

Fire Management Plan Review

Kanuti National Wildlife Refuge

May 2012

Review and Approvals



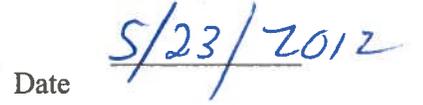
Prepared by Eastern Interior Fire Management Officer



Date



Submitted by Kanuti NWR Refuge Manager



Date

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(Highlighted Sections and associated sub-sections represent substantive changes from the original 2007 FMP.)

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1. Introduction

1.1. Purpose and Need for Action

This document is the Fire Management Plan (FMP) for the Kanuti National Wildlife Refuge (Kanuti NWR). The FMP is written to meet United States Department of the Interior (DOI) and U.S. Fish and Wildlife Service (FWS) requirements that all agency lands with burnable vegetation must be managed under an approved Fire Management Plan (620 DM 1.4).

The goal of the U.S. Fish and Wildlife Service (Service) wildland fire management program is to plan and implement actions to help accomplish the mission of the National Wildlife Refuge System. The mission of the National Wildlife Refuge System 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)

To maintain currency, fire management plans must be reviewed each year using the nationally established annual review process. Plans must be revised when significant changes occur or substantial changes in management are proposed. Minor plan revisions may be accomplished through an amendment added to the plan and signed by the line officer and servicing fire management officer. Major scheduled revisions to fire management plans will follow the 15 year Comprehensive Conservation Plan revision cycle to provide consistency in objectives and management strategy formulation. Without a current FMP, prescribed fires cannot be conducted and response to unplanned ignitions can only consider suppression strategies. Preparedness and prevention activities can continue in the absence of an approved plan. (FWS FMH 2010)

This FMP provides the planning framework for all Refuge fire management decision-making, within the context of the Revised Kanuti NWR Comprehensive Conservation Plan (CCP), approved in September 2008. It provides direction for activities including preparedness, appropriate management response, fire prevention and education, monitoring, research, and hazardous fuel reduction using prescribed fire and non-fire treatments. The goal of the FMP is to integrate these activities into a unified management strategy that protects human life and identified property values and to conserve, protect, and enhance habitats and maintain desired ecological conditions for the benefit of fish and wildlife on the Refuge.

1.2. General Description of the Kanuti NWR

1.2.1. Location and Description

The Kanuti National Wildlife Refuge (NWR) lies totally within the Service's Interior Alaska Ecosystem Unit and contains a diverse mosaic of plant communities representative of all major habitat types occurring in Interior Alaska. Much of the following information comes from and is provided in more detail in other sources such as the Refuge's Comprehensive Conservation Plan (CCP) (USFWS 1987), annual narrative reports (USFWS 1996a), and the Land Protection Plan (USFWS 2002).

The Refuge is located in central Alaska, north of the Yukon River and south of the Brooks Range. The southern boundary of the Refuge is about 130 air miles north of Fairbanks. The Arctic Circle bisects the Refuge. Three dominant physical features of the Refuge are the Kanuti

Flats, and the Koyukuk and Kanuti Rivers, which flow through the Flats. The Refuge is roughly rectangular in shape, extends 50 miles east–west and 60 miles north–south, and is larger in size than the state of Delaware.

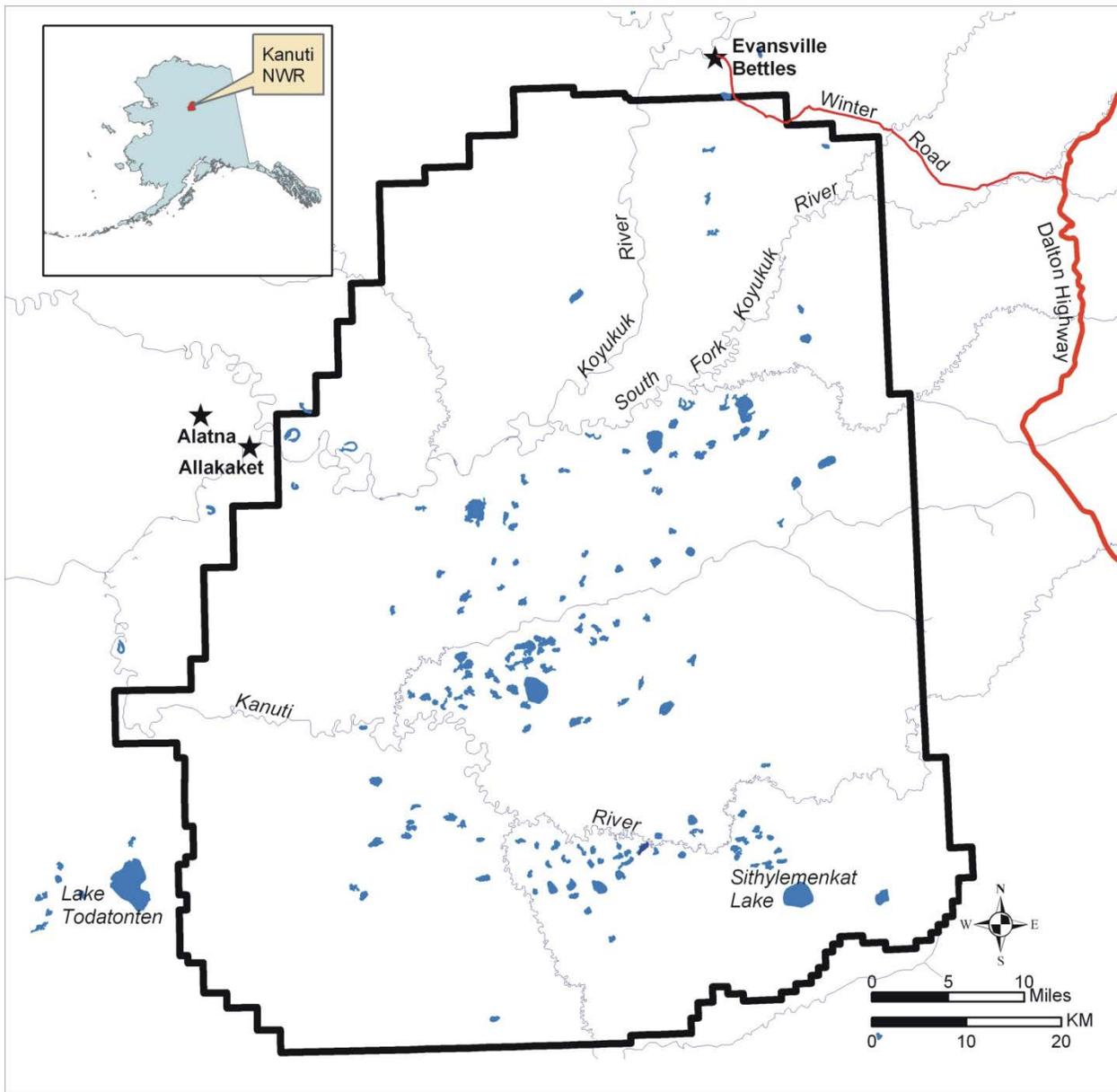


Figure 1: Kanuti NWR Overview Map

1.2.2. History and Land Status

The Kanuti area is considered to have been part of the route traveled by the ancestors of the American Indians from Asia to the Americas. The earliest human inhabitants may have arrived in the area about 12,000 years ago (Clark 1981). Historically, these peoples spent much of the year wandering the region in bands to exploit seasonal abundances of fish, wildlife, and plant materials (Nelson 1973). Native people currently living in the Kanuti area are mainly of Koyukon Athabascan descent, but also include Kobuk Eskimo people at the village of Alakata

(Clark 1996). Alatna is on the opposite side of the Koyukuk River from the Athabascan village of Allakaket (USFWS 1987). Contact between these two groups was peaceable and at times they intermingled and became culturally convergent (Clark 1996).

Lt. Henry T. Allen first explored the Koyukuk River for the U.S. Government in 1885. Before that time, almost nothing was known about the upper Koyukuk (Allen 1985). The pure subsistence lifestyle of local Natives began to change when the first steamboats ascended the Koyukuk River in 1897, bringing an influx of gold miners to the area (Wyman 1988). A local cash economy then began in the late 1800s, involving cutting wood for steamboats, hauling freight for the miners, and building boats (Tobuk 1980).

All the gold mining camps were abandoned by 1906 on lands which later became the Kanuti Refuge. Mining continued sporadically near Wiseman and Coldfoot, located on the Middle Fork of the Koyukuk, north of the Refuge.

All of these historic sites deserve further protection and management. Two other related historic mining sites of the late nineteenth and early twentieth centuries, known as Bergman and Arctic City, have also been abandoned. These sites were found on the Koyukuk River a few miles south of the present villages of Allakaket and Alatna, which are located just northwest of the current Refuge boundaries (Alaska Geographic 1983). Old boiler parts, flywheels and dredge buckets are the only obvious features remaining at several of these camps.

The economy of the upper Koyukuk area developed somewhat later by other occasional wage employment in supply industries and most recently, in firefighting (Nelson 1973, 1983; Hosley 1981; McClellan 1981). Despite these changes, in the 1940s, subsistence hunting and fishing was still providing all or a major part of the food to 70% of the people in the area (Marcotte and Haynes 1985).

Allakaket, the principal village in the vicinity, lies just to the northwest of the Refuge. The village was established in 1906 as an Episcopal mission. Schools and medical facilities led to the establishment of a permanent town at the site and at Alatna, across the river. Allakaket is largely inhabited by people of Athabascan heritage while people in Alatna are largely Kobuk Inupiaq. The two other villages adjacent to the Refuge at present, Bettles and Evansville, by comparison, are located on the Koyukuk River just north of the Refuge boundary. "Old" Bettles had also originally developed as a gold mining town near the head of navigation on the Koyukuk, but continued as a supply center until an airfield was built at Bettles Field, 5 miles away, during the 1940s (Alaska Geographic 1983). Bettles is the name often used today in reference to the area including Evansville and Bettles Field.

As of 2002, there are 1.2 million acres under actual federal management, of 1.6 million acres within the Refuge administrative boundary (USFWS 2002). The Refuge is surrounded by state selected and conveyed lands to the north and south; and private selected lands to the southeast and northeast. The Dalton Highway and the trans-Alaska pipeline corridor extend north-south a few miles east of the Refuge boundary. Within the Refuge there are approximately 346,000 acres of land selected or conveyed to Native corporations and 13,400 acres of Private Parcels. Corporation selections range in size from small lots to entire townships. Native allotments are considered trust lands and may be up to 160 acres. There are 37 private parcels scattered throughout the Refuge. The land status of private parcels may be selected, interim conveyed, or conveyed. Selected and interim conveyed lands remain under the management of the FWS.

The entire Kanuti area is sparsely populated. No all-season roads pass through the Refuge. The Village of Bettles, north of the Refuge, is accessible by a winter road from the Dalton Highway, which borders the northeast corner of the Refuge (Fig. 1). Travel in and around the Refuge is by air throughout the year, mainly by boat in summer, and by snow machine and dogsled in winter. Four villages (Allakaket, Alatna, Bettles, and Evansville) are adjacent to the Refuge boundaries. The total population of these four villages is currently 291 people (Alaska Interagency Communities at Risk Assessment 2001). There are no commercial or community developments within the Refuge. Archaeological and historic sites are found throughout the Refuge.

1.3. Significant Values to Protect

Human life is the single, overriding value to be protected by actions authorized under this plan. Priorities for the protection of human communities and community infrastructure, other property and improvements, and natural and cultural resources will be incident specific, and will be based on the values at risk, human health and safety, and the costs of protection.

“Conservation of fish and wildlife populations and habitats in their natural diversity including, but not limited to white-fronted geese and other waterfowl and migratory birds, moose, caribou (including participation in coordinated ecological studies and management of the Western Arctic caribou herds) and furbearers” is one of the primary purposes for which the Kanuti National Wildlife Refuge was established. Thus, habitat diversity and species productivity within the Refuge and throughout the Upper Yukon Basin are the core natural resource values that the Refuge fire management program is designed to protect. These values are largely dependent on the continued existence of a relatively natural fire regime.

Another purpose of the Refuge is to provide subsistence opportunities for local residents. Wildland fire may have both positive and negative short or long term effects on subsistence resources and infrastructure. Although periodic fire often increases habitat diversity and encourages productivity of some species leading to increased subsistence opportunities, large fires may temporarily decrease productivity in certain areas. The effects of fires on established trails and camps must also be considered.

Other values to protect include property and infrastructure in the communities of Allakaket, Alatna, and Bettles. Protection of public and private property including private and public telecommunications sites, Refuge administrative cabins, ANSCA trust lands, and identified historic and cultural resources will also be considered in Refuge fire management decisions.

The preservation of water quality and quantity is another identified Refuge purpose taken into consideration by this fire management plan. Water quality issues relating to fire are unlikely on the Kanuti NWR, but may be addressed through Emergency Stabilization (ES) and Burned Area Rehabilitation (BAR). See Sections 4.1.5 and 4.1.6.

Air quality is another important resource that will be considered in Refuge fire management decisions. Public health, safety, and economic well-being can all be impacted by smoke from wildland fires. Although smoke is a natural component of the local environment, and cannot be eliminated, the Refuge fire management program will seek to mitigate its negative effects through education and outreach.

Special values to be protected include:

- **Hulgothen Bluffs.** The Hulgothen Bluffs on Fish Creek in the northeast corner of the Refuge are a rich repository of Pleistocene fossils and also may be an important archeological site.
- **Kanuti Canyon.** The canyon is tremendously scenic, with 400' cliffs, unusual arid plant communities, and unique nesting habitat for birds of prey.
- **Sithyemenkat Lake.** The area surrounding the lake has rocky outcrops, sandy beaches, nesting habitat for birds of prey, and high scenic values.
- **Subsistence activities.** The Refuge is an important area for trappers, hunters, fisherman and other subsistence users.
- **Cultural Resources.** Pre-Athabaskan and Athabaskan sites and remnants of five turn of the last century mining camps are located on Refuge lands.
- **Old Growth Spruce/Lichen Habitat.** 73,000 acres of old growth habitat remains in the central portion of the Refuge and provides forage for caribou and other species.

See **Section 3.1.3** for more detail.

1.4. Effects of Climate on Biotic Composition

It is widely accepted by the scientific community that the earth, which has always experienced climate variation, is now undergoing a period of rapid climate change that is enhanced by anthropogenic atmospheric carbon enrichment during the past 100 years (Inkley et al. 2004). Historical trends and projections of declining snow cover during this century portend changes in boreal and alpine ecosystems. If air temperatures increase at projected rates, alpine snow cover will likely recede (IPCC 1996). Even small amounts of warming may eliminate some wetland plant and animal species in alpine regions (Burkett and Kusler 2000). Interactions and changes in forest dynamics due to disease and insects are also very likely in areas where warming is greater (Inkley et al. 2004).

Such climate change has the potential to affect fish, wildlife, and plants throughout North America—either directly or indirectly through responses to changing habitat conditions. The geographic ranges of North American flora and fauna are expected to shift upwards in elevation and northward over the next 100 years (IPCC 2002). Although the response will be diverse, such shifts could cause significant restructuring of existing plant and animal communities (Inkley et al. 2004).

Climate change in boreal and arctic Alaska is well documented (Arctic Climate Impact Assessment 2005, IPCC 2007, Hinzman et al. 2005). Mean annual air temperature in interior Alaska has increased by 1.3° C in the last 50 years and is expected to increase another 3 – 7° C by the end of the 21st century (Chapin et al. 2010). The snow-free period has increased, up to 10 days in some areas, largely due to earlier spring snowmelt (Hinzman et al. 2005, Euskirchen et al. 2006). These changes will have numerous effects on vegetation, hydrology, insect occurrence, and wildlife that could fundamentally change boreal forest and tundra ecosystems. Effects include:

- Melting permafrost;
- Melting sea ice, which has implications for marine mammals and regional weather patterns (Hu et al. 2010);

- Drying wetlands (Riordan et al. 2006);
- Changing fire regimes (Kasischke et al. 2010), including changes in the initiation and end of fire season, and changes in the frequency and severity of fires;
- Shifts in distribution of plants and animals (Murphy et al. 2010, Beck et al. 2011);
- Increased likelihood for invasive plant establishment (Villano 2008), and
- Increased possibility of wildlife disease and insect outbreaks.

Research and modeling efforts provide insight on potential future conditions, but specific agency guidance on addressing these changes is limited. The Service has developed a strategic plan for responding to climate change that includes three broad approaches: adaptation, mitigation, and engagement (USFWS 2010). The core of the Service's response will be adaptation, defined as planned, science-based management actions, including regulatory and policy changes, taken to help reduce the impacts of climate change on fish, wildlife, and their habitats.

Kanuti NWR's mandate to conserve fish and wildlife populations and habitats in their natural diversity presents a challenge for fire managers who must consider this and other legal mandates, as well as safety obligations in the face of changing climate and fire regimes.

A number of questions about the Service's response to these changes have yet to be answered:

- At what scale should diversity be addressed in management plans- the Refuge or beyond?
- Should naturally occurring fires be suppressed to maintain natural diversity if old-growth or sensitive habitats become rare due to fire or other stressors?
- The primary goal for mitigation in the Service's strategic plan is to sequester carbon. How will sequestration objectives be applied in Alaska, where numerous species depend on fire and where many naturally occurring, landscape-scale fires are currently allowed to burn if they do not threaten life or property?

In the absence of specific guidelines, Refuge fire management decisions will be based on guidance provided in Refuge Comprehensive Conservation Plan and associated step-down plans, ANILCA, the Alaska Interagency Fire Management Plan, and evolving scientific data about the effects of climate change. Activities will be coordinated with Landscape Conservation Cooperatives and the regional Inventory and Monitoring Program when appropriate. Continued monitoring of fire effects and participation in research efforts will better inform management decisions in the face of climate change.

2. Policy, Land Management Planning and Partnerships

2.1. Fire Policy

See **Appendix I** for complete citations of policy documents.

2.1.1. Federal Interagency Wildland Fire Policy

Fire, as a critical natural process, will be integrated into land and resource management plans and activities on a landscape scale, and across agency boundaries. Response to wildland fires is based on ecological, social and legal consequences of the fire. The circumstances under which a fire occurs, and the likely consequences on firefighter and public safety and welfare, natural and cultural resources, and values to be protected, dictate the appropriate response to the fire.

This FMP implements the guiding principles of federal wildland fire policy excerpted from the *Review and Update of the 1995 Federal Wildland Fire Management Policy (January 2001)*:

- 1) Firefighter and public safety is the first priority in every fire management activity.
- 2) The role of wildland fire as an essential ecological process and natural change agent 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.
- 3) Fire management plans, programs, and activities support land and resource management plans and their implementation.
- 4) Sound risk management is a foundation for all fire management activities. Risks and uncertainties relating to fire management activities must be understood, analyzed, communicated, and managed as they relate to the cost of an activity.
- 5) Fire management programs and activities are economically viable, based upon values to be protected, costs, and land and resource management objectives,
- 6) Fire management plans and activities are based upon the best available science.
- 7) Fire management plans and activities incorporate public health and environmental quality considerations.
- 8) Federal, State, tribal, local, interagency, and international coordination and cooperation are essential.
- 9) Standardization of policies and procedures among federal agencies is an ongoing objective.

