management option areas of each FMU, a detected ignition will initiate monitoring response unless the Refuge Manager specifies otherwise. Ignitions within all other fire management options (e.g. modified and full management) will trigger the appropriate suppression response(s) as outlined in the AIWFMP. Wildland fire used for resource benefit will remain available in the other fire management option areas as an alternative response upon the request of the Refuge Manager. After the conversion date (usually July 10) fires in modified option areas will be considered for resource benefit fires unless the Refuge Manager specifies otherwise.

4.1.1 Preparedness

Preparedness activities include program management, fire budget preparation, fire prevention/education, fire planning, training and certification, financial management, use of Internet and automated information systems, and program records and reports.

Federal interagency wildland firefighter medical qualification standards will be applied to all fireline personnel seeking positions that require an arduous rating. See the Red Book for more detail. 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. It is expected that all fireline qualified individual will maintain qualifications according to standards of the current Wildland and Prescribed Fire Qualification Guide (PMS-310-1). Specifics regarding annual refreshers and physical fitness levels can be found in the current Red Book. All fire training, qualifications, and experience will be maintained by the refuge fire staff in the Incident Qualifications and Certification System (IQCS).

FireBase is a FWS fire management budget tool. Its use is covered in a manual at the refuges. Fire Program Analysis will supplement or replace it with a new analysis.

Weather Information and Management System (WIMS) will be used to obtain information to analyze fire behavior. Weather data from Remote Automated Weather Stations (RAWS) will be used to inform decisions associated with wildland fire management. AFS performs maintenance on these RAWS sites annually.

Table 3 – RAWS Locations on the Refuges

Station Name/ID	Latitude	Longitude	Legal Description	Refuge
Koyukuk	66:00:30	157:34:12	T7S, R6E, Sec 12	Koyukuk
Cottonwood	65:20:45	155:56:10	T2S, R14E, Sec 2	Koyukuk
Kaiyuh.	64:25:32	158:06:21	T12S, R4E, Sec 29	Innoko
Round Lake	64:41:05	53:56:24	T9N, R25E, Sec 30	Nowitna

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 Tanana, and Ruby. The EFF Crews can be hired to assist with Refuge prescribed burns.

All fireline qualified personnel who have met the yearly fireline refresher, medical standards and work capacity test requirements, and have a current red card 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 for fire assignment. Refuge fire management staff may participate in Refuge fire suppression assignments, including surveillance/monitoring. The Refuge fire staff may be available for Regional and National fire assignments during periods of high fire occurrence.

4.1.1.1 Training and Qualifications

The Refuge FMO will maintain fire training, qualifications, and experience records for personnel on the refuges in IQCS. Requests for fire training classes will be coordinated through the Refuge FMO.

4.1.1.2 Refuge/Unit Delegation of Authority to Fire Staff

An example of the Delegation of Authority from the Refuge Manager to the Refuge FMO can be found in Appendix C of the Red Book.

4.1.1.3 Readiness

Each year prior to the active fire season, the refuge staff will review the refuge fire protection/suppression strategies. The Refuge FMO will discuss the upcoming fire season strategy with the AFS Galena and Tanana Fire Zone FMOs by June 1 of each year. An annual operating plan is being developed for each dispatch zone and they will be located in Appendix H once they are completed and signed. The Refuge staff will discuss annually fire protection/suppression strategies prior to the onset of field operations.

National and State Preparedness levels will be adhered to at all times. The preparedness/step up plan for the Refuge is located in Appendix G. The FMO will submit a list of qualified individuals to the Regional Fire Management Coordinator by June 1.

The refuge maintains a cache of basic fire equipment which will be inventoried annually and maintained in a “fire ready” condition by June 1 of each year. Additional fire equipment is available from the AFS Galena or Tanana Zones from April 15 through August 15.

The Refuge maintains a radio system that is utilized for FWS field operations, in addition AFS maintains a fire radio system that utilizes mountaintop repeaters to provide radio communication throughout the Galena zone. Both systems are inter-operable and can be used for fire communications. Repeater locations are shared and maintenance is the responsibility of AFS.

4.1.1.4 Aviation Management

Any fire-related aviation operations will follow applicable guidelines of the DOI National Business Center - Aviation Management Directorate.

AFS will be notified of all detection or reconnaissance flights originated by the Refuges. Flight following for refuge detection flights will be coordinated with AFS.

4.1.1.5 Fire Detection

Detection of fires is primarily by aircraft and AFS will be responsible for all scheduled detection and surveillance flights. When refuge land is affected by wildland fire, refuge fire personnel should attempt to go along on the AFS detection and surveillance flights. There may be some opportunities to use refuge aircraft for surveillance 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. The refuge aircraft will be coordinated with AFS. Billing to the incident will be done by assigning an A (aircraft) number to the incident.

New fires detected by the refuge will be reported to the appropriate AFS Zone as soon as possible. A detection/surveillance form will be completed and faxed along with a fire location marked on a 1:63,360 topographic map and longitude/latitude readings if available.

4.1.1.6 Initial Report of Fire and Initial Attack (IA) Dispatching

Upon notification of a new fire, the Refuge FMO will consult with the Refuge Manager or Acting Refuge Manager regarding special concerns and specific direction. The Wildland Fire Decision Support System (WFDSS) will be used to provide decision support tools, to document the course of action chosen and the decisions made by the Refuge Manager and the Refuge FMO. Together the AFS and the refuge will implement the selected management response.

Suppression-oriented response strategies and tactics will be employed in areas designated as critical, full and modified (until conversion). This strategy will be used to protect human life, property, and/or resources of special concern and to comply with the AIWFMP. Once the Refuge and AFS mutually decide to utilize initial or extended attack, AFS will implement the strategy.

4.1.1.7 Incident Commander Responsibilities (for all incident types)

All fires occurring on the Refuge and staffed with Service employees will be supervised by a qualified incident commander (IC). If a qualified IC is not available, one will be ordered through the local Dispatch Center.

The IC is a single individual responsible to the Refuge Manager/Line Officer for all incident activities, including the development of incident management strategies and tactics, and the ordering, deployment, and release of resources. The IC is responsible to:

- Provide a size-up to dispatch as soon as possible upon arrival on scene. A size-up checklist is in the Incident Response Pocket Guide (IRPG).
- Assess potential of using suppression and/ or using wildfire for resource benefits as objective(s) for the incident and contact the unit manager with recommendations.

- Using guidance in this FMP and/or a Delegation of Authority, implement selected response and manage an organization to implement effective strategies and tactics. Minimize suppression impacts where possible without reducing the effectiveness of the actions being undertaken.
- Determine resource needs and order additional as needed through local dispatch.
- Ensure that all resources assigned to the incident and those incoming receive a briefing and document these briefings. Refer to the Briefing Checklist in the IRPG.
- Continually re-assess incident complexity using the checklist in the IRPG. When a more qualified IC is needed, inform dispatch and delegated unit administrator and place the order the higher level IC.
- Depending on incident complexity, additional responsibilities may apply. The NWCG Fireline Handbook provides a more detailed description of IC responsibilities. All resources, including mutual aid resources, will report to the IC (in person or by radio) and receive an assignment prior to tactical deployment.
- All fires must be investigated to determine fire cause and if negligence or criminal intent were factors. If the IC suspects a fire cause is suspicious, a qualified wildland fire investigator will be ordered. The point of origin must be protected.

4.1.1.8 Mutual Aid and/or Cross Boundary Operations

AFS is responsible for both initial and extended suppression responses on the refuges and they maintain mutual aid agreements with the State of Alaska for resource sharing and cross boundary operations. There are currently no local mutual aid agreements with volunteer fire departments for initial or extended attack services on the refuges.

4.1.2 Incident Management

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.

As appropriate or needed, representatives from the Loudon Village Council Inc., Gana A' Yoo Ltd., Doyon Limited, the Tanana Chiefs Conference, the Bureau of Indian Affairs, the Alaska Department of Forestry and/or the local Alaska Department of Fish and Game staff will be consulted for input/concerns regarding fire suppression or fire used for resource benefit strategies.

The decision to order a Type 1 or 2 Incident Management Team (IMT1 or IMT2) will be based on fire size, location, threat to life and property, political sensitivity, organizational complexity, jurisdictional boundaries, values to protect, fuel type, topography and agency policy. The Incident Complexity Analysis located in Appendix F of the Red Book will be used by the IC as a guide determining when to order an IMT1 or IMT2. If possible the IC should be in consultation with the Refuge Manager in making the determination to order an Incident Management Team (IMT). 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, and provides specific guidance and constraints for the management response action.

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 IMT. Refuge staff (primarily the Refuge FMO) will help prepare the WFDSS documents. The Refuge Manager will select the course of action and incident objectives. 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 WFDSS will be re-validated by a periodic assessment done by the Refuge Manager or Acting Refuge Manager, the Alaska Fire Service FMO and the Incident Commander to ensure the current course of action is still valid.

All Type I and Type II incidents occurring on the Refuges will have a line officer's representative designated by the affected Refuge Manager to provide and maintain a conduit of communication between the Incident Management Team (IMT) and the Refuge Manager, as well as between the local suppression agency and the Refuge Manager. The Refuge FMO will usually function as the agency representative, but in the case of multiple incidents, other staff may also be assigned. Refuge staff will articulate Refuge resource management concerns and agency strategic direction, not tactical direction. The IMT reports to the Refuge Manager if the fire initiates on FWS land.

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.

4.1.2.1 Dispatching beyond IA

The IC will notify the Dispatcher whenever it appears a fire will escape initial attack efforts, leave Service lands, or when fire complexity will exceed the capabilities of command or operational forces. When additional resources are needed, the cooperating agencies may be contacted according to existing MOUs and/or additional resources can be ordered through the local Interagency Dispatch Center.

The local Interagency Dispatch will mobilize any additional resources, including higher level ICs and Incident Management Teams.

The Dispatcher or Refuge Manager will notify the Zone FMO, who will provide assistance, as available, with the implementation of the extended attack operations including:

- Assisting the Refuge Manager/Line Officer and delegated fire staff in completing the WFDSS analysis.
- Assisting the Refuge Manager/Line Officer in completing the Delegation of Authority, if needed.

4.1.2.2 Delegation of Authority to Incident Commander (IC)

A Delegation of Authority will be provided to any Type 3 or higher level IC. See the current Red Book for supporting guidelines which include Agency Administrators Briefing to IMT, and a Sample Delegation of Authority from Agency Administrator to Incident Management Team.

4.1.2.3 Resource Allocation and Prioritization

Resource allocation priorities are set through the local Interagency Dispatch Annual Operating Plan. Emerging initial attack fires will receive the highest priority. Priorities may involve a local Multi-agency Coordination Group (MAC) when there is significant fire activity on local cooperator lands.

4.1.2.4 Regulatory Compliance for Managing Unplanned Ignitions

National Environmental Policy Act - (NEPA) analysis is not conducted on wildfires because they are unplanned events. Suppression activities are Categorical Excluded from NEPA (516 DM 8.5(5)). Endangered Species Act (ESA) - Wildfire may impact endangered species and destroy critical habitat and this is considered a disaster or an act of God in the sense of 50 CFR 402.05. Emergency consultation may be conducted on the response to unplanned ignition.

Wilderness Act - Routine operations within the Refuge wilderness will be conducted using non-motorized means. Motorized equipment may be used in emergency situations that involve risk of human life and safety or other significant values to protect, - natural, cultural, or physical.

Clean Air Act - Impacts to non-attainment areas may limit management options for unplanned ignitions.