In addition, the following guidelines from *Guidance for Implementation of Federal Wildland Fire Management Policy (February 2009)* are considered in order to provide consistent implementation of federal wildland fire policy:

- 1) Wildland fire management agencies will use common standards for all aspects of their fire management programs to facilitate effective collaboration among cooperating agencies.

- 2) Agencies and bureaus will review, update, and develop agreements that clarify the jurisdictional inter-relationships and define the roles and responsibilities among local, State, tribal and federal fire protection entities.
- 3) Responses to wildland fire will be coordinated across levels of government regardless of the jurisdiction at the ignition source.
- 4) Fire management planning will be intergovernmental in scope and developed on a landscape scale.
- 5) Wildland fire is a general term describing any non-structure fire that occurs in the wildland. Wildland fires are categorized into two distinct types:
 - a) Wildfires – Unplanned ignitions or prescribed fires that are declared wildfires
 - b) Prescribed Fires - Planned ignitions.
- 6) A wildfire may be concurrently managed for one or more objectives and objectives can change as the fire spreads across the landscape. Objectives are affected by changes in fuels, weather, topography; varying social understanding and tolerance; and involvement of other governmental jurisdictions having different missions and objectives.
- 7) Management response to a wildfire on federal land is based on objectives established in the applicable Land/Resource Management Plan and/or the Fire Management Plan.
- 8) Initial action on human-caused wildfire's will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety.
- 9) Managers will use a decision support process to guide and document wildfire management decisions. The process will provide situational assessment, analyze hazards and risk, define implementation actions, and document decisions and rationale for those decisions.

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 mission objectives. Accomplishing fire operations objectives safely and efficiently will not be sacrificed for the sole purpose of “cost-saving.” Care will be taken to ensure that expenditures are commensurate with values to be protected, while understanding that other factors may influence spending decisions, including those from the social, political, economic, and biophysical environments. (2012 *Interagency Standards for Fire and Fire Aviation Operations, Chapter 1*).

2.1.2. National Fire Plan

This FMP emphasizes the following overarching goals and performance measures described in A *National Cohesive Wildland Fire Management Strategy (2011)*

Restore and Maintain Landscapes:

GOAL: *Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.*

Outcome-based Performance Measure:

- Risk to landscapes is diminished.

Fire Adapted Communities:

GOAL: *Human populations and infrastructure can withstand a wildfire without loss of life and property.*

Outcome-based Performance Measure:

- Risk of wildfire impacts to communities is diminished.
- Individuals and communities accept and act upon their responsibility to prepare their properties for wildfire.
- Jurisdictions assess level of risk and establish roles and responsibilities for mitigating both the threat and the consequences of wildfire.
- Effectiveness of mitigation activities is monitored, collected and shared.

Wildfire Response:

GOAL: *All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.*

Outcome-based Performance Measure:

- Injuries and loss of life to the public and firefighters are diminished.
- Response to shared-jurisdiction wildfire is efficient and effective.
- Pre-fire multi-jurisdictional planning occurs.

2.1.3. Department of the Interior (DOI) Fire Policy

This FMP meets DOI policy in the *Departmental Manual (620 DM 1 and 620 DM 2)* by making full use of wildland fire as a natural process and as a tool in the 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 Departmental programs. (620 DM 1.6 B)
- 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 situations and establishing priorities, and for implementing appropriate management responses to these situations. (620 DM 1.6 E)
- Bureaus will enforce rules and regulations concerning the unauthorized ignition of wild land fires, and aggressively pursue violations. (620 DM 1.7) Wild land fire will be used to protect, maintain, and enhance natural and cultural resources and, as nearly as possible, be allowed to function in its natural ecological role (620 DM 1.4.D).

Additionally, this FMP implements the policy outlined in 620 DM 2.4 that sets out the lead fire protection role of the *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.”

2.1.4. U.S. Fish and Wildlife Service Fire Policy

The goal of fire management as stated in the Service Manual (621 FW 1.2) is "to protect or enhance habitat and ecosystems for the benefit of fish and wildlife." Service policy (621 FW 1.3) states that the Service will use prescribed fire whenever it is an appropriate tool for managing Service resources, and will protect against wildland fire whenever it threatens human health, private property, or Service resources.

Any response to wildland fire occurring on Kanuti NWR will be based on direction provided in this FMP. The FMP addresses the management of all fire related activities, and considers a full spectrum of strategic options (from monitoring to intensive management actions) designed to meet Fire Management Unit (FMU) objectives. It fully applies procedures and guidelines in the FWS *Fire Management Handbook (FWS FMH 2011)* and the *Interagency Standards for Fire and Fire Aviation Operations (2011 Red Book)* and affirms these key elements of FWS fire policy:

- 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; 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 may be employed when they are selected as 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.
- Response to Wildfires 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 human ignition of wildfires on service lands.

2.1.4.1. Region 7 FWS Policy

All activities authorized under this FMP will comply with Region 7 FWS policies, including but not limited to:

- *Region 7 Policy for Management of Permitted Cabins on National Wildlife Refuges in Alaska (August 2010) (RW-1)*
- *U.S. Fish and Wildlife Service Region 7 Bear Awareness and Firearms Safety Training Policy (February 22, 2008)*
- *U.S. Fish and Wildlife Service Region 7 Watercraft Safety and Training Annex (January 12, 2011)*

2.1.5. Alaska Region Interagency Fire Management

Background on Fire Management Policy in Alaska Region (1939-2010):

The history of fire control within Interior Alaska dates back to 1939 when the Alaskan Fire Control Service was established under the General Land Office. Headquartered in Anchorage, it was given responsibility for fire suppression on an estimated 225 million fire-prone acres of public domain lands in Alaska. When the Bureau of Land Management (BLM) was formed in

1946, it received the management authority for most of Alaska's federal lands and also absorbed the Alaska Fire Control Service. The BLM fire organization was based in Fairbanks and Anchorage and the two offices worked cooperatively but separately. The BLM also kept a Division of Fire Management at the State Office.

In 1959, the first of three big divestures of land managed by BLM-Alaska began and, with the changes in land management authority, issues regarding wildland fire suppression responsibilities arose.

- Under the Statehood Act 1959, the State was granted 104 million acres of land.
- Alaska Native Claims Settlement Act of 1971 (ANCSA) established Native corporations and an entitlement of 44 million acres for those corporations.
- The Alaska National Interest Lands Conservation Act of 1980 (ANILCA) transferred approximately 100 million acres from BLM administration to the National Park Service and Fish and Wildlife Service.

Under ANCSA, the federal government was directed to continue to provide wildland fire suppression on lands conveyed to Native regional and village corporations. In response to ANILCA, Secretarial Order #3077, dated March 17, 1982, creating "a fire line organization with headquarters in Fairbanks" was issued. BLM, Alaska Fire Service (AFS) was formed and, in Department of Interior Manual 620, AFS was assigned the fire suppression responsibility for all Department of Interior-administered lands in Alaska and Native Corporation land conveyed under ANCSA. Department of Interior-administered lands include land managed by the BLM, the National Park Service, Fish and Wildlife Service, and the Bureau of Indian Affairs. Each agency remained accountable for following its agency's mandates and policies for resource and wildland fire management. The role of AFS is to implement each agency's direction.

BLM Anchorage and Fairbanks districts fire suppression authority was delegated to AFS. The Division of Fire Management in the State Office was phased out. Today, in conjunction with his interagency role, the AFS Manager works directly for the BLM State Director and serves as the BLM State Fire Management Officer. The BLM Field Offices¹ retain the fire management responsibilities; AFS implements the fire direction given by the Field Offices and provides technical fire management expertise. This same principal applies to FWS and NPS lands. The State of Alaska established a wildland fire suppression organization in the Department of Natural Resources, Division of Forestry, and, in the mid-1970s, began to gradually assume suppression responsibilities in the Anchorage area and on the Kenai Peninsula.

A reciprocal fire protection agreement was signed by the BLM, AFS and the State to cooperatively provide fire suppression operations in fire-prone areas. (AFS also has an agreement with the U.S. Army-Alaska for wildland fire suppression on BLM-managed lands withdrawn for military use.) Under the State agreement, AFS has the suppression responsibility for wildland fires in the northern half of the Alaska, regardless of ownership, including the Kanuti NWR. The State has the suppression responsibility for wildland fires in Southcentral, most of Southwestern Alaska and portions of the Central Interior. Most State protection areas are lands previously protected by the BLM Anchorage District; most of AFS protection is in

¹ BLM Districts are now called Field Offices.

areas once protected by the BLM Fairbanks District. As of 1985 when the State took over protection responsibilities for 66 million acres in southwest Alaska, the State and AFS each protect roughly half of the fire-prone lands in Alaska. The Forest Service protects State, Federal, and Native lands within the boundaries of Chugach and Tongass National Forests.

An Interagency fire response plan, the **Alaska Interagency Wildland Fire Management Plan 2010 (AIWFMP)**, was developed in Alaska during the 1980s and 1990s in order to help prioritize initial attack responses, and allow for some fires to be managed for resource benefit.

In 2010 the reciprocal fire protection agreements between the protection agencies (DNR, BLM AFS and USFS) and the individual memorandum of agreement between land management agencies (FWS, NPS, BIA) were consolidated into the **Alaska Master Cooperative Wildland Fire Management and Stafford Act Response Agreement 2010 (Master Agreement)**. The Master Agreement and its exhibits (including the AIWFMP) define the roles and responsibilities of the jurisdictional and protection agencies as well as operating procedures for fire management in Alaska.

2.2. Land/Resource Management Planning

2.2.1. Kanuti NWR Comprehensive Conservation Plan (CCP)

This FMP steps down from the Revised Kanuti NWR Comprehensive Conservation Plan (2008). The land and resource management goals and objectives that form the basis of this FMP have been identified in the CCP (**See Section 3.1.1.1**). The 2007 FMP was developed in conjunction with the 2008 CCP Revision and incorporates guidance from that document.

2.2.2. Compliance with Regulatory Acts

The management direction and actions specified in this FMP were evaluated in the Revised Refuge CCP and Environmental Assessment (EA) (2008), in accordance with National Environmental Policy Act of 1969 (NEPA), and Sections 304 and 810 of ANILCA. Public participation in the CCP process was used in the development of alternatives and in the selection of a preferred management alternative.

Prescribed fires and fuel reduction activities authorized under this FMP require completion of an initial NEPA Compliance Checklist in order to determine whether additional NEPA documentation is necessary. Fire suppression activities are normally categorically excluded from further Environmental Assessment analysis (516 DM 2 and 16 DM 6); however, before implementing any fire management project not categorically excluded, an EA or EIS will be prepared. Fire management activities authorized within the scope of this plan will also comply with all of the following Regulatory Acts:

- *Endangered Species Act of 1973 (ESA)*
- *National Historic Preservation Act of 1966 (NHPA)*
- *Archeological Resources Protection Act of 1979 (ARPA)*
- *Alaska National Interest Lands Conservation Act of 1980 (ANILCA)*
- *Alaska Native Claims Settlement Act of 1971 (ANCSA) [43 USC 1620(e)]*
- *Director's Order 172: Migratory Birds*

- *Subsistence Evaluation and Finding, Section 810 - Alaska Lands Act*

2.3. Fire Management Partnerships

2.3.1. Internal Partnerships

This plan has been developed with input from the Kanuti NWR Biological program as well as from the Fairbanks-based Subsistence program, as well as from other Alaska Refuges. It has been reviewed by the USFWS Region 7 Fire Management Program. The Endangered Species Act Section 7 Interagency cooperation 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 activities associated with prescribed fires or planned treatments.

2.3.2. External Partnerships

2.3.2.1. Alaska Interagency Coordinating Groups

2.3.2.1.1 *Alaska Interagency Coordination Center (AICC)*

National fire resource coordination is accomplished through the National Interagency Coordination Center (NICC) located in Boise, ID and through eleven Geographic Area Coordination Centers (GACCs) located throughout the country. AICC is Alaska's GACC, located on Fort Wainwright in Fairbanks. The principal mission of AICC is to provide safe, cost effective, and timely response of national and area resources for all aspects of wildland and prescribed fire management activities, and other emergency management activities within Alaska.

2.3.2.1.2 *Alaska Wildland Fire Coordinating Group (AWFCG)*

The Alaska Wildland Fire Coordinating Group (AWFCG) group provides coordination and recommendations for all interagency fire management activities in Alaska. Membership, procedures, and guidelines are documented in the AWFCG Memorandum of Understanding and Standard Operating Procedures available at <http://fire.ak.blm.gov/administration/awfcg.php>. The Region 7 Fire Management Coordinator represents the Service on this group.

2.3.2.1.3 *Alaska Multi Agency Coordinating Group (AMAC)*

The Alaska Multi-Agency Coordination Group (AMAC) provides a forum to discuss actions to be taken to ensure that an adequate number of resources are available to meet anticipated needs and to allocate those resources most efficiently. When activated and as warranted, the AMAC is tasked with the following: incident prioritization; resource allocation; coordination of state and federal disaster responses; political interfaces; media and agency information; anticipation of future resource needs; and the identification and resolution of issues. The *AMAC Operations Handbook* is available at <http://fire.ak.blm.gov/administration/mac.php>. The Region 7 Fire Management Coordinator represents the Service on this group.

2.3.2.2. Interagency Agreements and Planning Documents

2.3.2.2.1 Alaska Master Cooperative Wildland Fire Management and Stafford Act Response Agreement 2010 (Master Agreement)

The Master Agreement and its exhibits define the roles and responsibilities of the jurisdictional and protection agencies as well as operating procedures for fire management in Alaska. It documents the commitment of its signatories to improve the efficiency of fire management activities in Alaska by facilitating the coordination and exchange of personnel, equipment, supplies, services, and funds. The Master Agreement also facilitates improved coordination regarding other incidents covered under the National Response Framework (NRF).

Signatories include:

- The State of Alaska, Department of Natural Resources (DNR)
- The United States Department of Agriculture Forest Service, Region 10 (USFS)
- The United States Department of the Interior, National Park Service, Alaska Region (NPS)
- The United States Department of the Interior, Fish and Wildlife Service, Alaska Region (Region 7) (FWS)
- The United States Department of the Interior, Bureau of Indian Affairs, Alaska Regional Office (BIA)
- The United States Department of the Interior, Bureau of Land Management, Alaska (BLM)
- The United States Department of the Interior, Bureau of Land Management, Alaska Fire Service (AFS)

2.3.2.2.2 Alaska Statewide Annual Operating Plan (Alaska AOP)

The *Alaska AOP*, exhibit C of the Master Cooperative Agreement addresses cooperation, interagency working relationships and protocols, financial arrangements, and joint activities. The *Alaska Interagency Mobilization Guide* and the *Alaska Interagency Wildland Fire Management Plan* are incorporated by reference into the *Alaska AOP*. Signatories to the *Alaska AOP* include: State Forester, AFS Manager, USFS Regional Forester, FWS, NPS, BLM and BIA Regional Director.

2.3.2.2.3 Alaska Interagency Wildland Fire Management Plan 2010 (AIWFMP)

The purpose of the *Alaska Interagency Wildland Fire Management Plan 2010 (AIWFMP)* is to promote a cooperative, consistent, cost-effective, interagency approach to wildland fire management in Alaska and it is the interagency reference for wildland fire operational information. It has been incorporated by reference into the *Alaska AOP*

The AIWFMP specifies direction for the response to a wildland fire that is based on a management option designation, and provides guidelines to jurisdictional and protection agencies for decision support requirements as the complexity of a wildland fire increases. The

AIWFMP is designed to be used in conjunction with this FMP which contains definitive objectives and constraints for the Kanuti National Wildlife Refuge.

The following *AIWFMP* fire management objectives were developed to meet and support agencies' goals and to provide implementation guidance for fire operations:

- Protect human life.
- Prioritize areas for protection actions and allocation of available firefighting resources without compromising firefighter safety.
- Use a full range of fire management activities (fire suppression, monitoring, prescribed fire, thinning and other vegetation treatment projects, prevention and education programs, scientific studies, etc.) to achieve ecosystem sustainability including its interrelated ecological, economic, and social components.
- Use wildland fire to protect, maintain, and enhance natural and cultural resources and, as nearly as possible, enable fire to function in its ecological role and maintain the natural fire regime.
- Manage vegetation through various fuels treatment techniques to reduce and mitigate risks of damage from wildland fire.
- Balance the cost of suppression actions against the value of the resource warranting protection and consider firefighter and public safety, benefits, and resource objectives.
- Consider short and long-term cost effectiveness and efficiencies while maintaining responsiveness to Jurisdictional agency objectives and within the scope of existing legal mandates, policies and regulations.
- Minimize adverse environmental impact of fire suppression activities.
- Maintain each Jurisdictional agency's responsibility and authority for the selection and annual review of fire management options for the lands that they administer.
- Adhere to state and federal laws and regulations.

The *AIWFMP* provides for a range of suppression responses to wildfire that protects human life and property and other identified resources and developments, balances suppression costs with values at risk and is in agreement with Refuge resource management objectives. The result is that developed areas and other high resource value areas are protected and the natural occurrence of fire in the ecosystem is maintained in remote areas with minimal and cost-effective intervention. Currently many special concern areas (such as archaeological/cultural/historic sites and administrative sites/cabins) have been identified and taken care of through the process of changing the fire management option to one that provides the level of suppression needed to protect the resource(s) at risk. As new areas become known, they will be assigned a protection level and their locations provided to AFS.

Four wildland fire management options are established in the *AIWFMP*.

- ***Critical*** is the highest priority area/sites for suppression actions and assignment of available firefighting resources.

- **Full** is the second highest priority area/sites for suppression actions and assignment of available firefighting resources.
- **Modified** is a high priority for surveillance, suppression, and site protection during the peak of the fire season and less priority (often surveillance only) 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 suppression response may be initiated.

The **Critical management option** was specifically 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. These areas are the priority for detection coverage. The initial response to wildland fire is to provide protection to the area/sites. Use of wildland fire would only be appropriate in extraordinary circumstances.

The **Full management option** was established for the protection of cultural and paleontological sites, developed recreational facilities, physical developments, administrative sites and cabins, uninhabited structures, high-value natural resources, and other high-value areas that do not involve the protection of human life and inhabited property. Structures on or eligible for inclusion on the National Register of Historic Places and non-structural sites on the National Register are placed in this category. Fires occurring within or immediately threatening this designation will be high priority for initial action depending on the availability of firefighting resources but are less priority than wildland fires within or threatening a Critical Management Option area. The intent is to control wildland fires at the smallest acreage reasonably possible.

The **Modified management option** is intended to be the most adaptable option available to land managers. This option provides a higher level of protection when fire danger and probability of significant fire growth are high. A lower level of protection is considered when the fire danger and potential for fire growth decrease. 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 around July 10), the default action for all fires occurring within this option will be surveillance and assessment to ensure that identified values are protected and that adjacent higher priority management areas are not compromised.

In the **Limited management option** fire may be allowed to function in its ecological role while providing for the protection of human life and site-specific values. Most natural ignitions will be managed for 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.