4.1.2.5 Use of Decision Support Tools

WFDSS will be used to provide modeling support and document line officer decisions for all wildland fire incidents. AFS is responsible for entering in the initial incident information to start the WFDSS process. The line officer will be briefed on the current fire situation and will validate if the initial pre-planned response is meeting the strategic objectives for that incident. If the pre-planned response is not meeting the strategic objectives or if there are site specific incident objectives that must be met, a new course of actions and incident objectives will be developed and this decision documented in WFDSS. On-line tools within the WFDSS system (FSPPro, RAVAR, SCI) can be used to inform the decisions that the line officer must make. Once this decision is published, a periodic assessment schedule will be set by the line officer to re-validate that chosen course of action is still meeting strategic objectives. Whenever a course of action is no longer meeting strategic objectives, a new course of action and decision will be required. This sequence continues for the duration of the incident. Once the incident has been declared out, WFDSS reports will be generated to document the progression of the incident and the decisions made during its course. These reports then become part of the final project record.

A large portion of the refuge is available to manage fires for resource benefit and allow fire to perform its natural role. Fire for resource benefit in these areas is encouraged whenever long-term weather and fuel condition allow it. Fires managed for resource benefit will have this clearly stated in their incident objectives and parameters for when these conditions are not being met will be defined. If the pre-planned response in limited or modified management areas is monitoring, this pre-planned response may not require a change in the course of actions and no decision is required of the line officer. In these cases the incident may stay in the pre-planned response throughout the entire duration of the incident and not require a periodic assessment from the line officer. The Refuge FMO will provide timely updates on the incident status to the line officer and gain their concurrence that the incident is still meeting resource objectives. This will be validated in the WFDSS system. On-line modeling tools will help inform the long-term prognosis for these resource benefit fires and their use is encouraged. A WFDSS Decision Flow Chart is located in Appendix I.

4.1.2.6 Wildfire Reporting Requirements

The Refuge FMO will complete and file a Fire Report for the following types of fires within 10 days of a fire being declared out:

- All wildland fires on FWS and FWS-protected lands (usually DI-1202 provided by BLM).
- All wildland fires where the Refuge takes action, whether Refuge WFU or off –refuge wildfires.
- All escaped prescribed fires.
- All false alarms responded to by Refuge staff.
- Support action.

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

- All WFDSS documentation.
- Project maps.
- Monitoring summaries.
- Photographs/photo points.
- Funding codes used and cost.

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

Reviews and investigations are used by wildland fire and aviation managers to assess and improve the effectiveness and safety of organizational operations. Brief descriptions of various reviews and associated procedures and requirements, including those for serious wildland fire accidents, entrapments, and fire trespass are listed in the corresponding Red Book Chapter.

Incident Commanders and Single Resource Bosses will ensure AARs take place in a timely manner and that any significant issues are brought to the attention of the Zone FMO or Refuge Manager.

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.

4.1.2.7 Suppression Damage Repair

Repairing the impacts of suppression activities is the responsibility of the Incident Commander and funded by the wildfire account. This work should be completed by the incident resources prior to final demobilization whenever practical. However, it may be more cost-effective and practical to delay repairs to improve the probability of success. It is the responsibility of the Refuge Manager/line officer to ensure suppression activity damage repair is completed.

Repair of suppression damage will occur prior to crew release from the fire, including:

- Removing all trash from incident facilities, work areas and firelines.
- Replace soil dug from firelines to refill them to level; add water bars as needed.
- Fell and buck up hazardous trees and snags.
- Flush cut all stumps as close to ground level as practicable.
- Roll back and compact sod overturned by plowing (with a grader or by hand) to preserve native grass root stock.

4.1.3 Emergency Stabilization (ES)

Natural recovery is the preferred choice for recovery following unplanned ignitions. However, when natural recovery is not likely, ES treatments may be needed to prevent further degradation of cultural and natural resources in the burned area and downstream impact areas from erosion and invasion of undesirable species. ES uses emergency appropriations and activities must be completed within one year of fire containment. An IC may initiate ES actions before the fire is demobilized, as delegated by the agency administrator.

4.1.3.1 ES Planning and Post-Fire Assessments

Because of the emergency nature of the fire event, the Emergency Stabilization Plan (ES) must be developed expeditiously and is frequently developed by a local unit or designated burned area ESR team. The Refuge Manager/Line Officer is responsible to order or assign teams to develop ES plans. The Refuges/unit may not have sufficient expertise to conduct burned area assessments; resource specialists from cooperating units or from the Region may be needed to assist in developing a plan. The ES Plan specifies treatments approved to implement post-wildfire emergency stabilization on a single incident. The plan specifies only emergency activities and treatments to implement within one year of wildfire containment. The plan must be completed within 7 calendar days of wildfire containment and approved within 6 business days of receipt by the approving office. The FWS National BAER coordinator reviews and approves ES plans by the end of September. The plan is prepared by an

interdisciplinary team during or immediately after wildfire containment. Information and a plan template are at <http://fire.r9.fws.gov/ifcc/esr/home.htm>.

A DOI Memo dated September 5, 2007, regarding Emergency Stabilization Cost Containment states that “all Emergency Stabilization planning must adhere to Department of the Interior policy (620 DM 3.6.B) requiring that standard treatments are to be used that have been validated by monitoring data from previous projects, or when there is documented research establishing the effectiveness of such actions”. All plans must “Justify proposed treatment(s) with existing research or monitoring documentation that demonstrates that the proposed treatment(s) are significantly more effective in achieving the emergency stabilization objective than natural recovery...”

4.1.3.2 ES Post-Wildfire Issues and Values to Protect

Wildfire damage to improvements is a concern. Developments are typically protected from fire damage, but dispersed improvements such as fences, public use facilities, and gates, are likely to be damaged by severe or large fires. Fires that burn across winter use trail areas may cause excessive down fall that would require cutting out the trail prior to use the following winter. A list of winter trails is found in section 3.2.1.2. Other values to protect are listed throughout section 3.2.

ES actions likely to be needed deal with erosion, invasive plant infestation, prevent additional damage to cultural resource sites, or loss of sensitive and protected species habitat or native vegetation post-fire, as identified in 620 DM 3, include

- 3.7 M (2) placing structures to slow soil and water movement,
- 3.7 M (7) seeding or planting to prevent permanent impairment of designated Critical Habitat for Federal and State listed, proposed or candidate threatened and endangered species,
- 3.7 M (10) direct treatment of invasive plants,
- 3.7 M (12) monitoring of treatments and activities for up to three years.

4.1.3.3 ES Treatment Maintenance and Monitoring

ES treatment monitoring will be clearly defined in the ES and BAR plans and, when practicable, will follow the AWFCG monitoring protocol available at http://fire.ak.blm.gov/administration/awfcg_committees.php

4.1.3.4 ES Reporting Requirements

There have been no recent ES and BAR treatments since the interagency BAER projects from the 2004 and 2005 fires. Required repair of damage resulting from AMR suppression activities will be completed before crews and resources are released from the incident.

Rehabilitation and restoration efforts will be undertaken to protect and sustain ecosystems, public health, safety, and to help communities protect infrastructure. A final report with a summary of actions taken and results will be completed at the end of the first year of BAER funding. A recommendation of additional BAR treatments is also completed at that time.

If there are situations on the refuge where natural recovery is not likely to happen, identify them and the actions allowed by policy (620 DM 3.7.M [ES] or 620 DM 3.8.M [BAR]) that apply.

Post wildfire activities references can be found in the Interagency Burned Area Emergency Response Guidebook and Interpretation of Department of the Interior 620 DM 3.

4.2.1 Burned Area Rehabilitation (BAR) Planning

A BAR plan is a document that specifies treatments required to implement post-fire rehabilitation policies. This plan may be programmatic (prepared in advance) and applicable to clearly defined types of incidents and situations, or prepared by an interdisciplinary team of specialists during or immediately following the containment of a wildfire. Information and a BAR plan template are at the DOI ESR website at <http://www.fws.gov/fire/ifcc/est/home.htm>.

4.2.2 BAR Issues and Values to Protect

There are few structures or improvements that would fall under BAR located on the refuges. The main area of concern would be potential erosion from severe burns in areas with steep enough slopes to cause soil movement, the restoration of winter trails from down fall, and the identification and treatment of invasive plants introduced by fire suppression activities.

4.2.3 BAR Environmental Compliance

Two (2) categorical exclusions may apply to BAR activities. The first is a DOI categorical exclusion (516 DM 2, Appendix 1(1.13)) and the second is a FWS categorical exclusion (516 DM 8.5(5)). When utilizing the FWS categorical exclusion, the Refuge/unit staff will complete the most recent version of the NEPA Compliance Checklist (FWS Form 3-2185) and submit the form with the BAR plan. If using the DOI categorical exclusion, consultation with the Regional Office is recommended for the most current information regarding use of this categorical exclusion. BAR projects must comply with NHPA. Plans will be submitted to Regional archeologist for review and cultural / archeological clearance. To the greatest extent possible, recommendations of Regional archeologist and/or SHPO will be followed in implementing the project. BAR projects that may affect T&E species/their habitats must comply with Section 7 of the ESA. Projects that affect T&E species/ their habitats will be submitted for Section 7 consultation. Designated wilderness lands may be considered an "extraordinary circumstance" under the Department Manual, whereby a categorical exclusion could not be used. In addition, a minimum requirements analysis would be necessary for BAR activities that involve uses prohibited by the Wilderness Act.

4.2.4 BAR Monitoring Protocols

Monitoring protocols will be included or referenced in the BAR plan and will follow DOI policy, Regional protocols, and will use demonstrated standards for similar physical and biological conditions and neighboring lands with similar values to protect.

4.2.5 BAR Contact Information

The Refuge biologists and GIS specialist would be involved in creating and implementing a BAR plan. Assistance would also be sought from the Regional Fire Management Coordinator and the Regional Fire Ecologist.

4.2.6 BAR Public Information and Public Concerns

Because BAR is planned, a meeting to inform the public of activities planned, obtain input from local communities and neighbors, and identify issues needing further discussion and resolution should be held early in the BAR plan development process.

4.2.7 BAR Reporting Requirements

An Annual Accomplishment Report is required for funding in years two and three. Detailed Annual Accomplishment Reports will be completed by the end of each fiscal year to document actual accomplishments, costs and monitoring results; and will be kept in field unit project files. A copy of

annual accomplishment report will be sent to Regional office. For national office use, annual accomplishments are summarized and reported on the NFPORS treatment/activity form. Planned data entries into the NFPORS Rehabilitation and Restoration Module are the responsibility of the National Burned Area Coordinator. NFPORS Accomplishment updates are the responsibility of the field unit; they are to be completed by the 23rd of every month and at the end of the fiscal year until the project is shown as completed.

4.3 Management of Planned Fuels Treatments

Regional and National Fire Preparedness and Relative Fire Danger Levels will be used as trigger points in managing prescribed fires on the Refuge. Trigger points can be changed in the future by comparing seasonal risk analyses and historical weather with historic fire activity and CFFDRS fire weather indices.

- Prescribed fires may be restricted at National and Regional Preparedness Level 4 and 5. (See the current National Interagency Mobilization Guide for details.)
- Burning at Regional Fire Preparedness Level 4 should be done with caution providing all contingency forces are available and requires RFMC approval.

Prescribed burn plans are written by Refuge FMO, AFMO, or fuels management specialist or other fire staff member determined to be qualified by the FMO. All plans are approved by the Refuge Manager. Each plan will follow the format and include the required elements of the Interagency Prescribed Fire Planning and Implementation Guide. Complexity, frequency and duration of monitoring activity will be dictated by burn objectives and specified in the prescribed fire plan. For prescribed fire within the Koyukuk Wilderness Area, the prescribed fire plan will contain a minimum requirement analysis (MRA).