The AIWFMP allows the land manager to authorize the Protecting Agency to provide an increased or decreased level of suppression action depending on the situation at hand (non-standard response). Additionally, the selected fire management option area should be re-evaluated during the next annual review period. The AWFCG may approve departures from the selected management options during periods of "unusual fire conditions" for a specific

geographic area(s). These decisions will be based not only on fires and acres burning, but also on anticipated fire behavior and acreage likely to be burned, existing and anticipated smoke problems, probability of success, the experience and judgment of Service and Protecting Agency personnel, and decisions of the Multi-agency Coordinating Group (MAC Group).

Signatories include:

- The State of Alaska, Department of Natural Resources (AKDNR)
- The State of Alaska, Department of Environmental Conservation (ADEC)
- The State of Alaska, Department of Fish and Game (ADF&G)
- The United States Department of the Interior, National Park Service, Alaska Region (NPS)
- The United States Department of the Interior, Fish and Wildlife Service, Alaska Region (Region 7) (FWS)
- The United States Department of the Interior, Bureau of Indian Affairs, Alaska Regional Office (BIA)
- The United States Department of the Interior, Bureau of Land Management, Alaska (BLM)
- The United States Department of Agriculture Forest Service, Region 10 (USFS)
- The Association of Village Council Presidents
- Tanana Chiefs Conference, Inc. (TCC)
- Chugachmiut, Inc.
- Anchorage Fire Department

2.3.2.2.4 Alaska Interagency Mobilization Guide (AIMG)

The *Alaska Interagency Mobilization Guide (AIMG)* identifies policy and agreements that establish the standard procedures that guide the operations of multi-agency/jurisdictional logistical support activities. The guide is an extension of Agency Manuals, Handbooks, Directives, and Instructional Memorandums relating to logistical support. The guide is intended to promote uniformity of logistical support communications, facilitate interagency dispatch coordination, and ensure that the most timely and cost effective support services are provided. It is designed to accommodate amendments and will be recognized as currently applicable until amended.

2.3.2.2.5 2009 Alaska Enhanced Smoke Management Plan (ESMP)

The *Alaska Enhanced Smoke Management Plan (ESMP)* developed by the Alaska Department of Environmental Conservation (ADEC) in coordination AWFCG helps fulfill Alaska's responsibilities for protection of air quality and human health under federal and state law and reflects the *Clean Air Act* requirement to improve regional haze in Alaska's Class I areas. Under state regulation all agencies, corporations and individuals that burn areas larger than forty acres of land a year, whether slash or *in situ*, require a controlled burn approval application and written

approval from ADEC. The *ESMP* outlines the process and identifies issues that need to be addressed by ADEC and land management agencies or private landowners / corporations to help ensure that prescribed fire (e.g. controlled burn) activities minimize smoke and air quality problems. Adoption of this document enables the State to certify to the U.S. Environmental Protection Agency (EPA) that we are implementing a smoke management plan which addresses elements of the EPA's *Interim Air Quality Policy on Wildland and Prescribed Fire, April 23, 1998 (EPA's Interim Policy)*. The *ESMP* and accompanying volume of appendices have been adopted by ADEC and participating Wildland owners and managers through a Memorandum of Understanding (MOU).

2.3.2.3. Other Partners

The FMP was prepared in cooperation with Refuge neighbors and interested parties. Personal contact and correspondence, mail-outs, radio announcements and e-mail were among the methods used to contact interested parties. Village elders and two village councils (Allakaket, Bettles/Evansville) contributed to the development of the plan. The Alaska Department of Fish and Game, Bureau of Land Management Alaska Fire Service (AFS), Tanana Chiefs Conference, Bureau of Indian Affairs (BIA) and Doyon Limited provided information and exchange of ideas in the formulation of the FMP. The plan was also developed in association with Fish and Wildlife Service (Service) biologists, managers, and fire management officers.

Local residents, the Regional Native Corporation, and BIA were all concerned about private parcel protection. Repeated visits were made to two local villages (Allakaket and Bettles/Evansville) and the information gathered was used in writing this plan. In 2006 the two village councils expressed concern about landscape-scale prescribed burning for resource purposes in areas close to their villages (given recent active local wildland fire history), but strongly supported hazard fuels reduction burns as part of village WUI projects. The Allakaket Village Council expressed concern about a "diminished sense of well-being" after a large portion of the Refuge was converted from forest to open burn scar during the extreme fire years of 2004 and 2005. Specific concerns included the lack of shelter while travelling by snowmachine through burned areas, or by boat along burned river corridors; and the loss of timber values – mainly cabin logs.

Kanuti Refuge staff were concerned about:

- Maintaining fire's natural role on the Refuge, considering that 70% of the Refuge had burned since 1950.
- How to fund the monitoring of past and future fire.
- Protecting critical wildlife habitat, such as the remaining unburned lowland lichen range for wintering caribou.

The Regional Archeologist expressed concern identifying and protecting prehistoric, historic, and cultural sites.

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3. Kanuti Refuge Fire Management Unit Characteristics

There are five Fire Management Units on Kanuti Refuge. The FMUs have been defined by fire management objectives and correspond with the suppression options in the Alaska Interagency Wildland Fire Plan. Increasing levels of fire protection extend across the Refuge from southeast to northwest, as the areas of human habitation are approached (**Figure 2**). Wildland Fire Use is a fire management option in all FMU's.

Between 1997 and 1998, the USFWS, AFS, and native organizations came to a consensus to: 1) modify the Fire Management Units in the south and east of the Refuge to the Limited Management Option; 2) apply the Modified Management Option to the central area of the Refuge; 3) use the Full Management Option as the northern and western borders are approached, and 4) place the Critical Management Option around the four villages. This pattern of management options reflects the pattern of human habitations, which are the primary values at risk (**Figure 2**).

Fire management Unit	CCP management designation	Wildland fire management option**	Wildland fire management objectives
Kanuti Limited	Minimal	Limited	<ol style="list-style-type: none"> 1. Allow fire to burn under the influence of natural forces within predetermined area to maintain fires ecological role in the ecosystem. 2. Protect human life and site specific property within the unit 3. Prevent fire from burning into Full or Critical management option areas. 4. Reduce overall suppression costs through minimum resource commitment.
Kanuti Modified	Moderate	Modified	<ol style="list-style-type: none"> 1. Protect human life and site-specific values. 2. Minimize acres burned in old growth lichen area. 3. Protect identified resources and prevent the fire from burning into Full or Critical management option areas. 4. Reduce overall suppression costs through minimum resource commitment. 5. Use prescribed fire and mechanical treatments to reduce hazardous fuels around specified sites. 6. Implement limited suppression options after yearly conversion date.
Bettles Interface	Minimal	Full and Critical	<ol style="list-style-type: none"> 1. Protect human life, property, designated sites, and designated natural resources. 2. Minimize acreage burned during initial attack. 3. Use prescribed fire and mechanical treatments to reduce hazardous fuels around specified sites
Allakaket Interface	Moderate	Full and Critical	
Sithylenkat Lake	Private	Full	

Table 1: Kanuti NWR Fire Management Units

The Modified Management Unit was expanded to the southeast in 2006 in order to protect remaining lowland lichen habitat for wintering caribou (**Figure 2**). This change to an increased level of suppression option was initiated by Kanuti Refuge staff and was supported by AFS. The extensive 2004 and 2005 fires (Clawanmenka and Old Dummy Fires) had burned much of this slowly regenerating lowland caribou habitat (**Figure 11**). Fire management units are validated annually to ensure resource objectives are being met. The FMUs boundaries were placed to take advantage of natural barriers and landmarks on the ground rather than administrative boundaries.

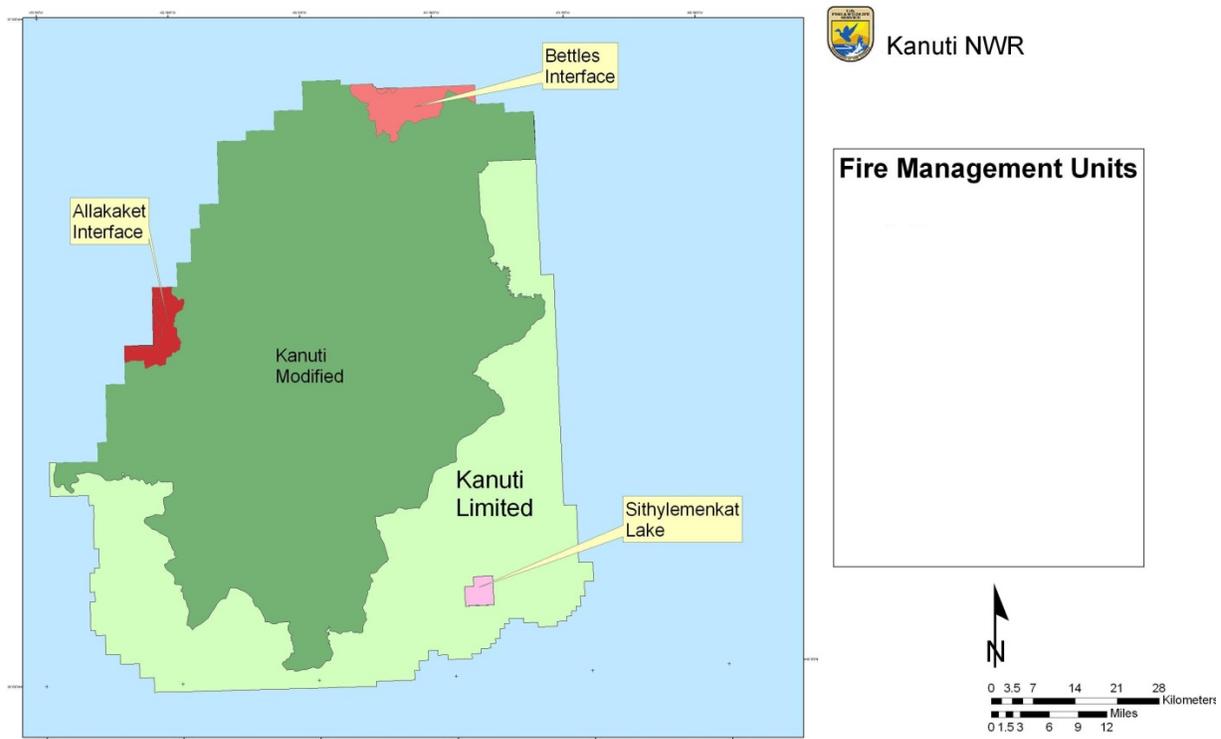


Figure 2: Kanuti NWR Fire Management Units

3.1. FMP-wide Management Considerations

3.1.1. Fire Management Goals, Strategies, and Guidance

3.1.1.1. Fire Management Goals, Strategies, and Guidance from the Refuge CCP

The Refuge CCP, which was adopted in 1987, provided further direction in habitat management objectives, specifically to "emphasize the maintenance of the Refuge's natural diversity and key fish and wildlife populations and habitat," to "maintain the Refuge in an undeveloped state," to "provide opportunities for continued subsistence use of Refuge resources," and to "maintain opportunities for hunting, fishing, and other recreational activities" (USFWS 1987).

This FMP incorporates management direction from the 2008 Kanuti Revised CCP which was in final draft when the FMP was originally signed.

The Refuge CCP (USFWS 2007) further states:

The primary objectives of fire management on Service lands are to conserve, protect or enhance habitat and to maintain ecosystems for the benefit of fish and wildlife. Fire management activities on the Refuge include preparedness, wildland fire suppression, wildland fire use, prescribed fire, outreach, education and prevention, monitoring, emergency stabilization and rehabilitation, fuels management, smoke management, prevention of fire trespass and fire ecology research. All activities will be conducted in accordance with Refuge, Service, and

Department of Interior policies and approved interagency and Refuge-specific fire management plans. Fire management decisions by manager are based on values warranting protection, protection capabilities, firefighter safety and/or land and resource management needs.

The Refuge Fire Management Plan provides specific information on the application and management of fire on the Refuge. Additionally, the Alaska Interagency Wildland Fire Management Plan provides a cooperative framework and operational guidelines for the suppression of wildland fires. The suppression of human-caused and unwanted wildland fires and the use of natural-caused wildland fires and prescribed fires as management tools are important management prerogatives on the Refuge.

The ANILCA establishment purposes require that we manage Kanuti for its natural diversity—both wildlife and habitat. We interpret this to mean on a Refuge-wide scale. In the next 10-15 years, active management of wildland fire will be essential to our maintenance of the natural variety of vegetation re-growth stages typical of Kanuti and interior Alaska. This habitat diversity benefits many wildlife species that utilize “younger” habitats found in previous burns (USFWS 2006, pages 46-47). For example, research has shown that maintenance of a natural fire regime can benefit moose because of their preference for early successional shrub and deciduous habitats 10-30 years post-burn (Maier et al. 2005). Certain songbird and small mammal species also tend to occur in these early- and middle-aged successional habitats.

The Refuge CCP also references area wide fire management planning (i.e., Alaska Interagency Wildland Fire Management Plan [AWFCG 1998] and Seward–Koyukuk Fire Management Plan [SKPT 1984]), which describes the use of suppression to help meet management objectives.

Whenever possible, Refuge management, and specifically fire management decisions, should attempt to maintain the wild character of Kanuti Refuge, as stated in the most recent CCP (USFWS 2007). Kanuti Refuge has five wilderness review units (Kanuti Flats, Kanuti Canyon, Koyukuk Flats, Alatna Hills and Ray Mountains.) Each of these units has special features that meet the definitions of wilderness as defined by the Wilderness Act, being undeveloped, untrammeled, highly natural and offering outstanding opportunities for solitude or a primitive and unconfined type of recreation. However, as a result of concerns expressed by the State of Alaska and subsequent analysis of those concerns by the Service, management alternatives that would have recommended Congress consider areas of the Refuge for inclusion in the National Wilderness Preservation System were eliminated from detailed consideration in the 2007 CCP.

3.1.1.2. Fire Management Goals, Strategies, and Guidance from Other Sources

The Refuge Fishery Management Plan (USFWS 1993) describes the importance of aquatic resources on the Refuge and calls for monitoring of fish species and water quality to conserve fish populations and habitat in their natural diversity and provide opportunity for continued subsistence use by local residents.

The North American Waterfowl Management Plan (USDI 1986) identifies the Kanuti Refuge as a waterfowl habitat area of major concern. The plan stresses the value of maintaining an adequate habitat base to ensure perpetuation of North American waterfowl populations.

The Western Arctic Caribou Herd Management Plan (BLM and others 1995) calls for allowing a natural fire regime to help maintain habitat quality. The Refuge is partly within the herd's historic range.

The National Fire Plan was developed in August 2000 (www.fireplan.gov) with the intent of actively responding to severe wildland fires and their impacts to communities, including assuring necessary firefighting resources, emergency stabilization and rehabilitation, hazardous fuels reduction, and community assistance. The Kanuti Refuge fuels reduction WUI projects at the adjacent communities of Allakaket, Bettles and Evansville are in response to directions within the National Fire Plan.

The Koyukuk River Moose Management Plan (ADF&G 2001) indicates the need to evaluate, plan and implement prescribed burns to maintain and/or improve moose habitat in the Koyukuk River drainage.

3.1.2. Common Characteristics of the Kanuti NWR FMUs

3.1.2.1. Climate

The Refuge has a subarctic continental climate, characterized by extreme seasonal variations in temperature and day length. Climate information is taken from USFWS (1996a), Selkregg (1976) and USDA (2002). Summers are short but moderately warm and can be rainy, with average July temperatures usually 65 to 70°F (**Table 2**). Because of its northern location, the sun stays up nearly all day for much of the summer, leaving little time for cooling during the short "night." Even when the sun does set during the summer, lighting conditions still exceed "civil twilight" continuously from May 13 to August 4. The sun does not set from June 2 to July 9 on the Refuge areas north of the Arctic Circle. Temperature extremes range from +90°F in summer to -70°F in winter.

Month	Mean temperature (°F)		Precipitation (inches)
	Maximum	Minimum	
Jan	-11.0	-28.4	0.40
Feb	-4.6	-24.8	0.36
March	13.6	-11.8	0.27
Apr	34.3	8.5	0.19
May	55.7	31.8	0.30
Jun	70.2	47.7	0.69
Jul	72.1	50.7	0.94
Aug	65.6	44.5	1.22
Sep	50.5	32.0	0.83
Oct	27.8	13.2	0.58
Nov	3.1	-12.3	0.41
Dec	-11.9	-27.9	0.39
□ Annual	30.4	10.3	12.50

Table 2: Mean temperature and precipitation by month at Allakaket, Alaska, 1949–1998. From the Western Region Climate Center, Period of Record Monthly Climate Summary <http://www.wrcc.sage.dri.edu/>

For an understanding of fire activity, it is important to note that the Kanuti area's temperatures and topography are quite conducive to extraordinary summer lightning activity (Trigg 1971).

These patterns dictate the lightning strikes that provide the primary ignition sources for wildland fires. The prevailing (“wet”) winds are southwesterly or westerly during summer (Jun–Aug) and average about 9 miles per hour. During the rest of the year, prevailing northeasterly (“dry”) winds average 5–10 miles per hour.

The geography of the Kanuti area resembles a large basin with an opening that faces southwest, along the Koyukuk drainage. The surrounding mountains, foothills and uplands cause uplifting of the moisture-laden summer air masses arriving from the southwest. These air masses have moved in from the Bering Sea along the entirely open Yukon and Koyukuk River valleys. The vertical movement of these summer air masses over the Kanuti Refuge leads to the development of towering cumulus clouds. A result of these towering cumulus clouds is a pattern of lightning storms, leading to wildfire ignitions (**Figure 3, Figure 7**).