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. Reviewer qualifications will be based on project complexity using the Interagency Guide:

- For low or moderate complexity projects, a Prescribed Fire Burn Boss Type 2 (RXB2)
- for high complexity projects, a Prescribed Fire Burn Boss Type 1 (RXB1)

Prescribed fires involving aviation operations will be reviewed by either a RXB1 or RXB2 with operational aviation experience, depending upon their air operations complexity.

These following activities will be done each year prior to implementing a prescribed fire program:

- ensure that all prescribed fire burn plans are up-to-date and signed
- if needed, renew smoke management plans/permits
- review fire behavior/smoke dispersion model runs for each plan to assess if they an update
- maintain an “out-year” list of potential burn units
- check “out-year” burn plan for NEPA and Threatened and Endangered Species compliance
- check with refuge biologist(s) regarding future prescribed burning opportunities
- ensure that the equipment needed for each burn is available and in good operational condition
- check availability and fireline qualifications of the staff needed to accomplish each of the burns
- assess training needs of refuge fireline personnel
- input burn plan information into FireBase, NFPORS, FMIS and FPA

For informational purposes, copies of approved burn plans can be provided to AFS and other affected or involved agency/party (such as the Alaska Department of Fish and Game, National Park Service, Gana A’

Yoo or Doyon Limited). Execution and supervision of prescribed burn plans on the Refuge are the responsibility of the Refuge FMO. Local resources (e.g. village EFF crews) may be utilized to supplement Refuge resources.

Prescribed fire prescription elements are not generic. Each prescription must be tailored to project-specific objectives and list limits for environmental conditions within which project execution is allowed must be listed in each individual plan. These may include any or all of elements such as wind speed and direction, soil moisture, 1-hour, 10-hour and/or 100-hour fuel moisture, woody live fuel moisture and/or litter/duff moisture that help predict the resultant post-ignition flame length and spread rate.

A fire burning within prescription is expected to accomplish project objectives. Flame length can be correlated with fire intensity, fire effects on vegetation, and likely success in maintaining control. Excessive flame lengths may cause unwanted mortality and be difficult or impossible for hand crews to control. High intensities are typically desirable when exposed mineral soil is needed for successful white spruce or white birch regeneration. The Canadian Forest Fire Behavior Prediction System (FBP) can be used to estimate fire intensities. Observations of post-ignition flame lengths will help validate model projections. Overall, the duration of exposure to heat should be relatively short unless exposure of bare mineral soil is desired. Smoldering fires can damage or destroy root systems and topple trees.

The Canadian Drought Index (CDI) will be used to track drought conditions. 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.

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 wildfire is appropriate. A prescribed fire must be declared a wildfire by those identified in the burn plan when that person(s) determines that the contingency actions have failed or are likely to fail and cannot be mitigated by the end of the next burning period. An escaped prescribed fire must be declared a wildfire when the fire has spread outside the project boundary, or is likely to do so, and cannot be contained by the end of the next burning period. A prescribed fire can be converted to a wildfire for reasons other than an escape. The Refuge Manager will be notified of a problem prescribed fire.

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

- Escape from the predetermined unit or from the Refuge, except where interagency agreements provide for certain fires to cross such boundaries.
- Exceed prescription and/or cannot be successfully managed under the existing burn plan.

Once a prescribed fire is declared a wildfire, an incident assessment (WFDDS) will be immediately completed by the Fire Management Officers from the Refuge and AFS/Galena or AFS/Tanana Zones to determine the appropriate management action to be taken. 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.

The Burn Boss will ensure an informal After Action Review (AAR) is conducted for each operational period on a prescribed fire.

All prescribed fires declared a wildfire will have an investigative review initiated by the Refuge Manager. The level and scope of the review will be determined by policy and procedures of the Red Book and the Service Fire Management Handbook. 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.

Burn Plans will specify information to be included in a project file. Burn Bosses are responsible to provide the following minimum documentation to the Refuge Manager or FMO for each prescribed fire:

- 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 burn day weather forecast and the projected weather for the next 3 days
- A copy of all fire behavior observations made during the burn
- All post-burn observations and evaluations
- Photos taken prior to the burn, during the day of the burn and post burn
- Aircraft use records and a implementation cost summary
- Any other correspondence or documentation pertaining to the burn, including documenting any unanticipated difficulties encountered during implementation

The Burn Boss will complete an Individual Fire Report with the Refuge FMO, who will file the report electronically within 10 days of the fire being declared out

Evaluation of the burn should consists 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 burn plan objective(s).

A summary of all prescribed 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.

4.3.1 Processes to Identify and Prioritize Fuel Treatments

Prescribed fire will be used on a site-specific basis to reduce hazardous fuels in WUI areas, maintain fire-dependent ecosystems, and to enhance wildlife habitat. Prescribed fire use in wilderness is allowed if it meets the minimum tool requirement for administering the areas as wilderness and is necessary to accomplish the purposes of the refuge, including Wilderness Act purposes.

Although its use to date is not extensive, prescribed fire is an important management tool for both habitat and ecosystem processes. It is often the only cost effective, reliable means of habitat manipulation. Prescribed fire may be implemented in any FMU to reduce hazard fuels, restore historic conditions or for fire research, it may also be implemented to improve or maintain wildlife habitat or subsistence values. If prescribed fire is implemented primarily to meet habitat or subsistence values, funding will be provided from non-fire programs. Prescribed fire funding through traditional fire funding is limited to projects

with the primary goals of reducing hazard fuels or maintaining fire dependent ecosystems. Prescribed fires conducted for habitat purposes will be funded out of NWRS funding.

Over the long-term it is desirable to maintain a variety of seral stages across the Refuges. Within the next decade desired future vegetation 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. Prescribed fire may become a critical tool to help maintain a suite of seral stages across the refuge under changing fire occurrence patterns due to warming climates.

Refuge prescribed fire programs are designed to accomplish the broad goals mentioned above and these more specific primary and secondary goals:

- Reduction and removal of hazardous fuels, especially dead and decadent black spruce in WUI areas.
- Increase edge effect and create vegetation mosaics by altering seral stages of vegetation and by breaking up large monotypic stands of black spruce.
- Increase vegetative growth and diversity by removing dead and decadent old growth and recycling nutrients tied up in the organic layer.
- Maintain/restore fire's natural role in boreal ecosystems and maintain naturally-ignited fire as a dynamic ecosystem process.
- 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.
- Provide opportunities for fire effects research.
- Increase production of forage utilized by big game species such as moose.
- Increase new shoot production of graminoids and remove dead herbaceous growth along marsh margins to enhance known waterfowl nesting and muskrat habitat.

Prior to green-up: In the boreal/mixed wood-leafless and shrub/grass fuel types, an early spring burn (April to mid-May) may be feasible when ground fuels are still relatively moist or on exposed sites where the snow has melted earlier than adjacent areas. This type of burn must occur prior to the peak of moose calving. Normally only grassy sites will burn early in the spring. Southerly exposed broadleaf and shrubland sites can sometimes be burned to remove leaf litter and dead downed material while snow is on adjacent spruce fuels.

Green-up through foliage maturation: Prescribed fires between early June and mid-July must be scheduled with caution, as this is the peak active fire season. Fires can quickly become difficult to control. Pre-green-up fires may cause problems if allowed to burn into this period.

Maturation of foliage: A very feasible time to burn in the boreal spruce fuel types is from mid-July to early September depending upon weather and drought trends. The risk of problems is reduced when an "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.

4.3.1.1 Prescribed Fire Project Planning and Implementation

Prescribed fire implementation will follow the standards set forth in the FWS Fire Management Handbook, the Redbook, and the Interagency Prescribed Fire Planning and Implementation Procedures

Reference Guide 2008 (Prescribed Fire Guide), which is available for download at www.nifc.gov/fire_policy/rx/rxfireguide.pdf.

Prescribed fires will be used to accomplish land and resource management objectives in accordance with the Refuge CCP and will be carried out only under a written and approved Prescribed Fire Plan. The Zone FMO or designee will write plans for proposed treatments.

Individual resource management prescribed burns and hazard fuels treatment projects must be identified in advance and entered into the National Fire Plan Operations & Reporting System (NFPORS) for funding consideration. The Refuge staff will coordinate with the Refuge FMO or designee to develop a list of future projects.

All burn plans will include monitoring for smoke impacts. Test fires will be used to assess smoke dispersal. Weather forecasts for the day of the burn and the next two periods must be obtained.

Project planning must begin six to ten months in advance of implementation, or longer if pre-burn preparation must occur during a specific phenological stage of the vegetation to be treated. Preparation of treatment areas may be assigned to qualified personnel or a contractor. If a project requires pre-burn preparation, this will be identified in the burn plan.

4.3.1.2 Prescribed Fire Operations

Prescribed fires may be ignited during Regional or National Preparedness Levels 4 or 5 if requirements specified in the Regional Interagency Mobilization Guide and the National Interagency Mobilization Guide are met and RFMC approval is obtained.

Cooperators, contractors, and casual hires (AD) may be used to implement prescribed fires. ADs must meet FWS standards. Cooperators, such as members of Volunteer Fire Departments, must have appropriate qualifications certified by their agency. Those who supervise FWS employees during prescribed fires must meet 310-1 inter-agency standards.

Operational Checklist

- At least thirty days prior to the burn, the Burn Boss will ensure all local, state, and smoke management permits are in place and current.
- At least two weeks prior to ignition, the Burn Boss will notify staff assigned to assist on a prescribed fire to ensure adequate planning of work and leave schedules.
- At least one week before ignition, all engines, tools, supplies, etc., will be checked.
- At least two days prior to the anticipated ignition date, the Assistant Refuge Manager will contact all the resources identified in the plan to determine availability.
- When a Burn Boss from outside the area is assigned, he/she will report to the Refuge Manager a day prior to scheduled ignition.
- Public and media contacts will be completed as designated in the burn plan.
- Warning signs or road guards will be used to advise motorists of a prescribed fire in progress, especially if smoke could reduce visibility.
- Refuge roads adjacent to burn units will be closed temporarily as needed.
- Test fires will be used to assess holding capability and smoke dispersal. Weather forecasts for the day of the burn and the next two periods must be obtained.

A prescribed burn will not be implemented unless all contingency forces are confirmed as being on-site or in standby status, as specified in the plan.

4.3.1.3 Prescribed Fire Public Notification

Notification lists will be included in all burn plans. 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).

The public will be informed of prescribed fires through news releases, interpretive messages, and educational programs. Individual prescribed fires should not be conducted without informing those agencies and members of the public likely to be impacted. Documentation of notification will be in the burn bosses daily log (ICS 214).

4.3.1.4 Multiple Prescribed Fire Projects

Multiple prescribed fire projects or units being burned at the same time will require an increased level of communication and supervision. A Prescribed Fire Manager Type 1 or 2 (RXM1/2) should be order to coordinate and supervise these types of projects. Prescribed burns that involve multiple units or do not have multiple aerial firing platforms may be supervised by a RXM2.

4.3.1.5 Prescribed Fire on Non-agency Lands

Reference the USFWS Fire Management Handbook Chapter 17 for specific requirements for implementing prescribed burns on non-agency lands.

4.3.1.6 Prescribed Fire Conversions and Reviews

A prescribed fire must be declared a wildfire by the Burn Boss or the Refuge Manager identified in the burn plan when they determines that the contingency actions have failed or are likely to fail and cannot be mitigated by the end of the next burning period. A prescribed fire can be converted to a wildfire for reasons other than that it spread outside the project area and cannot be contained by the end of the next burning period. A new management strategy will be implemented. A formal analysis using WFDSS or another decision support tool will be undertaken to determine management options as needed. The Refuge Manager and Zone FMO will be notified of a problem fire or a converted prescribed fire. The protection agency has responsibility for escaped prescribed fires on the refuge. The protection agency will work with the Burn Boss and incoming IC (they may be the same person) to ensure continuity of command and personnel safety.

Escaped prescribed fires will have an investigative review initiated by the Refuge Manager. The level and scope of the review will be determined by policy and procedures of the Red Book and the FWS Fire Management Handbook.

4.3.2 Monitoring of Prescribed Fires

Prescribed fires will have a monitoring program designed to assess that the treatment achieved the results intended. These monitoring plans will be coordinated with the FWS Regional fire ecologist to ensure appropriate monitoring methods are used and a consistent approach is used state-wide. Pre-treatment data collection as well as post-treatment data collection will be required. Further information is provided in section 5.2.

4.3.3 Planning, Preparing and Implementing Non-Fire Hazardous Fuels Treatments

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 with concurrence with the Regional Fire Management Staff. This plan will evaluate all possible options and long-term effects along with costs. Monitoring would occur to determine whether objectives were met and overall treatment effectiveness. 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. For the Koyukuk Wilderness FMU, a minimum requirements analysis will be completed as part of the authorization process for all fuels treatment activities.

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 its 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 to monitor.

As new areas of special concern become known, they will be identified on a refuge GIS layer and their locations will be given to AFS. Currently all special concern areas (such as critical habitat, 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 a level of suppression needed to protect the resource(s) at risk.

4.3.4 Fuels Treatment Regulatory Compliance

The Refuge will comply with all the related requirements of the Clean Air Act, which is implemented through State, Tribal, and local regulatory agencies. 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 Draft Alaska Enhanced Smoke Management Plan (June 2004) provides smoke management guidance. <http://www.dec.state.ak.us/air/smokemain.htm>

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 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.

Public health related to smoke exposure is an important concern of the refuge. Burn plans and incident assessments (WFDDS) will note smoke sensitive areas that could be impacted by projects and incidents. Smoke management techniques will be used as much as practicable to minimize the amount of smoke produced and its impact on smoke sensitive areas, following the most recent edition of the NWCG Smoke Management Guide for Prescribed and Wildland Fire.

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. If smoke drifts within 300 feet of an inhabited residence a high volume air quality sampler must be set up and operated.
- 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 more than 40 acres, the Refuge FMO will comply with the DEC permit requirements for open burning.

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

4.3.5 Fuels Treatment Monitoring

Fuel treatment projects will have a monitoring program designed to assess that the treatment was conducted as intended. These monitoring plans will be developed during the fuels treatment planning stage and will be coordinated with the FWS Regional fire ecologist to ensure appropriate monitoring methods are used and a consistent approach is used state-wide.

4.3.6 Fuels Treatment Reporting Requirements

Individual resource management prescribed burns and hazard fuels treatment projects must be identified in advance and entered into the National Fire Plan Operations & Reporting System (NFPORS) for funding consideration. The Refuge staff will coordinate with the Zone FMO or designee to develop a list of future projects. A list of projects planned over the next five years is located in Appendix J.

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.

4.3.7 Fuels Committees and other Collaborative Groups

Fuel treatment projects will be discussed and coordinated with AFS Zone FMOs and other entities that are identified during project development.

4.3.8 Fuels Treatment Funding Processes

The Refuge FMO is responsible for developing fuels treatment projects and requesting project funding through the NFPORS budgeting system. This involves developing out-year planning for projects several years in advance of implementation. Once funding is obtained for the project, the Refuge FMO is responsible for coordination and over-sight of the project through its completion. Once the project is complete, the NFPORS system will be used to document the project accomplishments. The timelines for these updates follow the federal fiscal year calendar.

4.3.9 Debris Burning

Prescribed fire can be used to dispose of vegetative debris produced from hazardous fuel reduction activities, and removal of hazard trees,. The Refuge FMO will review all fuels disposal projects for complexity. A burn plan signed by the Refuge Manager is required for all debris burning on Refuge land.

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 contract stipulations related to debris burning. The project or contract must include funding to plan and conduct debris burning including plan preparation, and identify the qualified individual(s) responsible for burning. Generally low 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.

4.4 Prevention, Mitigation and Education

4.4.1 Wildfire Investigation and Trespass Policies

The inadvertent or intentional ignition of wildland fuels by humans is illegal. As possible, the Refuge will investigate all human-caused wildfires at the earliest possible time. The investigation may range from a documented determination of cause by the initial attack crew to criminal investigation by a qualified arson investigator.

4.4.2 Prevention/Mitigation Activities

Prevention will focus on preventing human caused fires. Prevention activities on the Nowill focus on increasing youth and young adult awareness of the effects of human-caused fires and the benefits of natural fire.

Prevention efforts will focus on outreach to the public during the fire season (airing prevention messages weekly on radio station KIYU). Cabin permits will specify FIREWISE measures to be taken annually to protect each structure.

Mitigation efforts will focus on reducing hazardous fuels around administrative cabins. An annual assessment of hazardous fuels will be performed for all of the administrative sites each fall. All future cabin permits will specify FIREWISE measures to be taken annually by the permittee to protect each structure. FIREWISE brochures are available to the public in the Refuge offices.

The refuge will take an active role in assisting nearby communities to reduce the risk of wildland fire to life and property, focused on reducing hazardous fuels within and adjacent to the communities. Assistance will be limited to hazardous fuel assessments, recommendations for treating hazardous fuels and providing information relating to potential sources of financial assistance for such projects. The FIREWISE, Volunteer Fire Assistance and Rural Fire Assistance programs will be supported as the need arises. The refuge will engage in a dialogue with neighboring communities regarding ways of collaboratively dealing with wildland urban interface problems.

4.4.3 Education/Outreach Activities

Communicating information on the role of fire in the northern boreal forest and tundra ecosystems is a high priority for the Region and the Refuges. The Region's "Role of Fire" (available at <http://alaska.fws.gov/fire/role>) describes the role wildland fire plays on the refuges.

Participation in the annual Galena Science Camp will further an understanding of fire ecology. The Refuges will also pursue other avenues to bring fire ecology education into the Galena City, Ruby, Tanana, and Yukon-Koyukuk Area School Districts.

Refuge staff play an important role in educating the public regarding the role of fire when they meet numerous village residents throughout the year. Each encounter provides an opportunity to discuss fire management on the refuge and learn about individual preferences and understanding of the role of fire.

5.0 Monitoring and Evaluation

The intent of this chapter is to document processes for determining whether the FMP is being implemented as planned and fire-related goals and objectives are being achieved. Information obtained from monitoring and evaluations is used to update the FMP and land management plans.

5.1 Fire Management Plan Monitoring

Monitoring and evaluation are functions used to determine if a 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 improve wildland urban interface and hazardous fuels treatment techniques. It also provides documentation regarding performance measures.

5.1.1 Annual FMP Review

FMPs will be reviewed annually and updated as needed. The Refuge Manager is responsible for approving updates. In addition, revisions of FMPs with Regional review and concurrence may be needed periodically or after completion of a new (or significantly revised) CCP.

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, Alaska Interagency Wildland Fire Management Plan, compatibility with refuge plans, support of the applicable National Wildlife Refuge promises, 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 Regional Fire Management Coordinator reviews annual changes to the refuge fire management plan as prepared by the refuge.

Refuge fire management option (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.

5.1.2 FMP Terminology

Terms in the FMP are defined in the National Wildfire Coordinating Group glossary, located at <http://www.nwcg.gov/pms/pubs/glossary>.

5.2 Treatment Effectiveness Monitoring

Suppression, prescribed fire, non-fire fuels application, and emergency stabilization and rehabilitation all require some level of monitoring and evaluation. Each 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.

Monitoring and evaluation are activities that must be accomplished before, during and after any prescribed burn or wildland fire managed for resource benefit on the refuge to ensure the fire is burning within prescription, and to ascertain whether habitat/resource management objectives have been met. Post-wildland fire monitoring may examine both short and long-term fire effects on vegetation. Whenever possible, monitoring efforts will utilize the AWFCG monitoring protocol available at http://fire.ak.blm.gov/administration/awfcg_committees.php. Using these protocols will help ensure that data can be shared across jurisdictional boundaries within Alaska. Long term fire effects monitoring requires that a formal plan be approved by the regional office.

All prescribed burns must have measurable objectives. Monitoring will be done to refine future prescriptions and to document and verify that the stated objectives have been met. Both first and second order fire effects on vegetation 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. Coordination with refuge biologists is imperative for implementing a monitoring program. Monitoring of long-term effects requires a formal plan be approved by the Regional Office.

Suppression monitoring can range from surveillance monitoring of limited fires to ground-disturbing suppression tactics used on unwanted fires. Phase one occurs when a fire is active and phase two is monitoring post-fire ecological effects.

Phase 1 Suppression Monitoring Goals are:

- to ensure public and firefighter safety
- to determine if suppression tactics are compatible with the FMP, refuge plans, and the smoke management plan
- to document fire cause and location, size, fuels, management option (limited, modified, full, critical), spread potential, weather, smoke characteristics, potential threats, tactics, constraints, public and firefighter safety, cultural resources and sensitive natural resources.

For the fire duration monitor spread, weather, fire behavior, smoke characteristics, potential threats, fire intensity and other information commensurate with the AMR:

- to determine if any critical sites or natural resources are threatened
- to gather daily situation data to validate or change the WFDSS decision

Phase 2 Suppression Monitoring Goals are:

- to monitor 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.

Prescribed Fire monitoring is important to ensure that a prescribed burn is accomplished safely and data is gathered to refine future prescriptions and burn plans. Prescriptions should be written so that field observations and measurements readily show if the fire is in prescription or not. Prescribed fire objectives should be clear and measurable so assessment 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 monitoring protocol will be utilized when performing pre-burn surveys.

Prescribed Fire Monitoring Goals are:

- to determine if prescribed fires are compatible with refuge goals and objectives
- to determine if the prescribed fire successfully produced the desired vegetation response
- to determine if prescribed fire plans are adequate to perform a prescribed fire

The primary fire behavior and environmental parameters that may need to be measured periodically during prescribed fire operations are listed in Table 6 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 may be entered on the Fire Surveillance Form (Appendix T).

Table 4 - Example Fire Behavior and Environmental conditions for prescribed fire monitoring

Fire Behavior	Environmental Conditions
Rate of spread by fuel type.	Temperature
Flame length by fuel type	Relative humidity
Flaming Zone Depth	Midflame wind speed and direction
Daily Hours of active flaming	Estimate of atmospheric mixing, stability
Fire character (running, crowing, etc.)	Direction of smoke transport
	Cloud cover
	State of the weather
	Fuel Moisture
	Duff Moisture

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.

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.

Fire research and monitoring is encouraged on all prescribed burns planned on the refuge and wildland fires that may 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 are dependent upon observed and predicted fire behavior and weather. On-site monitors may be assigned to specific prescribed burns.

5.2.1 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 advance seral stage habitats.
- To determine the natural variability of fires on the refuge, including occurrence, extent and severity.
- To establish long-term monitoring sites in vegetation communities or fuel types common to the refuge and under-represented in existing state-wide monitoring efforts.
- To understand fire and treatment effects in different vegetation/fuel types to develop predictive capabilities for modeling fire distribution, spread and behavior.
- To refine Refuge fire regime and condition class maps.
- To insure that project objectives have been met or unexpected results can be documented.

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. 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 AIWFCG 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 in the AWFCG interagency fire effects monitoring protocol (http://fire.ak.blm.gov/administration/awfcg_committees.php) or in the Service's Fuel and Fire Effects Monitoring Guide (<http://firer9.fws.gov/ifcc/monitoring/RefGuide>). Whenever possible, the AWFCG monitoring protocols will be selected to help ensure data transfer across agency boundaries within Alaska.