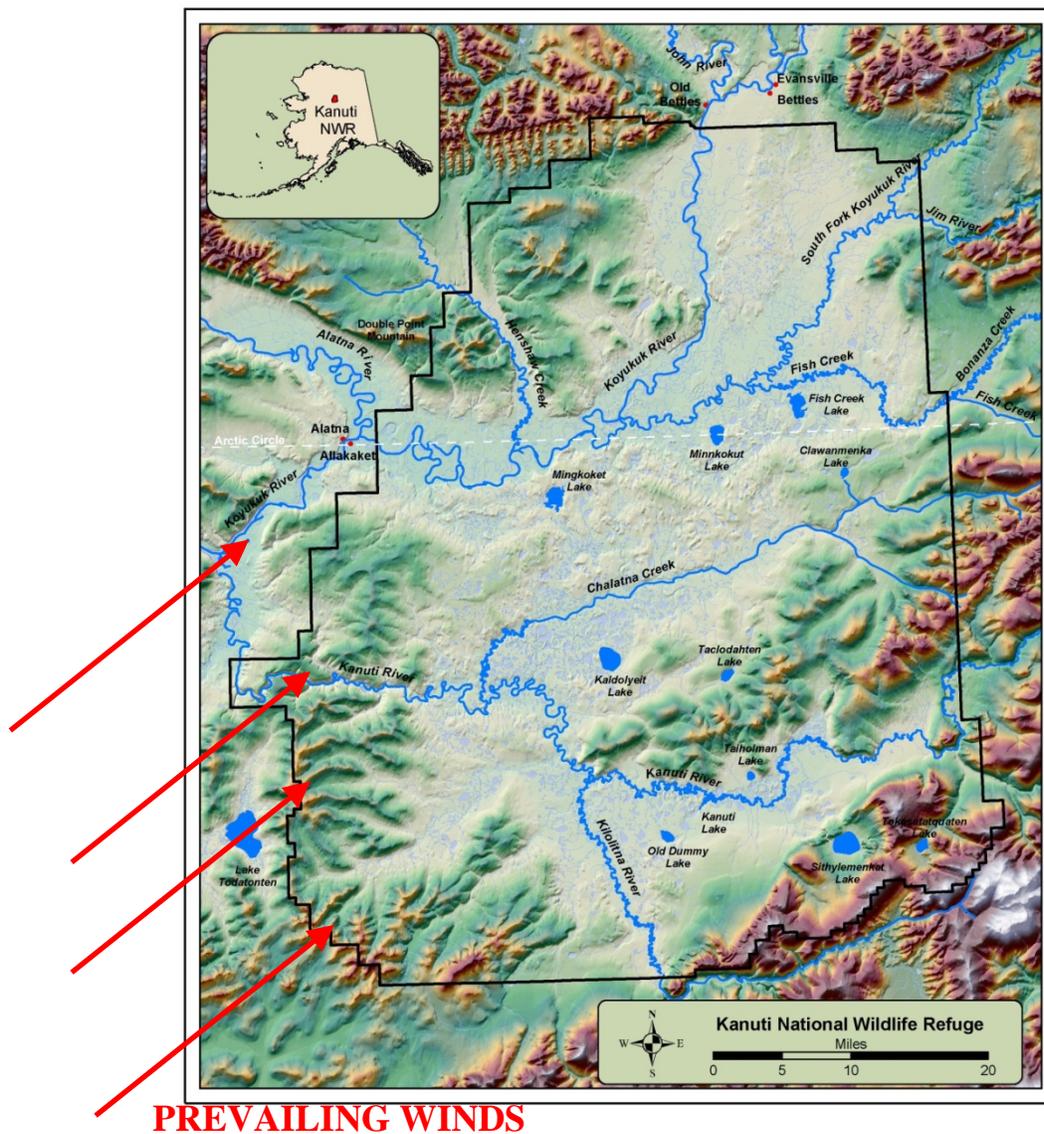


Figure 3: Uplifting of prevailing southwesterly summer winds leads to development of towering cumulus with resulting lightning strikes and wildfire ignitions.

As these winds are forced upward, the wind pattern on the northern slopes of the Ray Mountains can be particularly turbulent (Maxwell USFWS, pers. comm.). Some thunderstorms may also move counter to prevailing wind patterns (Dissing and Verbyla 1998). Some of these lightning storms are “wet”, since the uplifting of the moisture-laden air also causes precipitation to fall. However, some lightning storms are “dry”, with little precipitation. Most wildland fire ignitions result from the “dry” thunderstorms.

Precipitation averages 12.5 inches annually at Allakaket (**Table 2**). During the period, from June through mid-September, the average rainfall is 8 inches at Allakaket. This is over half the average yearly rainfall in just three and a half months. Precipitation at Allakaket and Bettles in summer occurs mainly as rain showers and thunderstorms. Large differences in precipitation in the Kanuti area may be recorded within relatively short distances. Snow covers the ground in the Kanuti area from October to May. The average snowfall is 72 inches at Allakaket and 83 inches at Bettles. Because of the presence of snow for over half the year and the presence of permanently frozen subsoil, this amount of precipitation is relatively effective for plant growth, and in some places creates saturated soils. The growing season is short in the Kanuti area; green-up begins in late May, and leaves begin to drop in mid-August.

The average freeze-up date for the Koyukuk River is mid-October, although open water may be found until November. The river's average date of breakup at Allakaket is early to mid-May. Most ponds and lakes freeze up a week or two before the Koyukuk River, and the ponds usually thaw in mid to late May or early June, depending on their size. Flooding sometimes accompanies breakup in the spring, as ice blocks the river channel and water spreads over the broad lowlands between the Koyukuk and Kanuti Rivers. Many ponds and lakes in the floodplains depend on the flooding to be recharged because of otherwise relatively low precipitation. The summer thundershowers often cause floods along creeks and rivers that drain the Brooks Range and other mountainous areas to the east and south of the Refuge.

3.1.2.2. Fire Weather

The Alaska Interagency Coordination Center (AICC) Predictive Services website <http://fire.ak.blm.gov/predsvcs/weather.php> maintains links to statewide fire weather forecasts and weather data. Fire weather briefing products including Red Flag Warnings and Fire Weather Watches are posted daily on the site throughout the fire season, and a link is included to the National Weather Service Spot Forecast Request page.

Alaska Red Flag Warning & Fire Weather Watch Criteria (if combined with burnable fuels)		
1.	Strong Wind:	Wind* \geq 25 mph & RH \leq 30%
2.	Low Humidity:	RH \leq 15%
3.	Strong Wind Low Humidity:	Wind* \geq 25 mph & RH \leq 15%
4.	Dry Thunderstorms:	Dry thunderstorms w/ scattered coverage (25% Areal) and < 0.10” rainfall
* Wind is defined as frequent gusts or sustained for one hour or more		

Table 3: Alaska Red Flag Warning & Fire Weather Watch Criteria

Kanuti NWR maintains a permanent, Weather Information Management System (WIMS) compliant Remote Automated Weather Stations (RAWS) on the Refuge. The Eastern Interior

FMO is responsible for maintaining station catalog information for this station to meet NFDRS standards (green up date, cured, freeze date, etc.). Daily observation into WIMS is an AK-UYTC dispatch responsibility.

Short Name	Full Name	Station Type	WIMS ID	Latitude	Longitude	Elevation	Zone	WX Zone	Valid for FWI	AICC ArcIMS ID	Site Description
KAN	Kanuti NWR	RAWS	500321	66.08472	-152.1694	825	TAD	AKZ219	Y	1002	none

Table 4: Kanuti NWR Remote Automated Weather Station

3.1.2.3. Fire Danger

Since the 1990s, fire danger indices in Alaska have been calculated using the Canadian Forest Fire Danger Rating System - Fire Weather Index (CFFDRS - FWI) instead of the National Fire Danger Rating System (NFDRS) used throughout most of the rest of the U.S. For most purposes the CFFDRS focus on duff moisture better represents Alaskan fuels than the NFDRS woody fuels classes. However, the reliance of FSPRO and other fire behavior modeling tools has prompted Alaskans to ensure that fire weather stations are cataloged and maintained in WIMS as NFDRS stations.

3.1.2.3.1 CFFDRS - FWI

The Canadian Forest Fire Weather Index (FWI) tracks the effects of weather on forest fuels. In doing so, it gives an estimation of potential fire danger and fire behavior in the area adjacent to a weather station at which the weather is recorded. It is based on the moisture content of three classes of surface forest fuels, plus the effect of wind, on fire behavior. The FWI system is probably best explained as a bookkeeping system in which, for a particular weather station, fuel moisture is added in the form of precipitation and subtracted in the form of drying. Precipitation is the only input component that will add to fuel moisture while the other inputs of temperature, relative humidity, wind speed, and time of year, control the rate of drying.

The system consists of six components; three primary indexes, or codes, representing fuel moisture for each of the three fuel layers, two intermediate indexes representing rate of spread and fuel consumption, and a final index representing fire intensity as energy output per unit length of fire front. Each year, for each representative weather station the system is initiated three days following the station's snow-free date; and shut down following the station's freeze-up date.

1. The Fine Fuel Moisture Code (FFMC) represents the moisture content of litter and cured fine fuels, 1-2 cm deep. It expresses the ease of ignition and fuel flammability. FFMC is sensitive to daily changes in temperature, rainfall, relative humidity, and wind speed. Time lag is 2/3 day, which means that it takes two thirds of a day for the fine fuels to react to a change in the weather.

2. The Duff Moisture Code (DMC) represents the moisture content of loosely compacted, decomposing organic matter, 5-10 cm. deep, which determines resistance to control. DMC is sensitive to temperature, rainfall, and relative humidity. Time Lag is 12 days.

3. The Drought Code (DC) represents the deep layer of compacted organic matter, 10-20 cm. deep, which determines resistance to extinguishment. It indicates seasonal drought and smoldering fires in deep duff or large logs. DC is sensitive to temperature and rainfall. Time lag is 52 days.

4. The Initial Spread Index (ISI) represents a numerical rating of fire spread immediately after ignition without the influence of variable fuel quantity (the fuel type isn't considered). It fluctuates with wind speed and time of day. ISI is a combination of FFMC and wind.

5. The Build Up Index (BUI) represents total fuel available for combustion. In the absence of rain, BUI fluctuates little throughout the day. BUI is a combination of DMC and DC.

6. The Fire Weather Index (FWI) represents the intensity of a spreading fire. FWI is a combination of ISI and BUI.

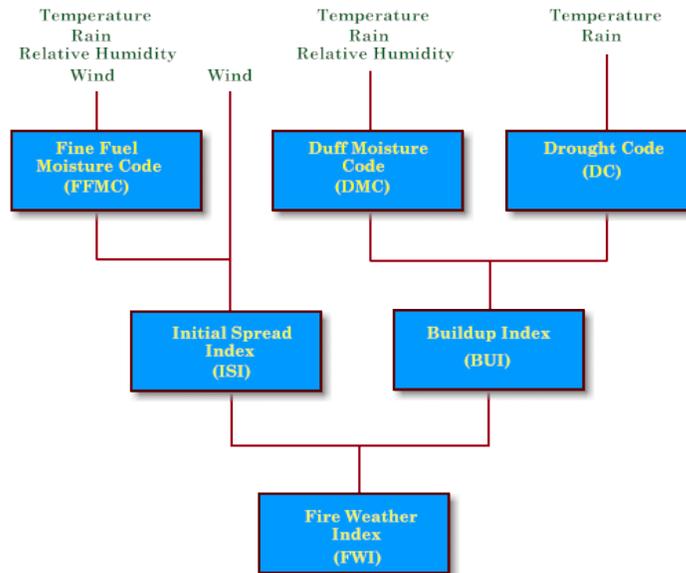


Figure 4: CFFDRS Fire Weather Index (FWI) system

Fuel Moisture Code	Soil horizon	Water capacity mm	Rain fall thresholds mm	Timelag* days	Nominal fuel depth cm	Bulk density Mg/m ³
FFMC	L	0.62	0.6	2/3	1.2	0.021
DMC	F	15	1.5	15	7	0.071
DC	H	100	2.9	53	18	0.139

* A fuels time-lag is expressed as that amount of time required for the fuel to lose 1 – 1/e (about 2/3) of the free moisture above equilibrium on a standard day (noon temperature of 21.1°C, relative humidity of 45%, 13 km/h wind, during the month of July) (Merrill and Alexander 1987).

Figure 5: Properties of the FWI System’s fuel moisture codes. (Wilmore 2001)

Weather readings taken at 13:00 solar noon local standard time (14:00 daylight savings time in Alaska) at weather stations for temperature, rainfall, relative humidity, and wind speed are used as inputs into a computer program that calculates the six indices for each station.

3.1.2.3.2 *NFDRS*

Fire weather station WIMS catalogs require annual Green-up and Freeze-up dates to be entered in order to maintain WIMS compliance and properly generate NFDRS indices.

3.1.2.4. Fire Return Interval

The Refuge lies within the boreal forest, which is often characterized by a combination of high intensity crown fires and severe surface fires covering large areas. Weather, fuels, and topography can combine to create these extremely large fires (Viereck 1983). Large-scale weather patterns are responsible for creation of conditions that control fire activity over these large areas (Johnson 1992, Cahoon and others 1994). Much of the area that has burned in the Kanuti area is accounted for in periodic severe fire years, such as in 1972, 1990, 2004 and 2005 (Johnson 1992, Davis and Mutch 1994).

Over the last 400–500 years, the fire return interval in the boreal forest of Interior Alaska has been fairly stable at about 100 years (Mann and others 1995). That means, mathematically, that all parts of a large area (such as the Kanuti Refuge) would be expected to burn within 100 years. Some areas, however, would not burn at all during that time, and areas with high lightning frequency, few natural barriers, and flammable fuel types would burn more than once (Mann and Plug 1999).

Examination of Kanuti fire history maps shows that about 48% of the area within Refuge boundaries burned between 1950 and 2002 (**Figure 6**). This information supports a fire cycle of 105 years, typical of the boreal forest. About 33% of the area within Refuge boundaries, however, burned between 1990 and 1992. This shorter cycle may suggest a fire return interval of approximately 30 years, but sufficient fuel loading may not occur within 30 years in the slowly growing boreal forest on the Arctic Circle (Mann and Plug 1999). Re-burns of dead and down timber in black spruce stands may carry the occasional wildland fire within 30 years, but the 100-year natural fire return interval is more likely. Yarie (1981) postulated a fire return cycle of less than 80 years in the Porcupine River valley, which lies in a drier subclimate well to the east of the Refuge, near Fort Yukon. The recent large fires (1990–2005) on the Kanuti Refuge probably represent the combustion of fuels accumulated during the previous 50 years of dedicated fire suppression, in addition to those areas of unburned fuels built up in the more natural 100-year cycle.

Thus, in the absence of suppression since 1984, the fire-driven ecosystem of the Kanuti Refuge may be attempting to return to a more natural 100-year cycle. We expect, in theory, fewer large landscape-scale fires on the Kanuti Refuge in the short-term future as contiguous fuel loading is broken up by smaller, more frequent fires. Highly flammable areas such as continuous black spruce stands in the uplands, however, can and will burn more frequently than 100 years, especially during hot, dry summers. Upland areas of the Kanuti Refuge, particularly in the foothills of the Brooks Range, can become very dry, and are highly prone to lightning strikes (Trigg 1971). High ambient air temperatures during the month of June may be a key feature of the initiation of large-scale burns in this area. June air temperatures in Interior Alaska are

Table 5: Fires and acreage burned by Management Option^a on Kanuti NWR lands, illustrating fire frequency, 1981–2000.

Year	Full protection*		Modified protection*		Limited protection*		Total	
	Fires	Acres	Fires	Acres	Fires	Acres	Fires	Acres
1981	9	4,184	0	0	0	0	9	4,184
1982	5	9	0	0	0	0	5	9
1983	24	1,622	0	0	0	0	24	1,622
1984	3	2	7	105	6	62	15	169
1985	6	3,847	4	18,282	4	144,442	12	166,573
1986	3	600	3	10,613	7	34,942	10	46,156
1987	0	0	4	83	5	18,001	9	18,084
1988	5	6,667	18	203,576	30	942,071	49	1,152,313
1989	1	1	2	4	1	4	4	9
1990	3	412	9	277,525	8	77,216	19	355,153
1991	3	42	12	64,580	8	227,450	22	292,072
1992	0	0	1	1	9	42,002	10	42,003
1993	2	22	4	29,101	9	63,467	13	92,590
1994	2	2	0	0	10	22,533	12	22,535
1995	4	1	0	0	2	420	6	421
1996	3	7,587	7	2,552	6	145,880	14	156,019
1997	2	1	2	10	4	30,750	8	30,761
1998	0	0	0	0	1	5	1	5
1999	0	0	0	0	7	151,531	7	151,531
2000	1	1	1	1	5	6,161	7	6,163
Total	76	25,000	74	606,433	122	1,906,937	256	2,538,372
Average	3.8	1,250	3.7	30,322	6.1	95,347	12.8	126,919

^a Number of fires in each Management Option category may exceed total number of fires because some fires burned in more than one category.

*For definitions of Management Options, please see Table 8.

Closer examination of fire history maps shows the existence of different fire return intervals within the Refuge boundaries (**Figure 6**). Discontinuous white spruce stands on the banks of the Koyukuk and Kanuti Rivers are broken up by streams and wetlands. These lowland white spruce stands have a calculated fire cycle of about 450 years and would be expected to burn only under the most extreme drought conditions (Magoun and Dean 2000).

Rolling uplands and gravelly outwash plains with extensive contiguous stands of black spruce or stunted white spruce (e.g., on the Hodzana Highlands, on lower slopes of the Ray Mountains, and in the Indian River uplands) may have fire return cycles of 70–100 years. Steep, broken alpine tundra above the timberline, by comparison, such as the upper slopes of the Ray Mountains, has a fire cycle of about 560 years. (See Section I.O.3. for further discussion of fire frequency related to vegetation types and how susceptibility changes over time.)

The number and extent of fires on the Kanuti Refuge also varies widely between years and decades (Kelsall and others 1977). Within a 10- to 15-year period, there are generally some years with practically no fires or area burned (for example, on the Refuge in 1989, 1998, 2003 and 2006), some years with a few fires reaching moderate size (such as 1985 and 2002), and one or two severe fire years with many large fires, some burning tens or hundreds of thousands of acres (such as 1990–1991 and 2004–2005). Over the last 12 years, area burned annually on the Refuge has ranged from 5 acres to more than 355,000 acres (1990) (**Table 5**).

The definition of Fire Regime Condition Class (FRCC) includes a qualitative measure describing the degree of departure from a reference (or historical) fire regime (see www.frcc.gov). Severe departures, such as are evident in many areas of the contiguous United States as a result of 100 years of fire suppression, may result in alterations of key ecosystem components such as structural stage, stand age, canopy closure, and fuel loadings (BLM 2004). In Alaska, however, the relatively short period of fire suppression on Kanuti Refuge (from the 1950's to 1984) may have caused a departure from the natural fire regime, but historical data are otherwise lacking. The effects of this period of fire suppression on the Kanuti Refuge fire regime and the condition class are not well known, but it is believed that the vegetation attributes (i.e., the species composition and structure) remain intact on Kanuti Refuge, and are functioning within the natural range.

The boreal forest on Kanuti Refuge thus most likely remains within FRCC Condition Class 1, in which the fire regime lies within the natural range and the risk of losing key ecosystem components, is low. The Fire Regime description for the boreal forest on Kanuti Refuge best fits that of Group IV, with moderate frequency, stand replacement fires, characterized by a forty to 120 year fire return interval range (BLM 2004). Fire management on Kanuti Refuge is predicated on the assumption that the boreal forest is currently within the natural fire regime.

3.1.2.5. Fire History

Relatively low precipitation, very long summer days with thermal uplifting, the presence of highly flammable fuel types, and frequent lightning strikes from mountain thunderstorms, all combine to make the forests in the Kanuti area one of the most prone to wildfire ignition in the state (Trigg 1971). Most lightning activity occurs from 4:00 to 6:00 p.m. during late June and early July. Lightning activity starts earlier in the day at higher elevations and later at lower elevations.

Before 1940 an average of 1.5 to 2.5 million acres burned uncontrolled each year in Interior Alaska (Lutz 1956). With the creation of the Alaska Fire Control Service in 1939, the annual average decreased to 900,000 acres (Lutz 1956). Until 1984, policy dictated that all wildland fires be suppressed (SKPT 1984). Aggressive suppression from the 1950s to 1984 succeeded in controlling all but a few fires in the Kanuti Refuge area, and an average of only about 4,000 acres burned each year in and around the Refuge before 1984 (USFWS 1987). These suppression actions were successful most of the time, although some large fires did occur, such as in 1972 (**Figure 6**). Large fires during this time defied suppression efforts, and others were not suppressed because of greater priorities elsewhere.