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 at <http://fire.org/firemon/lc.htm>. The USGS Monitoring Trends in Burn Severity provides NBR maps for fires greater than 1000 acres. These maps must be assessed with on-the-ground data to estimate the map accuracy since NBR has proven to be inconsistent in its ability to appropriately identify burn severity on Alaska fires. However, because of the costs associated with developing burn severity maps, 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.

5.2.2 Non-fire Effects Monitoring

Monitoring of non-fire fuel treatments on Service owned land will be the responsibility of the Refuge FMO in conjunction with the Regional Office. Monitoring will be designed on a case-by-case basis, but will follow established FWS and AWFCG monitoring protocols. The primary objective of non-fire fuel treatment monitoring will be to determine if the treatment has produced the desired change in fuels. Long-term monitoring of non-fire fuel treatments on non-service owned land (typically Native or village corporation land) will primarily be the responsibility of the landowner. The initial treatment effectiveness treatment will be carried out in conjunction with the Refuge FMO. Longer term monitoring can also be developed with input and assistance from the Refuge FMO.

5.2.3 Collaborative Monitoring with other Disciplines

If secondary objectives are established for fire or non-fire treatments to benefit wildlife or other refuge purposes, monitoring will be designed and implemented collaboratively with these other disciplines. For instance, invasive plant species monitoring will be conducted and coordinated with Refuge biological staff as populations of these species are identified.

5.2.4 Fuels Treatment Performance/ Targets

The majorities of habitat types within the refuges have intact, functioning fire disturbance regimes and are in condition class 1. Habitat treatments may be needed in the future in order to create or maintain the desired mosaic of age classes and patchiness on the refuges. The current fuel treatments planned involve hazardous fuel reduction projects around villages and individual cabins or allotments to reduce fire risk. These are contingent on the development of Community Wildfire Protection Plans for villages and funding availability.

6.0 References Cited

The following statutes authorize and provide the means for managing wildland fires on FWS lands or threatening FWS lands and on adjacent lands:

- 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.
- Economy Act of June 30, 1932 (47 Stat. 417; 31 U.S.C. 1535). Authorizes Federal agencies to enter into contracts and agreements for services with each other.
- Reciprocal Fire Protection Act of May 27, 1955 as amended by the Wildfire Suppression Assistance Act of 1989 (69 Stat. 66, 67; 42 U.S.C. 1856a)(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 fires when no agreement exists.
- 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. 668dd-668ee)(16 U.S.C. 460k-460k4). Governs the administration and use of the National Wildlife Refuge System.
- Alaska Native Claims Settlement Act of December 18, 1971. (88 Stat. 668; 43 U.S.C. 1601). Alaska Natives' lands are to continue to receive forest fire protection from the United States at no cost until they become economically self-sufficient.
- 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.
- Federal Fire Prevention and Control Act of October 29, 1974 et seq. (88 Stat. 1535; 15 U.S.C. 2201) as amended. Authorizes reimbursement to State and local fire services for costs incurred in firefighting on Federal property.

- Federal Grants and Cooperative Act of 1977. (Pub. L. 95-244, as amended by Pub. L. 97-258, September 13, 1982. 96 Stat. 1003; 31 U.S.C. 6301-6308). Eliminates unnecessary administrative requirements on recipients 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.
- Alaska National Interest Lands Conservation Act of December 2, 1980. (94 Stat. 2371, 43 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.
- Supplemental Appropriation Act of September 10, 1982. (96 Stat. 837). Authorizes 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.
- 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 the vicinity of agency facilities in extinguishing fires when no agreement exists.

Other Policy References:

- Guidance for Implementation of the Federal Wildland Fire Management Policy (Feb. 13, 2009)
- Departmental Manual, 620 DM 1-3, Wildland Fire Management, General Policy and Procedures; Wildland Fire Management, General Policy and Procedures – Alaska; and Burned Area Emergency Stabilization and Rehabilitation.
- United States Fish and Wildlife Service Manual sections 095 FW 3 Emergency Preparedness and Response -- Wildland Fire Management, 241 FW 7 Wildland Fire Safety, 232 FW 6 Training Standards for Wildland and Prescribed Fire Operations, 621 FW 1 Wildland Fire Policies and Responsibilities, 621 FW 2 Fire Management Planning, and 621 FW 3 Prescribed Fire.
- United States Fish and Wildlife Service Fire Management Handbook
- Interagency Standards for Fire and Fire Aviation Operations, also known as the “Red Book.”
- Interagency Prescribed Fire Planning and Implementation Procedures Guide (July, 2008)
- National Wildlife Refuge System Wildland Fire Management Strategic Plan (May 2006)
- A Collaborative Approach for Reducing Wildfire Risks to Communities and the Environment: 10-Year Strategy Implementation Plan (December 2006)
- National Fire Plan (September 2001) and Healthy Forest Initiative (August 2002)

- USFSW Manual, 610 FW 1-2 and 5, Wilderness Stewardship Policy

Appendix A- Location of RAWS, repeaters and administrative cabins on the refuge

Name	Latitude	Longitude	Elevation	Quadrangle	Quad	Fire Zone
Cottonwood RAWS	65.3458	-155.9361	1250'	Melozitna	B-6	Limited
Kaiyuh RAWS	64.4259	-158.1055	99'	Nulato	B-5	Limited
Koyukuk RAWS	66.0083	-157.5700	1440'	Shungnak	A-4	Limited
Round Lake RAWS	64.6854	-153.9377	470'	Ruby	C-2	Limited
Hill 2321 Repeater	64.3536	-153.8919	2260'	Ruby	B-2	Limited
Kokrines Repeater	64.9514	-154.8847	3667'	Ruby	D-4	Limited
Purcell Mountain Repeater	66.3072	-157.6685	2820'	Shungnak	B-4	Limited
Round About Repeater	65.5404	-156.5482	1080'	Kateel River	C-2	Modified
Totson Repeater	64.4542	-157.2944	2710'	Nulato	B-3	Limited
Tough Mountain Repeater	66.1321	-156.8370	Unknown	Shungnak	B-2	Limited
Hog River Admin. Cabin	65.9335	-155.3370	263'	Melozitna	D-5	Modified
Lower Nowitna Admin. Cabin	64.6735	-154.5155	255'	Ruby	C-4	Limited
Round Lake Admin. Cabin	64.6855	-153.9377	456'	Ruby	C-2	Limited

Appendix B 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

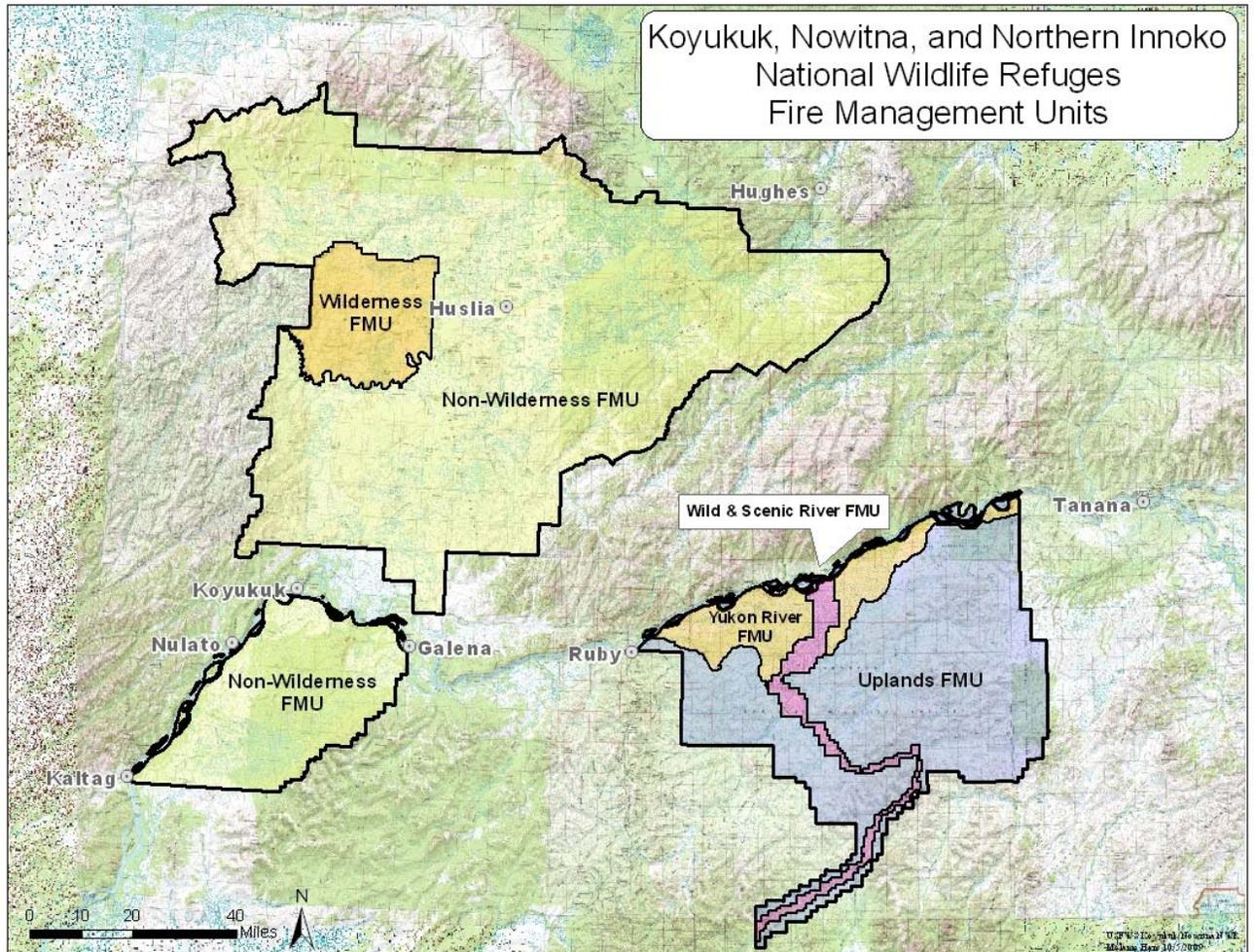
Federal Organizations:

Alaska Fire Service Galena Zone	(907) 656-1222	
Alaska Fire Service Tanana Zone	(907) 356-5553	
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)