Figure 5 displays the perimeters of all recorded fires 1950–2005 in the area of the Kanuti NWR. Since the creation of the Refuge in 1980 and after the fire suppression policy changed in 1984, an average of more than 22,000 acres has burned per year in the Kanuti Refuge (**Table 5**). Lightning has accounted for nearly all fire starts on the Refuge. Since 1981, lightning has started 92 fires burning 468,000 acres, or about a third of the Refuge area. Large fires in 1990 and 1991 burned about 24.8% of the Refuge, including large portions of the Hodzana Highlands and the foothills of the Ray Mountains. Some 25% of the Refuge burned in 2004–2005 in several very large and prolonged fires during these two consecutive severe fire seasons.

Approximately 50% of the Refuge is within the Limited Suppression Management option, where wildland fires are monitored but not suppressed (see Section III.C.). Suppression on naturally-caused fires occurs in the Modified Management Option areas in the central portion of the Refuge before the annual conversion date (ca. 15 July) to Limited, and in the Full and Critical Management Option areas near the villages (**Table 5**).

3.1.2.6. Ignitions/Cause

Since 1980, only two very small fires have been caused by humans on the Refuge. These were abandoned or escaped campfires that burned a total of 1.1 acres. From 1988 through 2000, 49% of all fires on the Refuge were attacked with the intent of extinguishment (85 of 172 fires).

3.1.2.7. Fire Season

The fire season on Kanuti NWR extends from early May to mid-September (**Figure 7**). The period of May through the middle of July is often dominated by high-pressure weather systems and sunny, dry weather. Cooler, rainy weather usually begins in mid-July with the advent of low-pressure weather systems. This weather pattern often continues through September until snowfall. The first frost typically occurs in early September. The first snow may occur at any time after the middle of September.

The vegetation can be dry on Kanuti Refuge during mid-to-late May, but lightning ignition is usually lacking because there are no thunderstorms (**Figure 7**). Green-up occurs in late May. Air temperatures in June may provide the key to the entire fire season, with higher temperatures indicating greater risk of ignition and subsequent rapid rates of spread. Higher temperatures in June are associated with uplifting of air masses and resulting development of lightning storms (**Figure 7**).

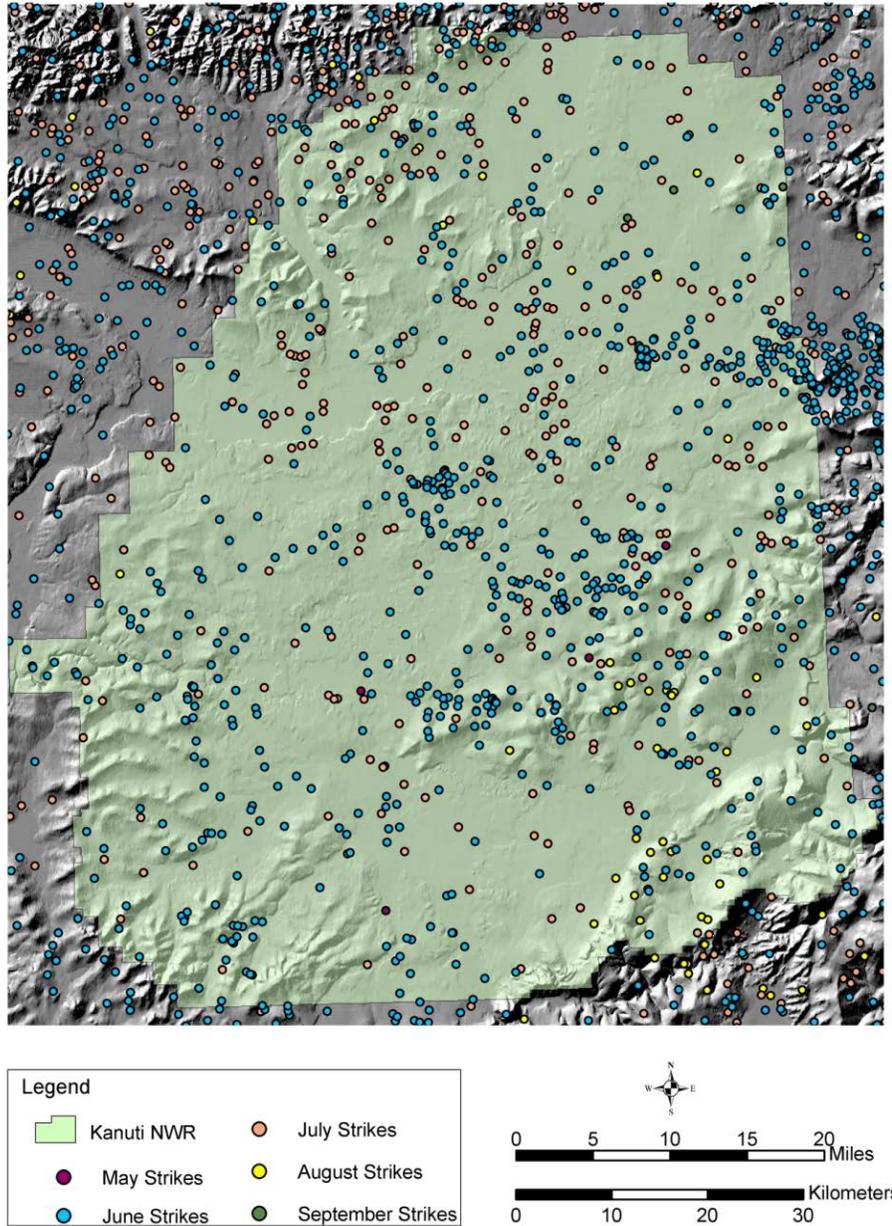


Figure 7: Wildfire ignitions by month for the period from 1950 to 2002, Kanuti NWR.

The peak time for such lightning ignitions on Kanuti Refuge, with about 60% of the fire starts on the Refuge, is the 30-day period between June 10 and July 10 (**Figure 7**). Wildfire ignitions by lightning tend to be clustered within Kanuti Refuge on mountain ridges exposed to uplifting southwesterly wind patterns (**Figure 7**).

Mid-to-late June is a critical period for wildfire ignitions on Kanuti Refuge. Nearly 70% of ignitions have occurred by July 10, about 80% by July 20, and around 90% by August 1. Most of the total acreage burned is usually accounted for by the end of July, although "late" fire seasons can see active burning into August and September (**Figure 7**).

3.1.2.8. Landcover & Fuels

3.1.2.8.1 Fire Behavior

Several modeling systems are available for predicting fire behavior in Alaska. The thirteen original National Forest Fire Laboratory (NFFL) fuel models have been applied directly, as well as with adjustment factors (Norum 1982).

A custom Black Spruce model based on NFFL parameters has also been developed. The 40 model extension of the original 13 models, released in 2005, provides additional flexibility for adapting the NFFL system used in Behave Plus modeling software to Alaska fuels. All of these models, however, are driven by 1 hour woody fuels and/or leaf litter and do not directly address the characteristics of feathermoss duff fuels that drive surface fires over much of interior Alaska.

The Canadian Fire Behavior Prediction System (FBP) offers several fuel types based on feathermoss duff. FBP relies on Canadian Forest Fire Danger Rating System (CFFDRS) Fire Weather Index System FWI inputs, which are officially tracked in Alaska, instead of the NFDRS inputs commonly used in the Lower-48.

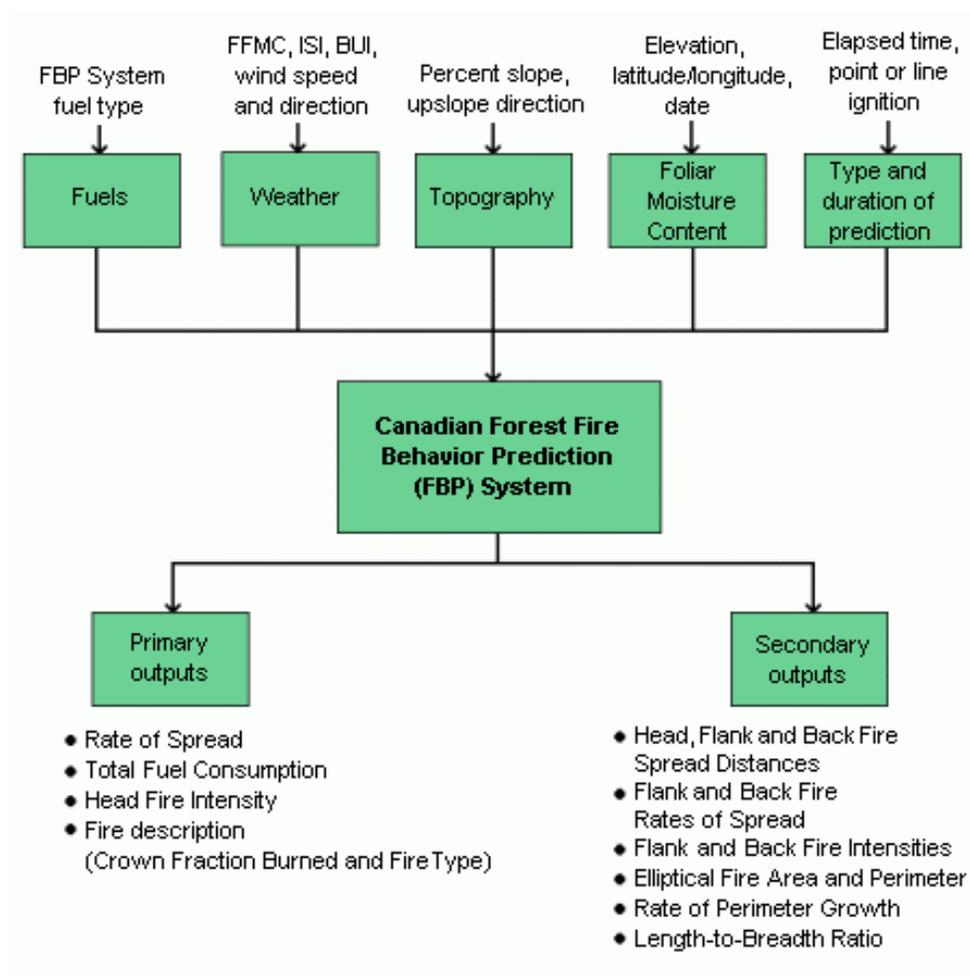


Figure 8: CFFDRS FBP Structure

Intensity and spread rate outputs in the FBP also account for the effect of aerial fuels, unlike NFFL which only models surface behavior. Unfortunately fire modeling tools such as Farsite and FSPro do not currently support the FBP system.

Vegetation type	Canadian fire behavior/danger model	NFFL fire behavior model	NFDRS fire danger prediction model	Estimated acreage on Refuge ^a
Black spruce forest White spruce forest	C-2 C-2	custom black spruce ^b 8 or 10 (heavy downed fuel)	Q H	573,000
Mixed spruce/ Hardwood forest	M-2 (can set amount of spruce)	8 (few spruce) or 9 (moderate spruce)	R	1,416,000
Hardwood forest	M-2	8	R	1,324,000
Shrublands/Brush	M-2	2 (grass w/flammable shrubs) or 5 (dwarf flammable shrubs) or 6 (heavy dead woody load)	B	3,452,000
Marsh Grasses	O-1	3	N	185,400
Tundra	O-1	1 (tussocks <1 ft high) or 3 (tussocks >1 ft)	S	278,100

^a Derived from Table 2.

^b Also see discussion in Section M.3.a. (Below and Norum 1982).

Table 6: Fuel models for fire behavior prediction and fire danger rating for vegetation types of Kanuti NWR. From the Canadian Forest Fire Danger Rating System (Stocks and others 1989), the Northern Forest Fire Laboratory (NFFL--Anderson 1982), and National Fire Danger Rating System (NFDRS--Deeming and others 1978).

The *Fuel model guide to Alaska vegetation* (Cella et al. 2008) includes crosswalks from *The Alaska Vegetation Classification* (Viereck et al. 1992) to fuel models from each of these systems (**Table 7**). The Guide should be used as a starting point for Alaska fuel modeling exercises but should not be considered as definitive. Departures from the Guide should be documented.

Y NWR Fuel Model Crosswalk (condensed from The Fuel Model Guide to Alaska Vegetation)					
Guidebook Group #	Description	Primary Carrier of Fire	Fuel Model		
			40	13	CFFDRS
2	Closed White Spruce Forest	feather moss, litter, duff	TU1	10	C3
3	Closed Black Spruce Forest	feather moss	TU3	9 ADJ	C2
5	Open White Spruce Forest	shrub & litter	TU5	10	C7
6	Open Black Spruce Forest	feather moss	TU4	9 ADJ	C1
7	Open Black Spruce-Tamarack Forest	feather moss & shrub	TU5	10	C1
9	White Spruce Woodland	feather moss & shrub	TU5	10	C1
10	Black Spruce Woodland with tussock	shrub & tussocks	GR2	1	O1
11	Black Spruce Woodland with lichen-moss	feather moss & lichen	TU4	9 ADJ	C2
12	Closed Red Alder Forest	leaf litter	TL2	8	M2
13	Closed Black Cottonwood-Balsam Poplar Forest	leaf litter	TL2	8	M2
14	Closed Paper Birch-Quaking Aspen Forest	leaf litter & sparse grass	TU1	8	M2
15	Open Paper Birch Forest	leaf litter & grass	TU1	9	M2
16	Open Quaking Aspen Forest	leaf litter, grass, shrub & slope	TL2	8	D1
17	Open Balsam Poplar (Black Cottonwood) Forest	leaf litter	TL2	8	M2
18	Woodland Paper Birch-Balsam Poplar	lichen or grass & leaf litter	GR1	1	O1A
19	Spruce-Paper Birch-Balsam Poplar	leaf litter	TL6	8	M2
20	White Spruce - Paper Birch - Balsam Poplar - Spruce	leaf litter & herbaceous plants	TU1	8	M2
22	Dwarf Tree Black Spruce Scrub	feather moss & shrub	TU4	9	C2
23	Closed Tall Alder Willow Shrub	leaf litter & woody debris	TU1	6	M2
24	Closed Tall Birch Shrub	shrubs	SH3	6	M1
25	Tall Shrub Swamp	herbaceous, shrub & leaf litter	SH1	1	O1A
26	Open Tall Willow Alder Shrub	grass & shrub litter	TU1	5	M2
27	Open Tall Birch/Birch-Willow Shrub	shrubs	SH3	5	M1
28	Closed Low Birch/Birch-Willow/Ericaceous Shrub	shrub	SH2	5	M1
29	Closed Low Willow/Alder-Willow Shrub	grasses	TU1	6	M2
30	Open Low Mixed Shrub-Sedge Tussock Tundra/Bog	tussocks	GR2	1	O1
31	Open Low Birch-Ericaceous Shrub/Bog	grass & dwarf birch	GR3	1	O1
32	Open Low Birch-Willow/Ericaceous Shrub/Bog	grass & shrub	GR2	1	O1
33	Open Low Willow/Sweetgale	herbacous	GR1	1	O1A
34	Open Low Alder/Alder-Willow Shrub	grass & low shrubs	GS1	1	O1
35	Sagebrush-Juniper	juniper	SH2	8	O1A
36	Sagebrush-Grass	grass & shrub	GS1	2	O1
37	Dwarf Shrub Tundra	herbaceous & low shrub	GR1	1	O1A
38	Elymus	grass	SH4	8	O1A
39	Grass-Shrub	short grass	GR2	1	O1
40	Grass-Herb	short grass & herbaceous	GR1	1	O1A
41	Bluejoint Meadow	grass	GR4	3	O1
42	Bluejoint Shrub Herb	grass	GR2	1	O1
43	Tussock Tundra	tussocks	GR3	3	O1
44	Mesic Sedge-Grass-Herb Meadow Tundra	grass & herb	GR2	1	O1
45	Sedge Willow Dryas Tundra	herbaceous	GR1	1	O1A
46	Sedge-Birch Tundra	herbaceous & shrub	GR2	1	O1
47	Wet Meadow Tundra	herbaceous	GR1	1	O1A
48	Wet Sedge-Grass Meadow-Marsh	grass	GR1	1	O1A
49	Wet Sedge Meadow-Bog-Shrub	herbaceous	GR1	1	O1A
50	Dry Species - Non Burnable		NB7	99	
51	Wet Species - Non Burnable		NB6	99	
52	Mesic Forb Herbaceous		GR1	1	O1A
53	Foliose and Fruticose Lichen		GR1	1	O1A
54	Crustose Lichen		NB9	99	
55	Aquatic Herbaceous		NB8	99	
56	Downed Beetle-killed spruce	downed woody fuel	SB1	11	M4

* The NB7 fuel model is a custom model for drier vegetated areas that typically do not burn.

** The NB6 fuel model is a custom model for wet vegetated areas that typically do not burn.

Table 7: Kanuti NWR Fuel Model Crosswalk

3.1.2.8.2 Landcover

Earth cover class	Acres	Percent cover
Closed Needleleaf	1,798	0.11%
Open Needleleaf	347,725	21.24%
Open Needleleaf-Lichen	28,587	1.75%
Woodland Needleleaf	135,343	8.27%
Woodland Ndl.-Lichen	58,110	3.55%
Woodland Ndl.-Moss	<u>1,294</u>	0.08%
<i>Subtotal coniferous</i>	572, 857	35%
Closed Deciduous	109,627	6.70%
Open Deciduous	<u>14,861</u>	0.91%
<i>Subtotal hardwood</i>	124, 488	7.61%
Closed Mixed Ndl./Decid.	67,618	4.13%
Open Mixed Ndl./Decid.	<u>110,116</u>	6.72%
<i>Subtotal mixed conf./hard</i>	177,734	10.85%
Tall Shrub	60,519	3.70%
Low Shrub	68,401	4.18%
Low Shrub-Tussock Tundra	76,261	4.66%
Dwarf Shrub	<u>8,200</u>	0.50%
<i>Subtotal shrub</i>	213,381	13.04%
Wet Graminoid	14,500	0.89%
Lichen	1,994	0.12%
Moss	2,490	0.15%
Mesic/Dry Graminoid	518	0.03%
Tussock Tundra	4,295	0.26%
Tussock Tundra Lichen	<u>1,856</u>	0.11%
<i>Subtotal herb/moss/lich</i>	25,653	1.56 %
Aquatic Bed	13,444	0.82%
Emergent	1,988	0.12%
Clear Water	48,513	2.96 %
Turbid Water	<u>6,183</u>	0.38%
<i>Subtotal aquatic/water</i>	70,128	4.28 %
Snow/Ice	8	0.00%
Sparse Vegetation	5,871	0.36%
Rock/Gravel	<u>8,801</u>	0.54%
<i>Subtotal sparse/non-veg.</i>	14,680	0.9 %
Terrain Shadow	248	0.02%
Smoke	9	0.00%
<i>Subtotal obscured</i>	257	0.02%
Fire Scar	116,331	7.10%
Fire Scar-Regeneration ^b	<u>321,921</u>	19.67%
<i>Subtotal recent fire scar</i>	438,252	26.77%
Total	1,637,430	100.03%

^a The area within the Kanuti NWR boundary includes some in-holdings of Native Patented and Native Selected lands, which are included in the acreage figures, above. Data above is from the Kanuti/Ray Mountains /Hogatza River Earth Classification Report, 2001.