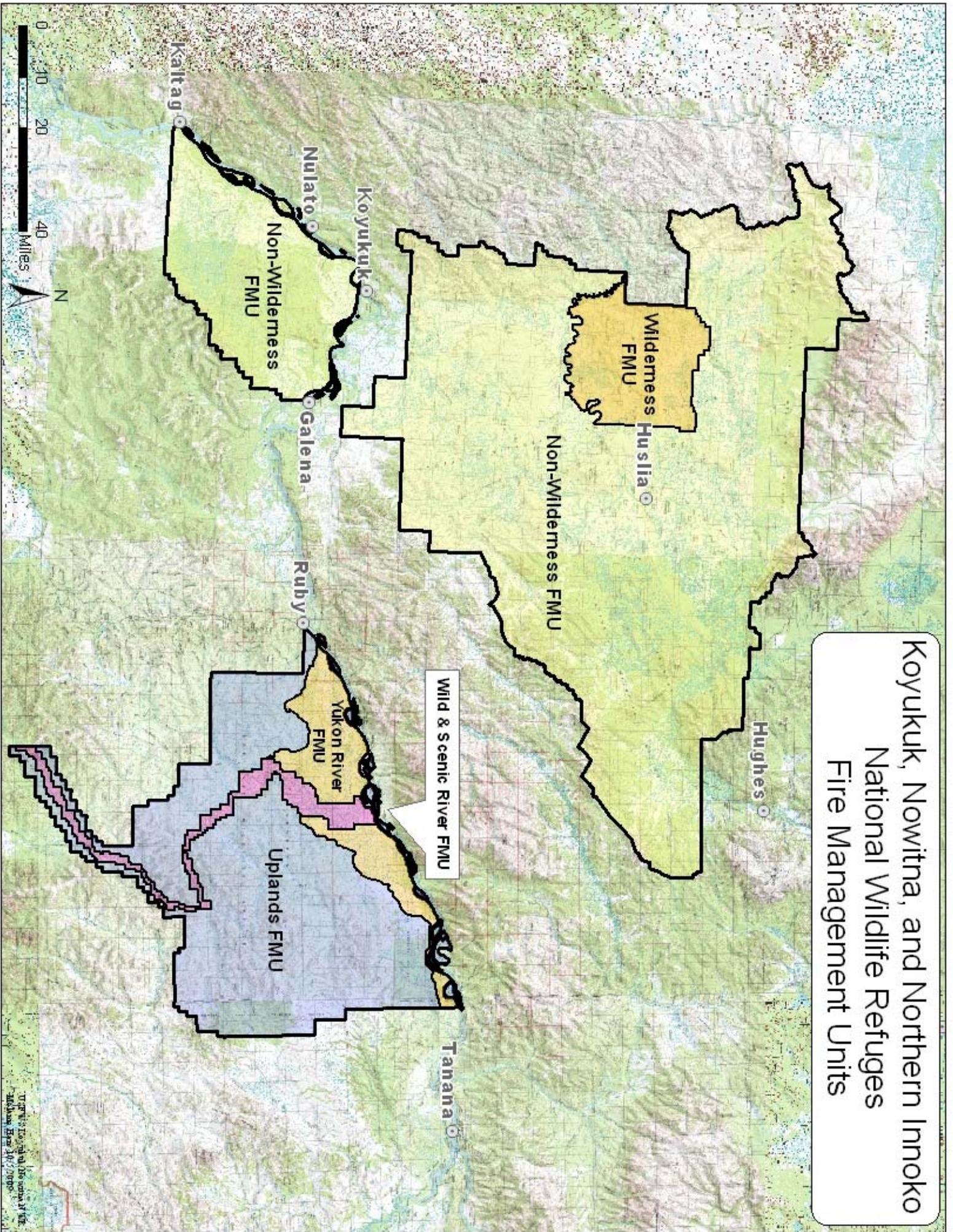
State of Alaska:

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

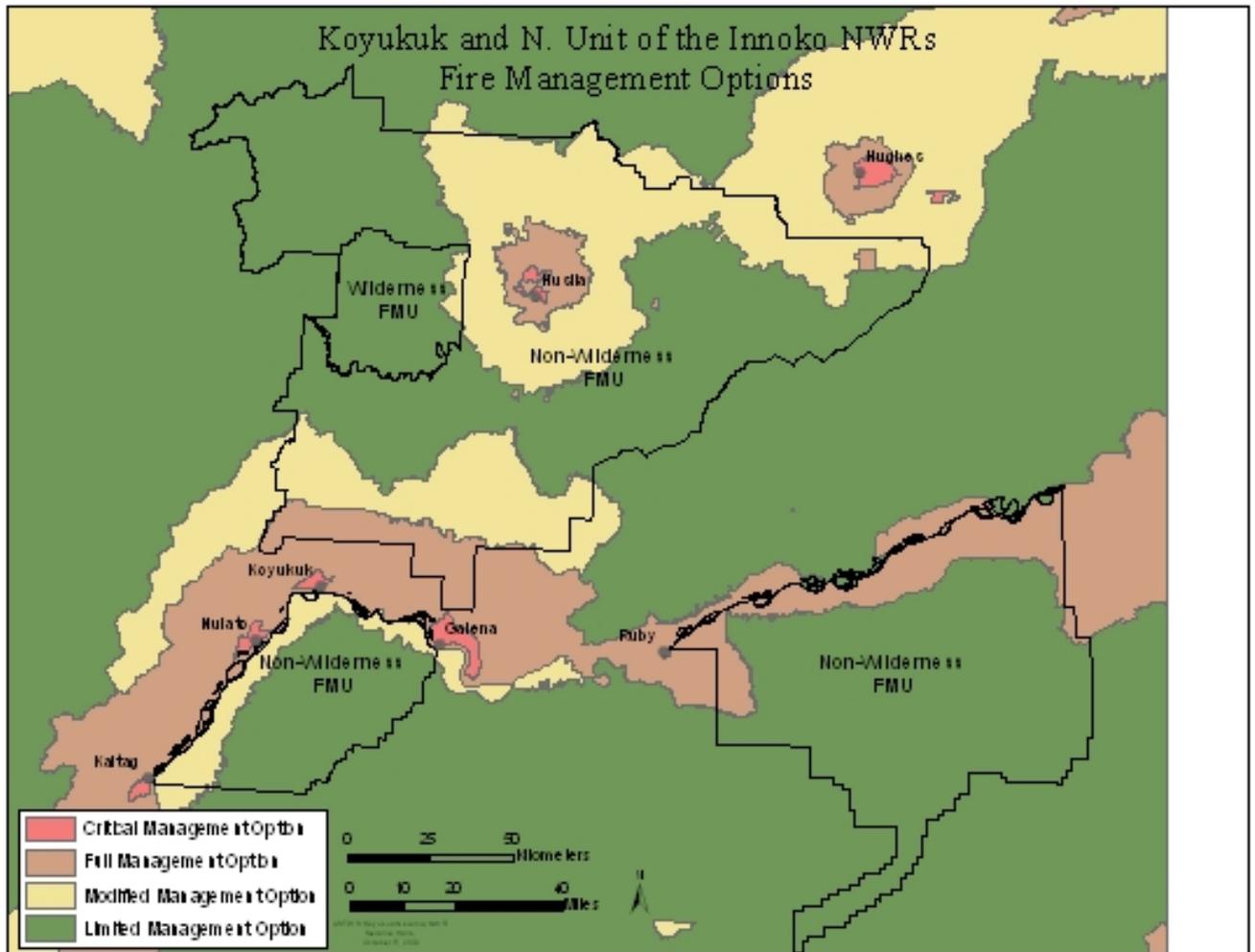
Appendix C- Fire Management Units



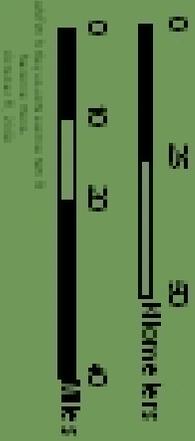
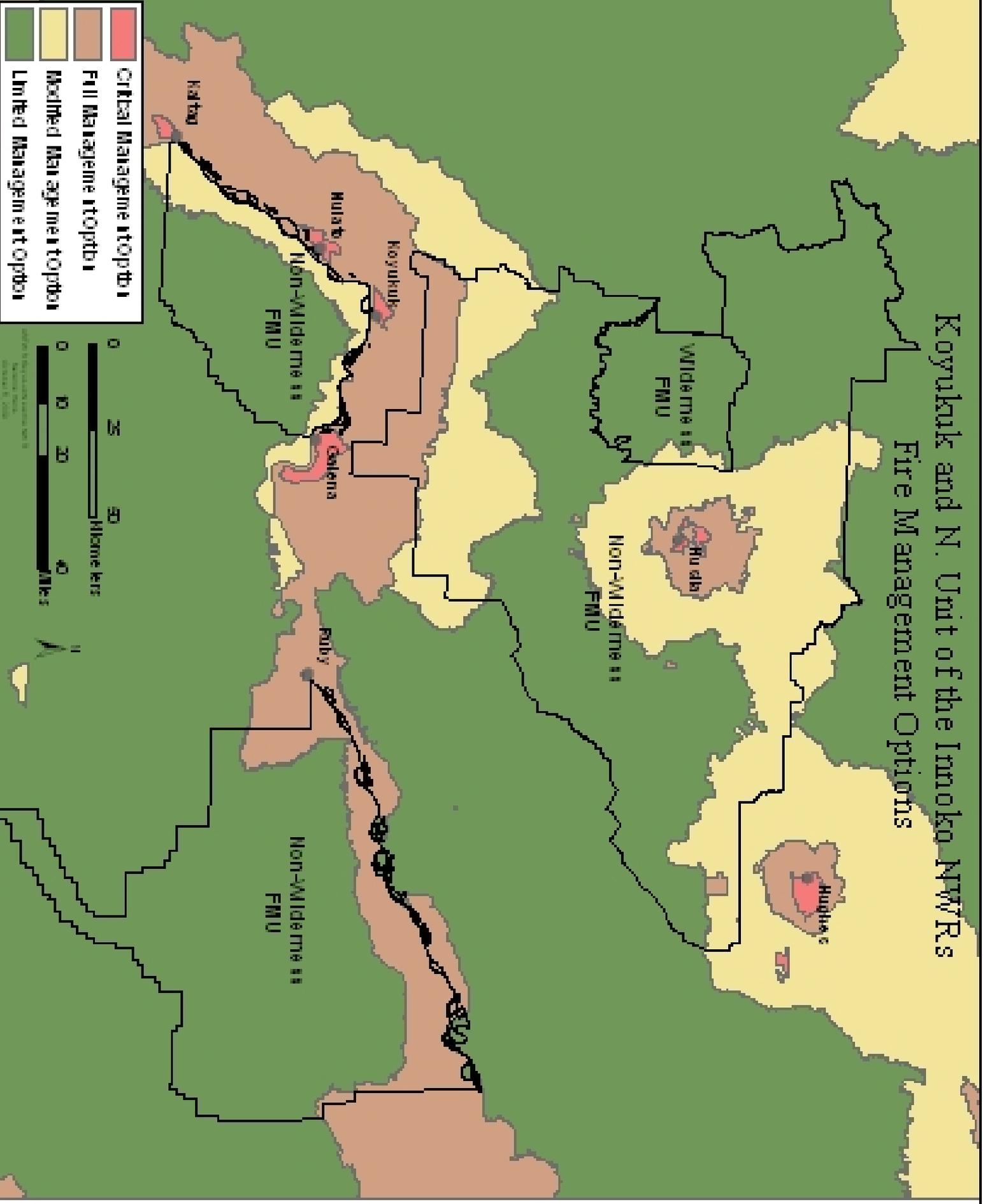
Koyukuk, Nowitna, and Northern Innoke
National Wildlife Refuges
Fire Management Units