Table 8: Earth cover acreages for Kanuti NWR lands

3.1.2.8.3 Fire Effects

The mosaic of habitats present on the Refuge today is largely a result of repeated glaciations, flooding and erosion of rivers, and fire activity (**Figure 9**). Fire exerts a powerful influence on the entire ecosystem, including hydrologic, carbon, and nutrient cycles, landscape diversity, wildlife and plant species diversity, and species distributions and abundances (Kelsall and others 1977; Pyne 1982, 1984; Bryant and others 1994; Clark and Sampson 1995).

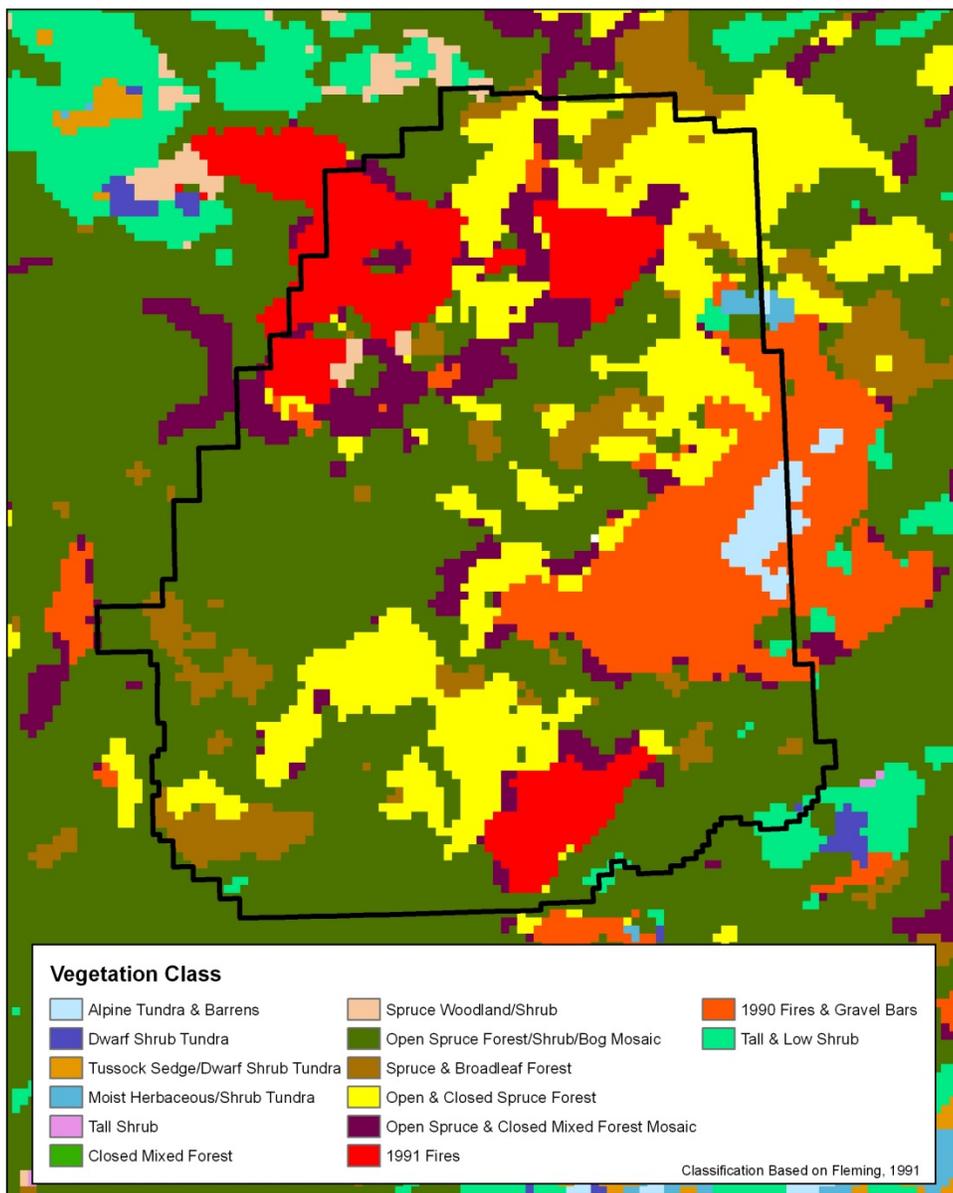


Figure 9: Vegetation/fuels map for Kanuti National Wildlife Refuge and vicinity

Agencies responsible for fire management in the North American boreal forest recognize that fire exclusion is not possible, and is also neither economically nor ecologically desirable (Pyne 1982, Stocks 1993). Vegetation patterns in the boreal forest can be dominated by a few intense, stand-replacing fires, especially in black spruce. These stand-replacement fires burn in extreme weather conditions and cover hundreds of thousands of acres (Johnson 1992). Recovery from these severe fires tends to provide even-aged stands on a landscape scale. More frequent, smaller, and less intense wildland fires provide better temporal and spatial heterogeneity to the natural fire recovery process. The small-scale patchy environment resulting from these more frequent, lower intensity fires produces a varied habitat with an abundant edge-effect. This is clearly of value to many wildlife species. The smaller scale patchy fires also break up contiguous fuel loading and make future landscape-level fires less intense.

Site characteristics, including biotic and abiotic factors, are important factors in determining forest resilience and what may become re-established on a site following fire. For example, poorly drained sites underlain by permafrost where stands of open black spruce are prevalent will likely return to that vegetation type following fire. Shifts in the fire regime to more severe or more frequent fires may lead to alternate successional pathways in black spruce forests, but this vegetation type will likely persist in landscape positions that favor moist, cool conditions (Johnstone et al. 2009). Availability of a seed source or ability of plants to re-sprout following fire will also strongly influence what comes back; if no willows are present on a site prior to fire, one cannot expect willows to significantly appear after fire.

Recent work has highlighted the role of burn severity in seedling establishment, survival, and subsequent vegetation patterns (Johnstone and Chapin 2006, Johnstone and Kasischke 2005). Variation in burn severity, measured by depth of the remaining organic layer, can have a strong influence on tree recruitment and succession on stand and landscape levels. Based on a number of field observations and modeling efforts from various studies, (Barrett et al. 2011) summarized forest recovery relative to post-fire organic soil depths as follows: sites with >10 cm of organic soil post-fire are expected to regenerate as black spruce, with permafrost eventually recovering; sites with 3-10 cm of organic soil are expected to come back as mixed hardwood/spruce stands with longer recovery of permafrost; and sites with <3 cm of organic soil remaining are expected to become dominated by deciduous trees with no permafrost.

Information regarding the effect of fire on specific plant and wildlife species is summarized in the national Fire Effects Information System (FEIS) database, accessible through the Internet at <http://www.fs.fed.us/database/feis/>. Information is available for many bird, mammal, and plant species which occur on the Refuge.

Descriptions of common Refuge habitats along with general discussions of fire behavior and fire effects follow.

3.1.2.8.3.1. Black Spruce (*Picea mariana*)

Black spruce is found most commonly on cold, poorly drained lowland sites and north-facing slopes, often associated with the presence of permafrost. Black spruce occurs in closed ($\geq 60\%$ canopy cover), open (25-59% cover), and woodland (10-24% cover) stands (Vioreck et al. 1992). On better drained sites, some mixing with white spruce (*P. glauca*) and paper birch (*B. neoalaskana*) occurs.

A carpet of feather mosses and lichens is very common as a primary component of the understory. Graminoid tussocks, various shrubs, including willows (*Salix* spp.) and ericaceous shrubs such as blueberry (*Vaccinium uliginosum*), crowberry (*Empetrum nigrum*), and Labrador tea (*Ledum decumbens*) may also be present. Sphagnum moss may be present on moister sites.

Dead lichen-covered branches are often present on live tree boles from the forest floor to the tree canopies, creating flammable ladder fuels. Live lower branches may also reach the ground, where they can take root, called “layering,” creating clusters of smaller trees around parent trees. Litter is primarily composed of a light loading of needles and understory leaves.

Fires characteristically burn in black spruce forests with relatively high intensities and slow, predictable rates of spread. Fires in black spruce are generally carried by surface fuels such as feather mosses, lichens and graminoids. Ignition of the tree crowns (individuals or groups of torching trees) will occur just behind the flaming fire front if flame lengths are sufficient enough to ignite the lower lichen covered black spruce branches. During dry years, the combination of dryness, lichens on the tree branches and fine surface fuels, results in more persistent flammability throughout the fire season than any other fuel type on the Refuge. Long duration smoldering is usually limited to red squirrel middens and peat accumulations unless conditions are very dry. Areas where fire has only partially burned surface fuels may be susceptible to re-burns. Spotting by aerial firebrands from torching trees is common. Instability of the atmosphere, surface winds, and fuel moisture of receptor fuels are critical factors influencing the degree and scope of spotting.

Mosaics of varying burn severity are common. Black spruce are easily killed by fire even in low severity burns. However, seeds from the semi-serotinous cones normally survive and provide a readily available seed source for a few years following fire. Seedling establishment is most effective where mineral soil is exposed, but seeds will germinate on numerous substrates if there are favorable moisture levels. Aerial stems of shrubs are often killed, but resprouting and regeneration are stimulated if root systems are not destroyed. The low shrub layer quickly regenerates in lightly burned areas. Lichens may not return in the short term unless residual fragments are present in unburned or very lightly burned areas. Common feathermosses in spruce forests are obligate climax species (*Hylocomium splendens*, *Pleurozium schreberi*) and are generally killed by fire although small patches may survive low-severity fire. Neither of these species will spread until tree canopy is reestablished.

3.1.2.8.3.2. White Spruce (*Picea glauca*)

White spruce is commonly found on warmer well-drained sites and on alluvial deposits along major river courses on the Refuge. White spruce also forms stringers along streams and around lakes, but on better drained sites than those on which black spruce is found. White spruce may reach 70 feet in height. On lowland sites, paper birch and balsam poplar (*Populus balsamifera*) may be components of the overstory, with quaking aspen (*Populus tremuloides*) as a component on upland sites. The understory may include tall shrub willow, alder (*Alnus* spp.), prickly rose (*Rosa acicularis*) and a shallow carpet of feather mosses. Smaller white spruce with larger components of willow, ericaceous shrubs, and sphagnum moss occur on moist marginal sites.

White spruce forest often transitions into scrub lands and broadleaf forests on upland sites. Dead downed woody fuels are predominantly white spruce logs and cast white spruce branch, needle and cone litter, but willow may also significantly contribute to loading where concentrations in the understory are heavy.

Fires in white spruce generally are slow spreading and burn with lower intensities than in black spruce. Smoldering fires in the root systems are common. Increased canopy cover and shading results in less fine fuels in the understory and tempers the response of fine fuels to changes in relative humidity. Ladder fuels of dead lichen-covered branches are not as prevalent in white spruce as they are in black spruce. Crowning only occurs under very dry conditions, especially in proximity to jackpots of dead fuels.

Mature white spruce stands may be replaced by broadleaf forest stands following fire—quaking aspen on drier sites and paper birch on moister sites—but white spruce will ultimately return. Open stands on dry sites may be replaced by shrub or broadleaf vegetation types if white spruce seed is not available. Crown fires can destroy seed-bearing cones. As fire intensity increases, survivability of aerial shrub stems decreases. Smoldering fires in root systems of mature white spruce can result in substantial blowdown following fire.

Plants possessing light, easily airborne seeds such as willow, birch, aspen, grasses and fireweed (*Chamerion angustifolium*) will readily invade burned areas. Sucker shoots from willow, alder, birch and aspen may encroach short distances into burned areas. Decadent tall shrubs will be stimulated by removal of dead stems and old growth in low to moderate intensity burns. Growth of herbaceous plants such as field horsetail and grass that were present pre-fire may be stimulated in low intensity burns

3.1.2.8.3.3. Broadleaf Forest and Mixed Spruce/Broadleaf

Broadleaf forest types occurring on the Refuge include paper birch, quaking aspen and balsam poplar.

- Aspen stands typically occur on dry south-facing slopes on the Refuge with an understory commonly including willow, kinnikinnick (*Arctostaphylos uva-ursi*) and fireweed (*Chamerion angustifolium*).
- Paper birch occurs on a wide range of upland sites. Birch generally grows on moister, cooler sites than aspen. On drier sites, lichens are an important component of the understory. On moist sites, alder, willow and field horsetail (*Equisetum spp.*) may predominate in the understory.
- Mixes of birch and aspen are found on moderately warm sites, generally as a mid-successional stage to climax white spruce forests. Prickly rose, graminoids and bearberry are common in the understory.
- Stands of balsam poplar occur on the river floodplains with willow, alder and graminoids common in the understory.

Mixed spruce/broadleaf forests are especially common on drier upland sites. This is normally a mid-successional stage of climax white spruce or black spruce forests. Tree components can include combinations of white spruce, black spruce, quaking aspen and paper birch. Elevation, aspect, drainage and successional stage of the site are important determinants of which coniferous and broadleaf trees are established. Plants common in the understory in mixed forests include willow, alder, bearberry, prickly rose, graminoids, and field horsetail.

Dead leaves and smaller branches cast from trees and shrubs are major contributors to the continuous litter layer on the forest floor. Since surface loading of dead fuels is low and is composed primarily of leaf litter, fires which occur in this fuel type are slow spreading and burn

with relatively low intensities. Fuel and soil moisture are commonly higher in this fuel type than in black spruce fuel types due to increased shading and forest floor leaf litter cover. Except under very dry conditions, broadleaf forests often serve as natural fire breaks for fires spreading into them from adjacent black spruce stands, because of the significant reductions in intensity and rate of spread. Crowning spruce fires will normally drop to the forest floor when encountering a broadleaf forest stand. Smoldering fire in root systems, punky downed logs and in standing dead or partially dead broadleaf trees can also occur. In mixed spruce-broadleaf forests, fire intensities generally increase in relation to the proportion and density of spruce within the stand.

Following fire, this vegetation type will generally replace itself. Broadleaf seedlings and shoots, willow seedlings and shoots, and invaders such as fireweed and field horsetail will re-establish first, with other herbaceous vegetation slowly returning via seed sources from outside the burn. The herbaceous stage will ultimately be replaced by a shrub stage and then a tree stage. In the tree stage, broadleaf trees will initially predominate, with white spruce usually increasing in dominance over time.

3.1.2.8.3.4. Tussock Tundra

Tussock tundra is dominated by tussock-forming sedges, usually tussock cottongrass (*Eriophorum vaginatum*) but sometimes Bigelow's sedge (*Carex bigelowii*). Tussocks are commonly 4-12 inches tall and 12-24 inches wide; vegetation between tussocks is comprised of low and dwarf shrubs, mosses (feathermoss and Sphagnum), and lichens (Viereck et al 1992). Tussock tundra can be a climax community in many areas, but tussocks can get overrun by mosses and shrubs. Fire may be necessary to maintain tussock tundra, particularly in southern portions of the interior.

The predominance of fine flashy fuels in this fuel type, especially substantial accumulations of cured graminoids common in tussocks, in combination with wind can result in fires with potentially high rates of spread and high intensities. Taller tussocks correspond with higher rates of spreads and intensities. Long term smoldering occurs only occasionally in root systems of shrubs present. Depth of burn into the organic layer is dependent primarily upon subsurface moisture, fine fuel moisture, and flaming front duration.

E. vaginatum can regenerate quickly following fire, often within the same year. The growing tips are protected from fire to a certain extent as they are within an insulating shield of dead and living plant material, sheaths, and scales; if the fire does not reach the growing tips, they quickly produce new stems. In very dry years, high intensity burns may kill the tussocks, leaving only burned tussock "stumps." If the tussock survives, new growth, including flower production, can be significantly stimulated by the removal of buildups of dead thatch, which helps to increase surface and soil temperatures, and increased nutrient availability.

3.1.2.8.3.5. Tall Shrub – Birch

Shrub birch is found on the Refuge in open boggy areas in association with ericaceous shrubs, labrador tea, sweetgale and sedges as well as on sub-alpine sites near tree line. Upland shrub birch will carry moderate to high intensity fires, especially with a well-developed grass, moss, lichen, and/or ericaceous understory. Floodplain shrub birch sites with ericaceous associates react to fire similarly to other open ericaceous sites.

3.1.2.9. Wildlife

The quality of habitat within the Refuge is reflected in its diversity and abundance of wildlife. Nearly 160 bird species (including 64 kinds of waterfowl and shorebirds), 39 mammal species, 16 fish species, and 1 amphibian species have been found on the Refuge (USFWS 1987).

The Refuge provides breeding habitat for more than 100 species of birds and serves as a migration corridor for birds breeding farther north and west. The Kanuti Flats was identified as a major breeding ground for white-fronted geese (*Anser albifrons*) in the early 1950s. This was an important factor leading to its designation as a national wildlife Refuge (USFWS 1987). Canada geese (*Anser canadensis*) also nest on the Refuge. The white-fronts winter in Louisiana, Texas and Mexico, while the Canada geese migrate to Washington and Oregon. Ducks banded on the Refuge migrate along all four North American flyways.

Thirty-nine species of mammals, representing 7 orders and 17 families, have been recorded on the Refuge. Some of the more noteworthy species include moose (*Alces alces*), caribou (*Rangifer tarandus*), black bear (*Ursus americanus*), brown (grizzly) bear (*Ursus arctos*), gray wolf (*Canis lupus*), marten (*Martes americana*), wolverine (*Gulo gulo*), lynx (*Lynx canadensis*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethica*), and snowshoe hare (*Lepus americanus*).

3.1.2.10. Hydrology

Abundant and diverse wetlands (including marshes, wet meadows, muskeg, lakes, ponds, rivers, and streams) are dominant features of the Refuge. The lowland Kanuti Flats region contains over 3,000 lakes and ponds, most of them smaller than 10 acres in size, and more than 1,800 miles of streams and rivers. See the Kanuti Fishery Management Plan (USFWS 1993) for descriptions of the types of water bodies on the Refuge. Sediment loads range from 10 to 100 parts per million in major streams in the flats and up to 500 parts per million in steep uplands. Dissolved solids average less than 200 milligrams per liter. Mean annual runoff for the region is very low, about 0.5 cubic feet per second per square mile. Exceptions are the Middle Fork and the South Fork of the Koyukuk River, and some of their tributaries, which have been actively mined for gold north of the Refuge border, in the Wiseman and Coldfoot areas (USFWS 1993).