Appendix D- Fire Management Options Map

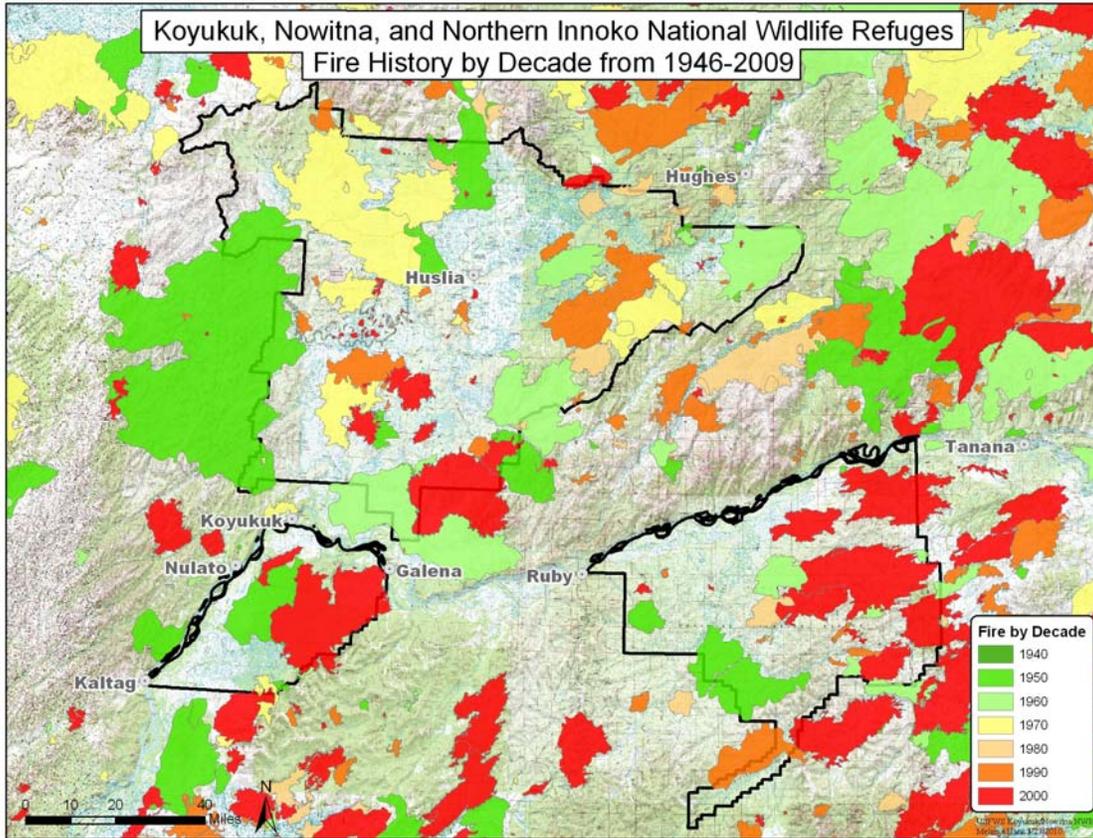


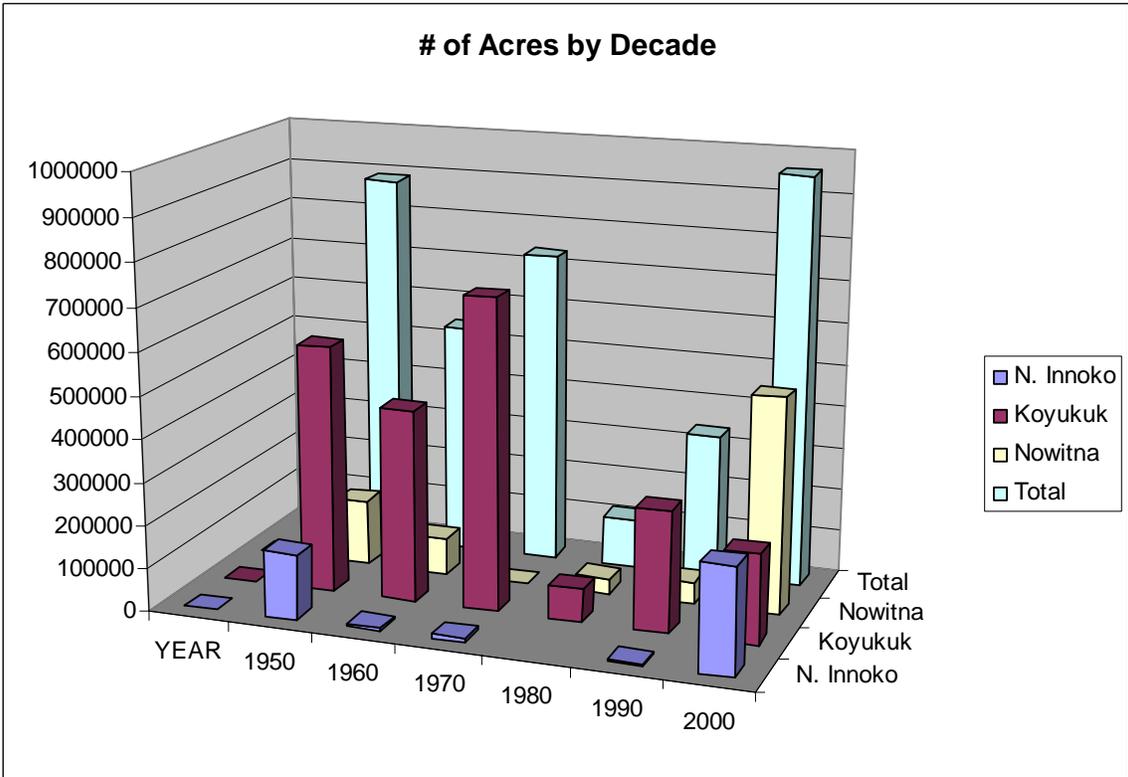
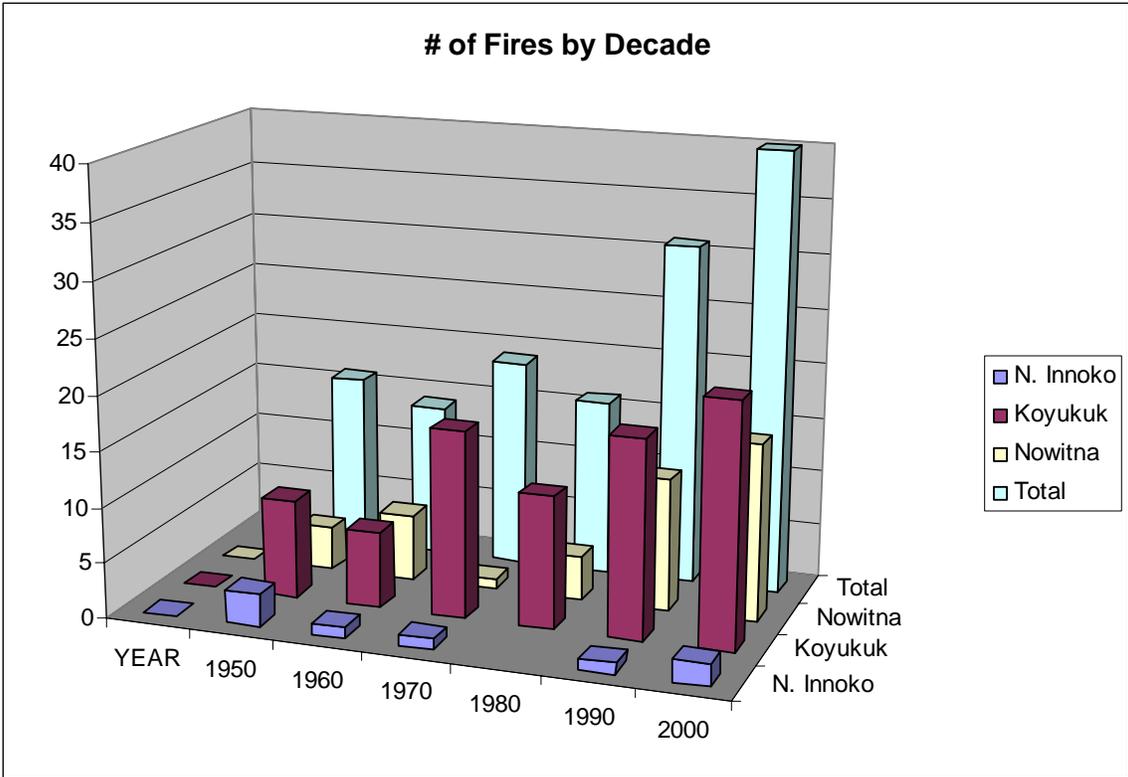
Koyukuk and N. Unit of the Imnoko NWRs Fire Management Options



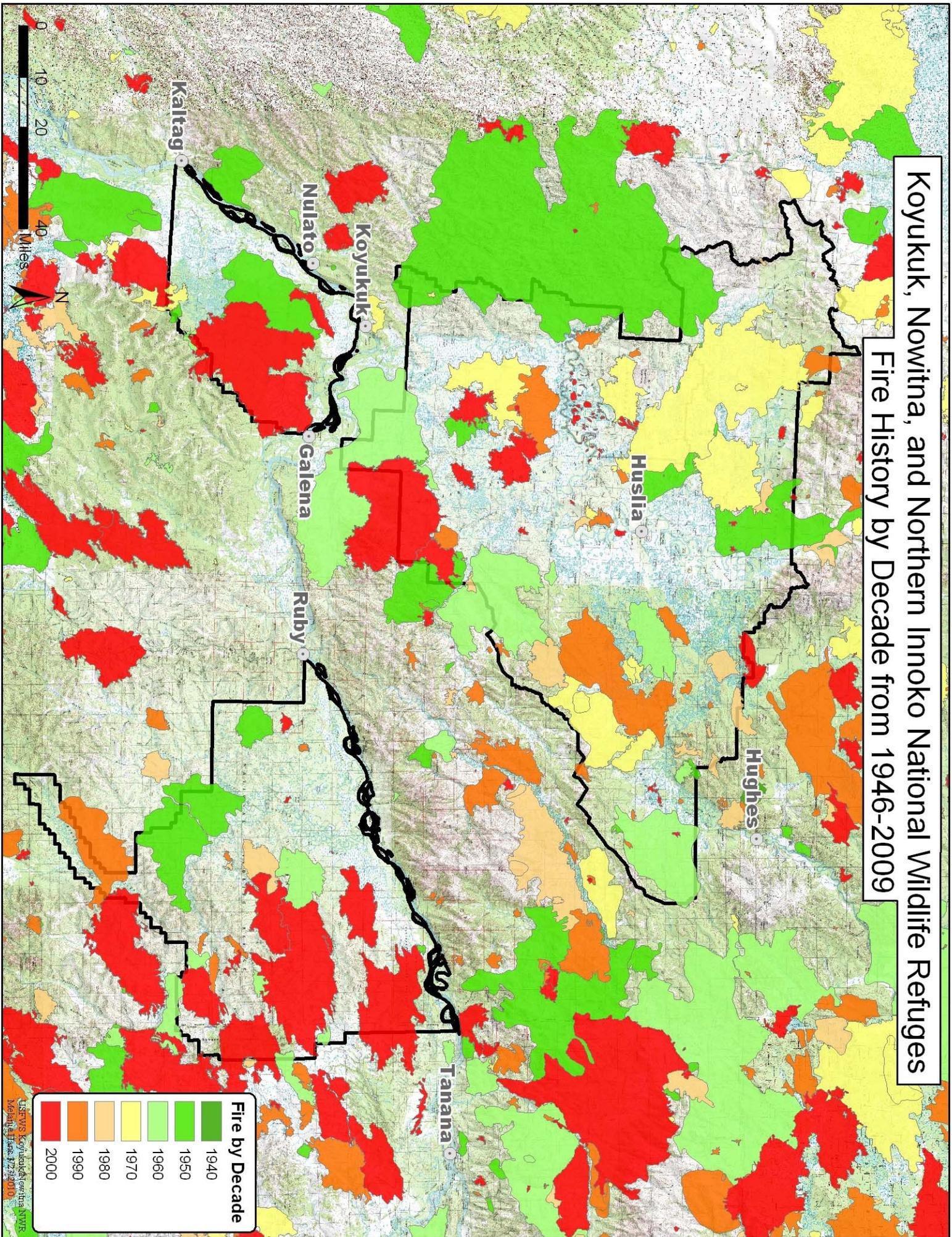
U.S. Geological Survey
Map Information
Version 1.0

Appendix E- Fire History





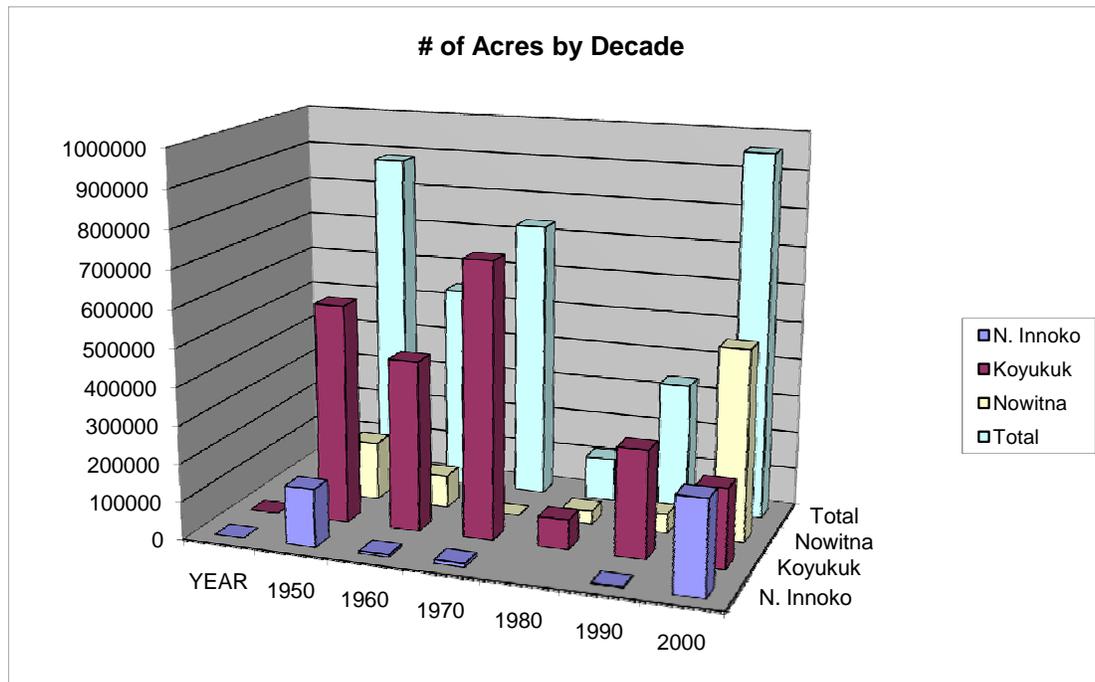
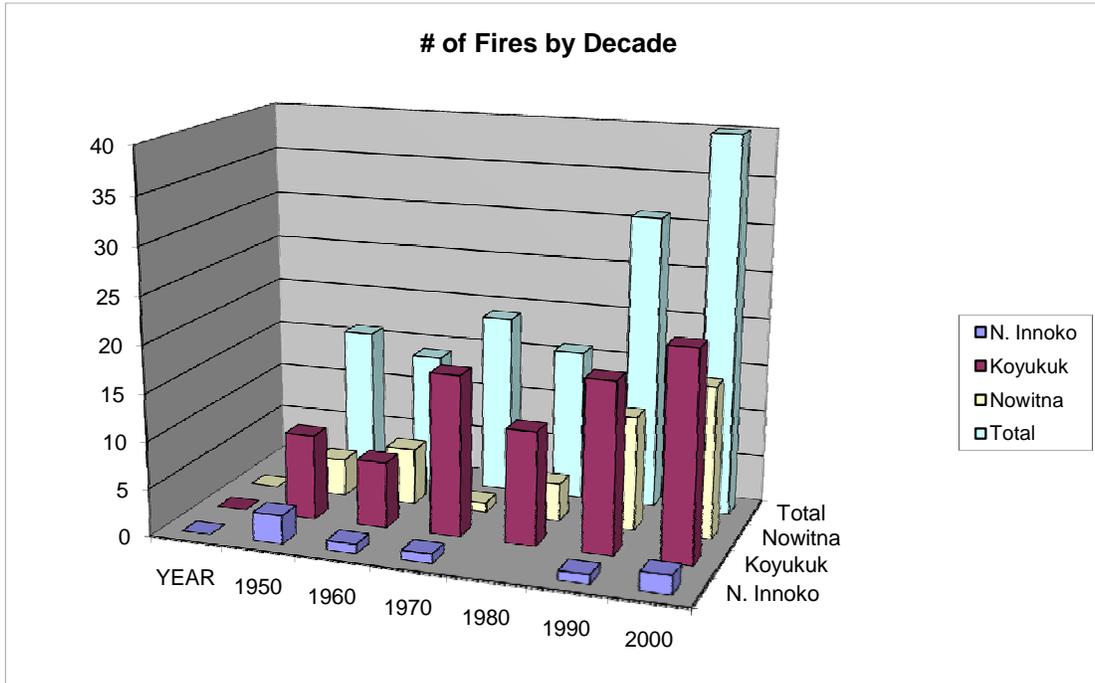
Koyukuk, Nowitna, and Northern Innoko National Wildlife Refuges Fire History by Decade from 1946-2009



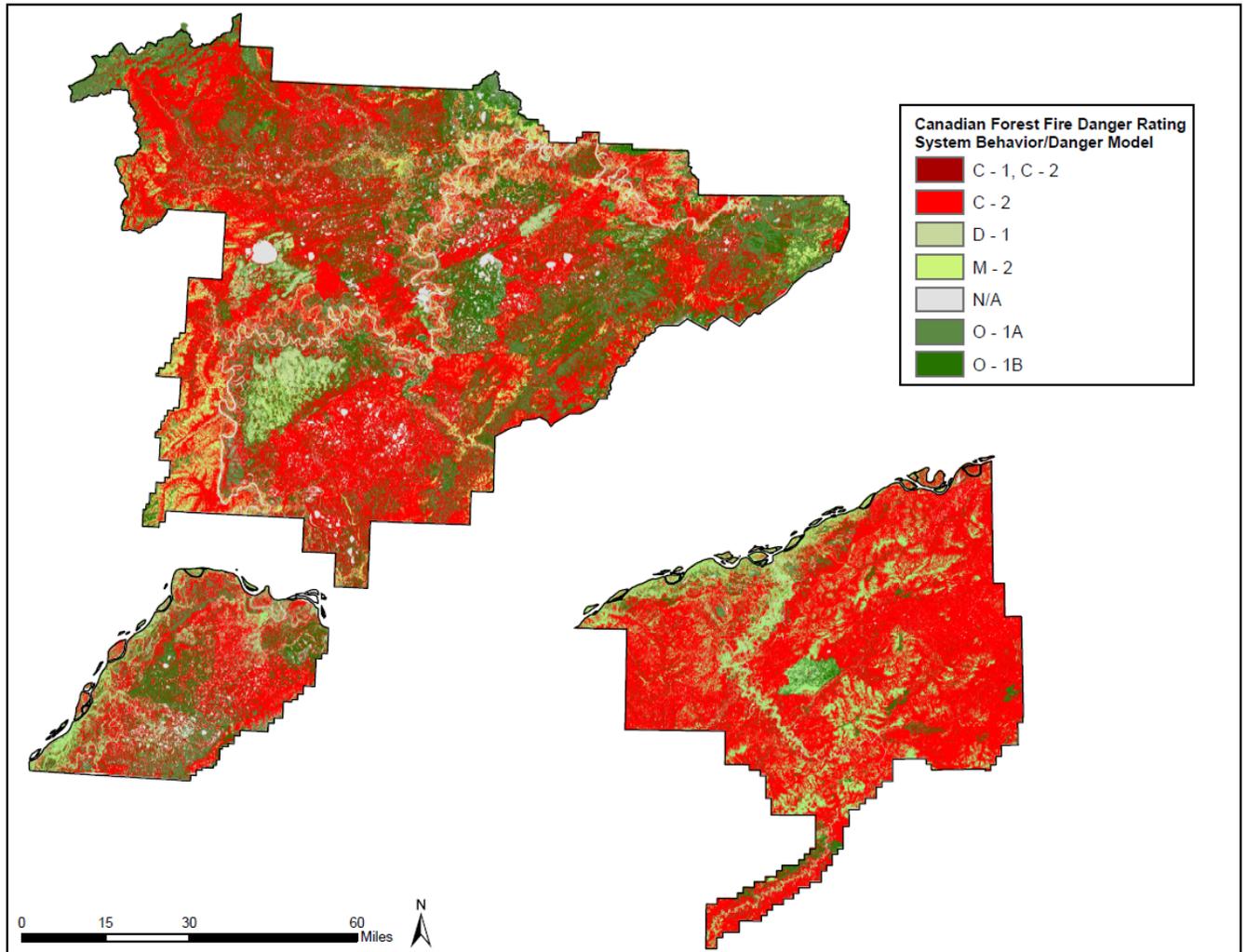
Fire by Decade	
Dark Green	1940
Medium Green	1950
Light Green	1960
Yellow	1970
Orange	1980
Red-Orange	1990
Red	2000

USFWS Koyukuk/Nowitna/NWR
Michael Hume, 1/23/2010

YEAR	N. Innoko # of Fires	Koyukuk # of Fires	Nowitna # of Fires	Total	YEAR	N. Innoko Acres	Koyukuk Acres	Nowitna Acres	Total
1950	3	9	4	16	1950	153,225	577,438	155,294	885,958
1960	1	7	6	14	1960	6,809	449,780	85,844	542,433
1970	1	17	1	19	1970	9,890	723,826	156	733,872
1980		12	4	16	1980		79,012	35,857	114,869
1990	1	18	12	31	1990	2,977	283,227	51,638	337,843
2000	2	22	16	40	2000	247,951	207,703	504,287	959,942
Grand Total	8	85	43	136	Grand Total	420,853	2,320,987	833,077	3,574,917



Appendix F- Fuel Model Map



Appendix G- Preparedness Plan

Appendix H- Dispatch Zone Annual Operating Plan

Appendix I- WFDSS Decision Flow Chart

Appendix J- Five Year Fuel Treatment Plan

Five Year Hazardous Fuel Treatment Plan- Koyukuk/Nowitna NWR

Year	Project Name	Unit	Treatment Type	Acres
2010	Ruby Hazardous Fuels Reduction	Unit 1	Pile Burning	5
"	" " " "	Unit 2	Pile Burning	10
"	" " " "	Unit 3	Hand Thinning	1
"	" " " "	Unit 3	Hand Piling	1
"	" " " "	Unit 4	Hand Thinning	7
"	" " " "	Unit 4	Hand Piling	7
"	" " " "	Unit 5	Hand Thinning	5
"	" " " "	Unit 5	Hand Piling	5
2011	Ruby Hazardous Fuels Reduction	Unit 3	Pile Burning	1
"	" " " "	Unit 4	Pile Burning	7
"	" " " "	Unit 5	Pile Burning	5
"	" " " "	Unit 6	Hand Thinning	9
"	" " " "	Unit 6	Hand Piling	9
"	" " " "	Unit 7	Hand Thinning	7
"	" " " "	Unit 7	Hand Piling	7
2012	Ruby Hazardous Fuels Reduction	Unit 6	Pile Burning	9
"	" " " "	Unit 7	Pile Burning	7
"	" " " "	Unit 8	Hand Thinning	5
"	" " " "	Unit 8	Hand Piling	5
2013	Ruby Hazardous Fuels Reduction	Unit 8	Pile Burning	5
"	Galena Hazardous Fuels Reduction	Unit 1	Hand Thinning	1
"	" " " "	Unit 1	Hand Piling	1
2014	Galena Hazardous Fuels Reduction	Unit 1	Pile Burning	1
"	Koyukuk Hazardous Fuels Reduction	Unit 1	Hand Thinning	5
"	" " " "	Unit 1	Hand Piling	5
2015	Koyukuk Hazardous Fuels Reduction	Unit 1	Pile Burning	5