3.1.2.11. Geology/ Hypsography

At least three glaciations have descended from the Brooks Range to the Refuge. As a result, the surficial geology of the Kanuti Refuge is largely composed of Quaternary and Pleistocene glacial deposits. Much of the Kanuti Flats region, especially along the major rivers, is covered by deep, poorly drained wind and water-deposited soils (histic pergelic cryaquepts) covered with a thick layer of peat. Also present are deep, well drained silts (typic cryorthents) and deep, well drained loess and silty or sandy, well drained loams (typic cryorthents). Intermediate elevations and higher alluvial fans have well drained, deep silt loams and fine sandy loams (typic fluvic cryofluvents) and deep, well drained silts (typic cryochrepts). Rolling hills in the area also have shallow, poorly drained soils with a thick peaty organic layer (histic pergelic cryaquepts); deep, well drained silty soils (typic cryochrepts); and rock outcropping of volcanic or sedimentary origin (SCS 1979, USFWS 1987).

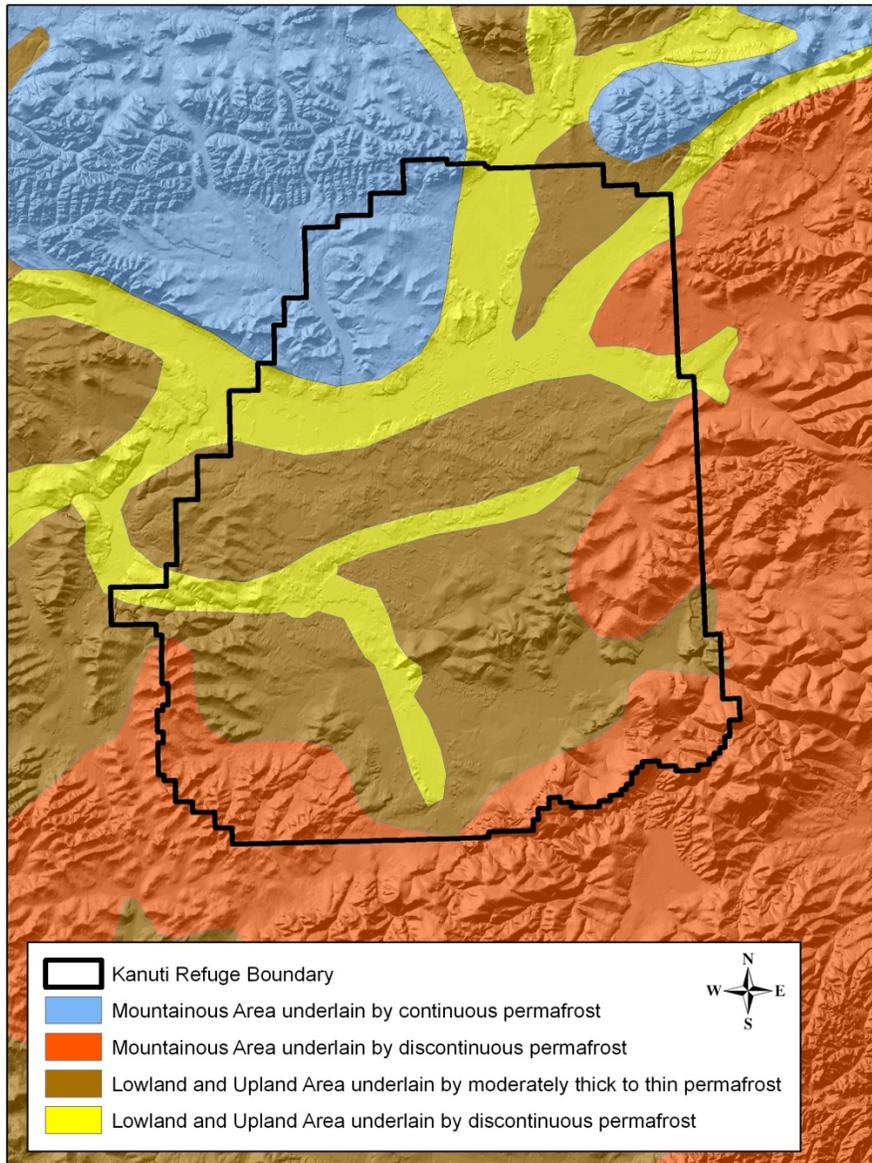


Figure 10: Distribution of permafrost in Kanuti National Wildlife Refuge and vicinity.

Permafrost is continuous under large parts of the Refuge and discontinuous elsewhere (**Figure 10**). Subsoils may be permanently frozen to depths exceeding 300 feet. Over the permafrost is the active surface layer of soil, duff, and peat, which thaws each summer. This layer may be from a few inches to several feet thick, depending on aspect, distance to a river, soil type, time since last wildland fire, vegetation type, and characteristics of the moss and litter layer. Soil drainage is poor in many places because of permafrost and lack of relief (USFWS 1987).

3.1.2.12. Humans & Human Activity

There are three primary categories of public use on the Refuge: subsistence use, recreational use, and commercial use, such as by air taxi operators. Subsistence uses are provided for by Alaska National Interest Lands Conservation Act (ANILCA) and account for the vast majority of public use on the Refuge. Subsistence users harvest more than 50 species of fish, mammals, birds, and plants (Marcotte and Haynes 1985, Sumida 1988). Priority recreational uses, dictated by the National Wildlife Refuge System Improvement Act of 1997, are "hunting, fishing, wildlife observation, and photography, or environmental education and interpretation." The main recreational activities are hunting, fishing, floating rivers, and incidental activities such as camping and wildlife observation (USFWS 1987). For a more detailed discussion of subsistence activities on the Refuge, see the Refuge CCP (USFWS 1987) and annual narrative reports (USFWS 1996a). Commercial air taxi operators fly recreational users, primarily hunters, into and out of the Refuge from Fairbanks and nearby communities.

A winter road extends 39 miles from Bettles to the Dalton Highway near Pump Station #5. The initial 3.9 miles of this road near Bettles are located on Kanuti Refuge proper (**Figure 1**). The Bettles winter road is used from January through March when there is sufficient snow cover to allow construction of a graded surface on frozen ground.

A winter snowmobile trail extends across the Refuge from Allakaket to Tanana. There are no other all-season trails or roads on Kanuti Refuge.

The Refuge provides an area in which local residents conduct subsistence activities, an area for them and others to ply commercial ventures, and a wild, remote area for recreationists. All recreation and subsistence uses depend on healthy habitat and wildlife populations.

The Refuge is mandated by ANILCA to provide for subsistence uses by local residents, and those uses have precedence over other consumptive public use (USFWS 1987). Subsistence uses are important not only for providing food, clothing, tools, and housing, but are important culturally and socially as well (USFWS 1987). The residents of the four list villages adjacent to the Refuge depend heavily on the Refuge's resources (Marcotte and Haynes 1985). Exact usage is not documented, because users often do not differentiate between Refuge land or Native corporation land, and many wildlife species move back and forth across these boundaries. Recent surveys have documented that 90–100% of households in the four area villages harvest wild resources, and that 450–680 pounds of wild resources are harvested for human consumption per person per year. Much larger amounts of fish are harvested for dog food (Sumida 1988, 1989; Sumida and Andersen 1990).

The Refuge has social importance beyond its value for subsistence and recreational activities. Although the area's remoteness and isolation result in relatively low levels of public use, those characteristics are important to many people (USFWS 1987).

Fish and wildlife that spend part of their life on the Refuge are also important to commercial, subsistence, and recreational users elsewhere. Salmon, waterfowl, migratory nongame birds, and caribou are important to people downstream on the Yukon, out on the Pacific, in Canada, in the Lower 48, and in Russia, Mexico, and Central and South America.

Cash-paying jobs are scarce in the Refuge area. Unemployment averages 32% in area villages, and 38% of people live below the poverty level (DLWD 2000). Cash incomes assist subsistence activities by allowing the purchase of supplies such as gasoline, oil, firearms, ammunition, tools,

and other materials. Economic exploitation of the Refuge is limited by law and by the nature of the area. Tourism, trapping, and commercial fishing take place on the Refuge.

Commercial harvesting of timber is not allowed on the Refuge (USFWS 1987). Although no commercial logging currently occurs in the area, white spruce stands on adjacent private lands are used for harvesting house logs.

Firefighting is and has been an important source of income for many local residents. Allakaket has two organized village emergency firefighting (EFF) crews that are called upon regularly in the suppression of large fires in Alaska and the Lower 48. These crews are trained to national standards. Gross earnings of local residents from firefighting have totaled more than \$1 million during the years 1985–1994 (latest figures available), although there is high annual variability because this income follows the boom-and-bust cycle of large fire years (Sylvester 1971).

The Refuge emphasizes involving local crews on appropriate fire management projects. Village crews may work on hazard fuel reduction projects, prescribed burning and a variety of natural resource projects. This work may include other emergency activities throughout the United States. For example, the Allakaket fire crew participated in Texas in the search for debris from the space shuttle Challenger disaster.

Further information on cultural resource sites within Kanuti Refuge can be found in other sources (Alaska Geographic 1983; Allen 1985; Andrews 1977; Clark 1996; Tobuk 1980)

3.1.3. Specific Values to Protect

3.1.3.1. Priority to Protect Human Life

Human life is the single, overriding value to be protected by actions authorized under this plan. Priorities for the protection of human communities and community infrastructure, other property and improvements, and natural and cultural resources will be incident specific, and will be based on the values at risk, human health and safety, and the costs of protection.

3.1.3.2. Communities and Other Adjacent Infrastructure

Communities in proximity to the Refuge include Alatna, Allakaket, Bettles, and Evansville. Allotments in the vicinity of Kanuti Refuge are trust lands under the jurisdiction of the Bureau of Indian Affairs (BIA). Titles to these parcels are held by individual Alaska Natives referred to as allottees. As trustee of these lands, the United States Government must ensure that these lands and their resources are maintained in perpetuity for the benefit of their Indian owners. One element of the trust responsibility is the protection of the land and resources from damaging wildland fires.

The Tanana Chiefs Conference (TCC), through an Indian Self Governance Compact, has assumed management of fire preparedness activities for allotments in the TCC service area, which includes the Kanuti Refuge. All allotments in the vicinity of Kanuti Refuge currently receive protection commensurate with the Full or Critical Fire Management Option. Allottees may authorize changes to the fire management option assigned to their allotment through the TCC fire program.

Whenever an allotment is threatened by fire, the Tanana Zone FMO will notify BIA directly, or through TCC of the threat. It will be the responsibility of the BIA to contact all current allottees and to keep them informed of the situation throughout the incident.

3.1.3.3. Adjacent Lands

All Refuge fire management decisions will consider impacts to neighboring landowners. The Fire Management Option for Refuge lands near some boundaries has been elevated in order to reduce the risk of fire spread and damage to neighboring values in Full and Critical Management Option lands. Neighboring landowners include:

Regional Native Corporations	
Doyon Regional Native Corporation	
Village Native Corporations	
Corporation	Village
K'oyitl'ots'ina Limited	Alatna/Allakaket
Evansville Inc.	Evansville
Other Ownership	
Native Allotment Owners	
Alaska Department of Natural Resources	
Bureau of Land Management	

Table 9: Kanuti NWR Adjacent Landowners

3.1.3.4. Refuge Infrastructure

3.1.3.4.1 *Refuge Repeaters*

The Service maintains a radio system that services Fairbanks, Kanuti NWR and Yukon Flats NWR. The system includes a base station on Ester Dome outside of Fairbanks and seven mountaintop repeaters, three serving Kanuti; three serving Yukon Flats; and one serving both Refuges. All repeaters are accessible by helicopter and will receive protection commensurate with the Full Fire Management Option. See **Appendix B** for radio system schematic including location coordinates.

3.1.3.4.2 *Refuge Remote Automated Weather Stations (RAWS)*

The Refuge maintains a permanent RAWS near its southern boundary. The Refuge RAWS will receive protection commensurate with the Full Fire Management Option.

3.1.3.4.3 *Bettles Bunkhouse*

The Bettles Bunkhouse was completed in 2007 on a parcel leased from Alaska Department of Transportation (AK DOT) to a replace a prior bunkhouse that burned in 2004. The building is owned and managed by the Refuge, though space is shared with the National Park Service. A

pair of solar arrays in the yard augments electrical power for the facility. The Bunkhouse is within the Critical Fire Management Option boundaries surrounding Bettles.

3.1.3.4.4 *Bettles Visitor Center*

The Kanuti NWR maintains an office in the National Park Service's Bettles Visitor Center. The Visitor Center is within the Critical Fire Management Option boundaries surrounding Bettles.

3.1.3.4.5 *Bettles Hangar*

The Kanuti NWR maintains a hangar for Bettles based aircraft, and includes a 2,000 gallon avgas fuel tank. The property is leased from AK DOT and is within the Critical Fire Management Option boundaries surrounding Bettles.

3.1.3.4.6 *Bettles Float Pond*

The Kanuti NWR maintains a cache, dock, and fuel tank at the Bettles float pond on a site leased from AK DOT. The float pond is within the Full Fire Management Option boundaries surrounding Bettles.

3.1.3.4.7 *Bettles Residence*

The Kanuti NWR maintains a residence for Bettles staff (currently the Refuge Pilot/Biologist). The property is leased from AK DOT and is within the Critical Fire Management Option boundaries surrounding Bettles.

3.1.3.4.8 *Marion Creek Cabin*

The Refuge owns and maintains a cabin at the BLM/NPS Marion Creek administrative site at Milepost 180 on the Dalton Highway. The property is within the Full Fire Management Option.

3.1.3.4.9 *Kanuti Lake Administrative Cabin*

An administrative cabin is located on Kanuti Lake. The cabin site will receive protection commensurate with the Full Fire Management Option and its estimated replacement value. The administrative cabin will be included in the AICC Known Sites database.

3.1.3.4.10 *Archaeological/Cultural/Historical Sites*

The Alaska Office of History and Archaeology (OHA) carries out the responsibilities of the State Historic Preservation Office. The National Historic Preservation Act of 1966 set up the position of State Historic Preservation Officer (SHPO) for each state, to be appointed by the Governor. In Alaska, the Governor has designated the Chief of the Office of History and Archaeology as the SHPO. OHA maintains The Alaska Heritage Resources Survey (AHRs), a restricted statewide inventory of Alaska's reported historic, prehistoric, and archaeological resources. This inventory of cultural resources includes objects, structures, buildings, sites, districts, and travel ways, with a general provision that they are over 50 years old. The fundamental use of the AHRs is to protect cultural resource sites from unwanted destruction. Various state and federal agencies and private companies use the inventory when planning or reviewing development projects. By knowing of reported cultural remains prior to construction, efforts can be made to avoid project delays and prevent unnecessary destruction of these non-renewable resources. Listing on the

AHRS does not, in and of itself, provide protection for sites. But it does allow for knowledgeable decisions to be made concerning the future of these sites.

Numerous cultural sites, including the Inupiaq (Kobuk) Eskimo hunting sites, Athabascan Indian fish camps, and remnants of turn of the century gold mining camps exist on the Refuge. However, few archaeological or historic sites have been extensively documented (Andrews 1977, Smith 1984, Hart Crowser and Associates 1985). Three sites are listed in the State of Alaska Heritage Resources Survey. These prehistoric sites include village and hunting sites. All such sites are now difficult to locate because they are hidden by moss growth, leaf litter, and thick plant growth, or because they have been obliterated by changing water courses or wildland fire.

Both Athabascan and Kobuk peoples lived in semi subterranean houses in the area (Clark 1996b). At least one known existing cemetery is associated with an old village site along the Koyukuk River within Refuge boundaries. Many other ancient sites have been destroyed and their artifacts redistributed by the meanderings of the rivers (West 1965).

As a result of Alaska Native Claims Settlement Act, the areas most heavily used by Native peoples within Refuge boundaries at the present time have been selected for conveyance or have already been conveyed to local village corporations or regional corporations (USFWS 2002). Many historic sites identified from records of the Alaska Historical Survey are on corporation, village, or private land (Andrews 1977). Known cultural sites are identified on Refuge fire maps. Documented sites will be included in the AICC Known Sites database and will be identified as **Full Historical**.

The Hulgothen Bluffs, thought to be a rich repository of Pleistocene fossils, have been identified as a “special value” area of the Refuge. The Bluffs are located on Fish Creek in the northeast corner of the Refuge. Fossilized remains of Pleistocene megafauna, buried in riverine or glacial lake sediments, have been recovered here (Smith 1984). Many of these fossils represent steppe-grassland species. The Bluffs may be an ideal site for excavation and study, although they have yet to be fully investigated.

3.1.3.5. Other Sites on Refuge Lands

3.1.3.5.1 Permitted Cabins

One cabin is currently permitted for trapping use on the Refuge. The *Region 7 Policy for Management of Permitted Cabins on National Wildlife Refuges in Alaska (RW-1)* states that, “the Service does not guarantee protection of a permitted cabin or its contents in the event of fire. Public and firefighter safety is the first priority in wildland fire activities and decisions. Firefighter safety will not be compromised for structure protection.

Current cabin permittees will be authorized to establish defensible space around the permitted cabin/structure using Alaska Wildland Fire Coordinating Group Fire Wise standards. New permits for cabins may be issued without authorizing Fire Wise standards because of other resource concerns. In all cases, the cabin permit must clearly state that the permittee understands the inherent risk in wildfire and that the cabin and its contents may not be protected in the event of a wildfire.”

Permitted cabins will be included in the AICC Known Sites database and will be identified as **Full Structure**.

3.1.3.5.2 *Unpermitted/Abandoned Cabins*

Unpermitted or abandoned cabins on Refuge lands will not be protected except on a case by case basis with Refuge Manager approval and Incident Commander concurrence. Known unpermitted/abandoned cabins will be included in the AICC Known Sites database and will be identified as **Non-Sensitive Structure**.

3.1.3.5.3 *Trails*

Trails within the Refuge may provide opportunities for low impact holding lines. Trails may also require Emergency Stabilization action, and/or post fire Burned Area Rehabilitation to clear deadfall following the passage of a fire or identify and eradicate invasive species.

3.1.3.5.4 *Subsistence Values*

An important purpose of the Refuge is to provide subsistence opportunities for local residents. Wildland fire may have both positive and negative effects on subsistence resources and infrastructure. Although periodic fire often increases habitat diversity and encourages species productivity leading to increased subsistence opportunities, large fires may temporarily decrease productivity in certain areas. The effects of fires on established trails and camps must also be considered.

3.1.3.6. Refuge Lands and Natural Values

3.1.3.6.1 *Natural Diversity*

Conservation of fish and wildlife populations and habitats in their natural diversity, including, but not limited to, waterfowl, raptors and other migratory birds, furbearers, moose, and caribou is one of the primary purposes for which the Kanuti National Wildlife Refuge was established. Thus, habitat diversity and species productivity within the Refuge and throughout the Upper Yukon Valley are the core natural resource values that the Refuge fire management program is designed to protect. These values are largely dependent on the continued existence of a relatively natural fire regime.

3.1.3.6.2 *Sensitive Biological Communities*

3.1.3.6.2.1. *Old Growth Spruce/Lichen Forest*

In 2003, approximately 160,000 acres in the central portion of Kanuti Refuge were designated as a special area intended to limit or exclude wildland fire from burning old growth lichen and spruce. The area was managed to maintain old growth lichen-spruce habitat through a change in the fire protection level from “limited” to “modified” suppression over a 260,000 acre area. By utilizing more aggressive fire suppression options early in the fire season, it was hoped that the potential for large fire growth would be limited, hence maintaining an area of unburned lichen-spruce habitat (USFWS 2006, page 47). This action was intended to maintain Refuge habitat for wildlife species such as caribou that use lichen woodland areas that have not burned in 80-100 years (Rupp et al. 2006).

No threatened or endangered plant species are known to occur on the Kanuti Refuge. However, the yukon aster (*Aster yukonensis*), a candidate for threatened or endangered species listing, has been found on the Koyukuk River south of Bettles, just north of the Refuge boundary.

3.1.3.6.2.3. Steppe-bluff Communities

The Kanuti Canyon, located in the extreme southwestern portion of the Refuge, supports rare plant communities. The north-facing slope of the canyon is covered with a wet taiga community, whereas the south-facing slope maintains a steppe-bluff community. Steppe-bluff communities in this part of Alaska are generally restricted to steep, south-facing bluffs near larger rivers and are quite unique in comparison to surrounding boreal forest communities (USFWS 2002). These steppe-bluff communities in the Kanuti Canyon contain sagebrush and grasses and drought-tolerant forbs. The cliffs of the Kanuti Canyon also provide unique nesting habitats for birds of prey and support higher concentrations than the surrounding boreal forest areas. The steppe-bluff community is mapped on interagency fire maps.

3.1.3.6.2.4. Raptor Nesting Sites

River corridor bluffs, snags, and open summits may host raptor nests including peregrine falcon nests. Although wildland fire is unlikely to adversely affect nesting sites, fire management and other actions undertaken in and around these locations may have negative effects. Disturbance of known nesting sites will be avoided during fire management activities. Known raptor nesting sites will be identified in the Statewide Known Sites database as **Avoid T&E Species**. Any raptor nests discovered during fire management activities should be reported to Refuge biologists.

3.1.4. Communications

Refuge resource, prescribed fire, and fuels treatment communication will take place on the Fairbanks-based Refuges VHF radio system which includes communication with the NPS Visitor Center in Bettles (**Appendix B**).

Fire communications will take place on the AFS-BLM fire communications system. Prescribed fire reporting and flight-following in fire areas may also use the fire system. See the *Eastern Interior Annual Dispatch and Preparedness Plan* (**Appendix C**) for details.

3.1.5. Safety Considerations

Public safety is a critical concern in all aspects of the Refuge fire management program. One way that the Refuge seeks to improve public safety is by managing wildland fire so that hazardous fuels are broken up or reduced. The main benefit of this hazardous fuels reduction activity is in the protection of villages and specific sites from burning.

People may have to leave villages because of fire for a variety of reasons. Smoke may require evacuation of all residents or only those who are particularly sensitive to smoke (e.g., very young or old, asthmatic). In addition, there may be a precautionary evacuation because of fire threat, or there may be an evacuation under imminent threat from fire. The FWS may assist with developing evacuation plans.

There are no developed recreational sites on the Refuge. Refuge staff are unable to notify recreational users of hazards because the users are widely scattered, and their locations are not

known to Refuge staff. Nearly all recreation is associated with river systems, which provides high mobility and will allow recreational users to avoid fire and smoke.

3.2. Bettles Interface, Allakaket Interface, and Sithylemenkat Lake FMUs

3.2.1. Bettles Interface, Allakaket Interface, and Sithylemenkat Lake FMUs Description

Just over 2.5% of land within the Refuge boundary has been designated in Full Management with less than 1% in critical option (**Table 1**). These lands encompassing the Critical zones are near the Refuge boundaries where defensible boundaries were used (rivers) rather than the administrative boundary.

All fuel types are present in the Interface Units. Dominant types include lowland white spruce, hardwoods, and willow shrublands, although some large areas of black spruce/stunted white spruce are also present (**Figure 9**).

The suppression status of these Critical and Full Option designations may eventually result in hazardous fuel accumulations around the settled areas over the long term as fuel loadings increase. Hazard situations in two neighboring villages to Kanuti Refuge have been identified and mitigated by mechanical treatments in 1997-2007.

3.2.2. Bettles Interface, Allakaket Interface, and Sithylemenkat Lake FMUs Values to Protect

Wildland fires in these units have high priority for suppression resources and the fires initially receive aggressive suppression action to minimize fire acres (**Table 1**). Safety and protection of identified sites or structures is a priority.

Minimizing the acreage burned in the Full management option areas is an objective during initial attack, but costs should be an important factor in selecting strategies and tactics for extended attack and escaped fires.

3.2.3. Bettles Interface, Allakaket Interface, and Sithylemenkat Lake FMUs Fire Management Guidance

Wildland fires in these units have high priority for suppression resources and the fires initially receive aggressive suppression action to minimize fire acres (**Table 1**). Safety and protection of identified sites or structures is a priority.

3.3. Kanuti Modified FMU

3.3.1. Kanuti Modified FMU Description

The Kanuti Modified FMU contains large sections of lowland marshes and wetlands. This modified unit was expanded by Kanuti Refuge staff in 2006 in the Lower Chalatna area to protect additional lowland caribou lichen habitat after the Old Dummy Fire (2005) and Clawanmenka Fire (2004) burned much of the area (**Figure 6**). Other fuel types present in this unit includes white spruce, hardwoods, and willow shrublands along the rivers (**Figure 9**). Some

large areas of black spruce/stunted white spruce are also present in the Henshaw Creek drainage in the Northwest area, which burned in 1991 (**Figure 6**).

Until the very dry summer of 2004, only portions of this largely lowland unit had burned since fire suppression began in the early 1950s in the area now within the Kanuti Refuge. Most of this modified area, with the exception of the Bettles Uplands and the Northwest area, lies in the wetlands between the two major rivers (**Figure 2**).

3.3.2. Kanuti Modified FMU Values to Protect

Allotments receive Full protection. Protection of remaining old-growth spruce/lichen habitat will be considered in fire management decisions.

3.3.3. Kanuti Modified FMU Fire Management Guidance

Refer to **Table 1** for specific fire management goals and objectives for this FMU. Prior to July 10, fires in this unit are to be suppressed unless under special circumstances, such as weather conditions, higher priority fires elsewhere in the vicinity or shortages of available suppression resources. As a general rule, fire management units with modified designations may be allowed to burn after the normal evaluation/conversion date of July 10, since normal seasonal change is likely to extinguish or reduce fire activity and size. This date is evaluated annually based on current and forecasted weather as well as current fire activity and fire resource availability.

3.4. Kanuti Limited FMU

3.4.1. Kanuti Limited FMU Description

This unit contains southern and eastern upland areas of the Refuge to include Hodzana Highlands, Ray Mountains, and Indian River. All fuel types are present in this unit but the dominant types include black spruce/stunted white spruce as well as the herbaceous or shrub types caused by recent burns. Extensive portions of this unit (e.g., Hodzana Highlands; Ray Mountains) burned during the years of 1990–1992 (**Figure 6**).

3.4.2. Kanuti Limited FMU Values to Protect

The Refuge purposes include managing to maintain natural habitat diversity. Human-caused wildland fires, however, be they accidental or intentional, have also affected the landscape for centuries (Lutz 1956, Pyne 1982). Management of human-caused fires will be based on other factors, including protection of human life, property, and identified values, as well as suppression costs and potential damage from suppression operations. Human-caused wildland fires will not be managed for resource purposes, but will be suppressed.

3.4.3. Kanuti Limited FMU Fire Management Guidance

Refer to **Table 1** for specific management objectives. Fires may be allowed to burn for resource benefits in this unit to maintain the current natural vegetation regime.

It is not uncommon for large acres of land in a given area to be burned by a few fires during periodic severe fire years. Limits may be placed on the number of wildland fires burning at one time or on the cumulative acreage burned during a year. Decisions to suppress fires in this FMU

may be based not only on the number of fires burning and acreage burned, but such decisions will also be predicated by the anticipated fire behavior, the weather prediction, the acreage likely to be burned, and the direction in which the fire is moving. The decision process also includes existing and anticipated smoke problems, the likelihood of the actions' success, as well as the experience and judgment of the Refuge FMO and AFS zone personnel, and the decisions of the Multi-agency Coordinating Group (MAC Group)(see below). Non-standard decisions such as suppressing a fire in Limited or allowing a fire to burn in Modified before the conversion date will require documentation with a Decision Criteria Record (AWFCG 1998). This will be prepared jointly by the Kanuti Refuge FMO and the suppression FMO.

4. Wildland Fire Operational Guidance

The national policy and procedure guidance in the current edition of the *Interagency Standards for Fire and Fire Aviation Operations*, (Red Book) is incorporated into this plan, and must be followed. Alaska operational guidance for the management of fires is located in the Alaska Interagency Annual Operating Plan (AOP).

4.1. Management of Wildfires

Initial response to Refuge fires will be carried out according to the procedures and guidelines in the *Alaska Interagency Wildland Fire Management Plan* (AIWFMP). All wildfire management decisions will include consideration of risks to public and firefighter safety, threats to the values to protect, costs of various mitigation strategies and tactics, and potential wildfire benefits.

4.1.1. Staffing

The Eastern Interior Refuges District includes Kanuti Refuge, along with Arctic, Tetlin, and Yukon Flats Refuges. The District shares fire management staff duty stationed in Tok and Fairbanks. All positions are currently funded through the Kanuti cost center.

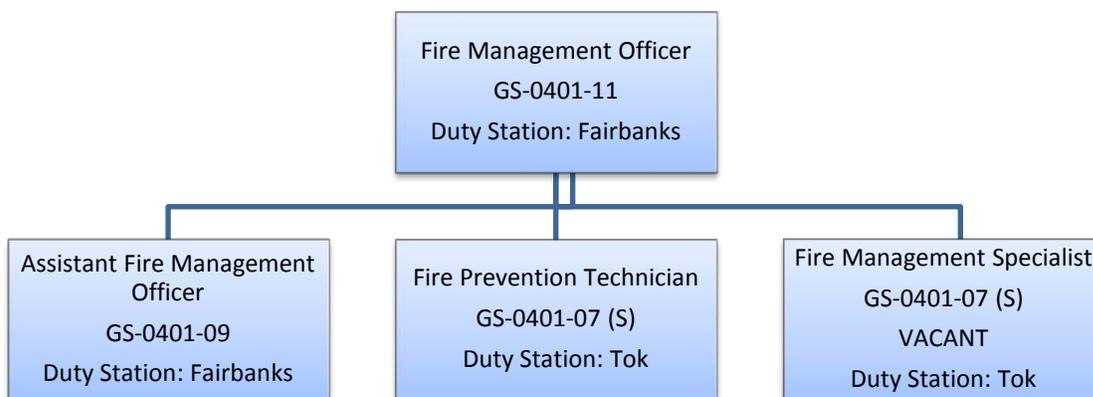


Figure 12: Eastern Interior Refuges fire management staffing

The Fire Management Officer (FMO), duty stationed in Fairbanks, is supervised by the Kanuti Refuge Deputy Manager. Refuge Managers from each of the Eastern Interior Refuges delegate specific fire management duties and responsibilities to the FMO (**Appendix E**). In addition, the incumbent takes an active role in fire management activities on the Refuges, cooperating and coordinating with the appropriate protection agency - Alaska Division of Forestry (DOF) for Tetlin, and Alaska Fire Service (BLM-AFS) for the other three Refuges including Kanuti, as well as with incident management teams (IMTs). The FMO is responsible for providing Refuge Managers with up to date fire information and for advising them on fire management decisions.

The Assistant Fire Management Officer (AFMO) is also duty stationed in Fairbanks, assists with overall program management, and serves as acting FMO when the FMO is assigned to fires or otherwise absent. The AFMO and FMO rotate duty officer responsibility during the fire season.

The Fire Management Specialist, duty stationed in Tok, is currently vacant. The incumbent is primarily responsible for coordinating fuels reduction projects, managing agreements in order to

accomplish treatments, and field supervision of the Fire Prevention Technician (FMO retains official supervisory duties).

The Fire Prevention Technician duty stationed in Tok works closely with the Tok Area DOF counterpart to implement Refuge specific prevention and outreach efforts and assist with local Community Wildland Fire Protection Plan (CWPP) efforts. The incumbent has primary responsibility for maintenance of the Refuge cache and Type 5 engine. The Fire Prevention Technician is a shared position and is also responsible for providing prevention services to the other three Refuges including Kanuti.

Due to limited fire program staffing, most prescribed fire and mechanical fuels treatments require outside assistance. Qualified Service personnel from other Refuges and programs, interagency partners, and assistance agreement cooperators play key roles in treatment accomplishment. Fire program and other qualified personnel may be available for Local, Regional and National fire assignments with supervisory approval.

The Regional Office in Anchorage has a fire management staff to assist the Refuge with fire ecology and fire research needs, fire planning, outreach and public information, and fuels management. Regular communication between Refuge staff, the Regional Fire Coordinator, and other Regional fire program staff provide for two-way information flow between the Refuge, the Region, and other Regional fire programs.

4.1.2. Training and Qualifications

Refuge personnel will meet *National Interagency Incident Management System Wildland Fire Qualification System Guide, PMS 310-1* training, experience, and fitness levels for prescribed fire and suppression positions. All personnel funded with fire funds who are hired under a position description containing firefighting duties will meet PMS 310-1 requirements for the appropriate fire position. Individuals will not be assigned to duties for which they lack training and qualification. All personnel hired as primary firefighters must meet the arduous fitness standard to maintain full fire funding and if the position is career status, arduous is required to meet special retirement considerations for fire. Additional training policy and guidance is available in the *Interagency Standards for Fire and Fire Aviation Operations* and in the *U.S. Fish and Wildlife Service Fire Management Handbook*.

4.1.2.1. Incident Qualifications and Certification System

The Eastern Interior Fire Management Officer is responsible for input and maintenance of all pertinent Refuge employee data into the Incident Qualifications and Certification System (IQCS), and for ensuring that employees are trained, qualified, and certified at levels which meet preplanned needs for appropriate management response, initial attack and prescribed fire, and for ensuring the accuracy of annual Incident Qualification Cards.

The Eastern Interior FMO has been delegated the duties of the Certifying Official from the Refuge Manager (**Appendix E**), and confirms through the issuance of an incident qualification card that an individual is qualified to perform in a specified position. The Incident Qualification Card has a currency of 12 months. Current fire qualifications for fire program and collateral duty employees will be documented annually in the Eastern Interior Preparedness/ Dispatch Plan (**Appendix C**).

Only PMS 310-1 and USFWS specific positions are approved for use by agency employees. IQCS Account Managers will proactively maintain organization codes for which they are responsible. Employees that are no longer employed by the FWS should be placed in INAC upon termination of duty.

4.1.2.2. National Incident Management System (NIMS) Training Requirements

Service personnel, who may become involved in emergency response activities, including wildland fire, are required to meet minimum training requirements established by the Department of Homeland Security in order to be NIMS compliant. Information regarding specific position requirements is outlined in the Service NIMS required training memorandum from the Director dated December 5, 2008 and the DOI Bulletin dated May 31, 2007.

4.1.2.3. Interagency Fire Program Management (IFPM) Requirements

Service personnel in IFPM covered positions must meet the NWCG qualification and additional required training requirements identified for their positions. Minimum qualification standards for Eastern Interior Fire Management positions is as follows:

Position	IFPM Position Standard	IFPM Complexity
Fire Management Officer	Unit Fire Program Manager	Moderate
Assistant Fire Management Officer	Wildland Fire Operations Specialist	Low
Fire Management Specialist	Prescribed Fire Fuels Specialist	Low
Fire Prevention Technician	N/A	N/A

Table 10: Eastern Interior Fire Program IFPM Standards

Information regarding specific position requirements is available at <http://www.ifpm.nifc.gov/>.

4.1.2.4. Physical Fitness and Conditioning

Employees serving in wildland fire positions that require a fitness rating of arduous as a condition of employment are authorized one hour of duty time each work day for physical fitness conditioning. Employees not having a fitness rating of arduous as a condition of employment, but who are required by a Critical Performance element or other written agreement to maintain an arduous level, will be authorized three hours per week of duty time for physical fitness condition. All other wildland firefighting personnel holding qualifications requiring ratings of moderate or arduous may be authorized, by their supervisor, up to three hours per week of duty time for fitness conditioning. Prior to any duty time being allowed for physical fitness conditioning, employees and supervisors must agree, in writing, what physical conditioning activities the employee will engage in, and when and where they will occur (**Appendix H**). Activities outside of the agreement will not be authorized or allowed. A combination of activities designed to increase both physical strength and aerobic fitness, while minimizing the possibility of physical injury, should be utilized.

4.1.3. Preparedness

Annual preparedness activities are documented in the *Eastern Interior Refuges Preparedness/Dispatch Plan (Appendix C)*.

4.1.3.1. Delegation of Authority to Fire Management Officer

The Refuge Manager will annually provide the Fire Management Officer a written delegation of authority to perform fire management duties for the Refuge. See (**Appendix E**).

4.1.3.2. Preparedness Planning

Eastern Interior Refuges Fire Preparedness Level will mirror the statewide preparedness level identified in the AICC Daily Situation Report. National preparedness levels will be identified in the NICC Situation Report. The *Eastern Interior Refuges Preparedness/Dispatch Plan (Appendix C)* will identify step up actions to be taken when these preparedness levels change.

4.1.3.3. Equipment and Supply Levels

The Eastern Interior Fire Management program maintains a 6 person cache and a Type 6 engine at the Tetlin NWR Headquarters in Tok. Normal Unit Strength is identified in the *Eastern Interior Refuges Preparedness/Dispatch Plan (Appendix C)*.

4.1.3.4. Communications

All Wildfire radio communication for Refuge and other Tanana Zone fires will take place on the BLM Alaska Fire Service radio network. Prescribed fire and other fuels project communications will normally be conducted on the Refuge radio network; however, interagency projects and communications with the Upper Yukon/Tanana Dispatch Center will occur on the BLM AFS network. Telephone contacts and radio channel plans appear in the *Eastern Interior Refuges Annual Dispatch/Preparedness Plan (Appendix C)*

4.1.3.5. Aviation Management

The Refuge aviation program primarily supports resource missions and is not under fire management control. Refuge aircraft may sometimes be used to perform fire related missions including detection, fire reconnaissance, and logistical support at the request of the protection agency. Air crew and passengers will be appropriately briefed prior to performing fire related missions. All fire-related aviation operations will follow applicable guidelines of the DOI Office of Aircraft Services (OAS). All fire-related Refuge aviation activity will coordinate with the Upper Yukon/Tanana Dispatch Center.

Refuge personnel performing fire-related aviation missions in cooperator aircraft will meet DOI standards and will additionally comply with cooperator policy and procedures when they are more stringent than DOI policy.

4.1.3.6. Fire Detection

Detection services for the Tanana Zone including the Refuge are the responsibility of the protection agency – BLM AFS, Tanana Zone. Detection flights are scheduled based on area lightning detections and fire danger rating, and are often combined with reconnaissance of ongoing fires. At the request of Tanana Zone, Refuge aircraft and/or personnel may be used to

perform detection missions. An aircraft resource order/ request number (A-number) will be issued by the local dispatch center if the Refuge is charging flight time to the detection flight or a specific fire.

4.1.3.7. Initial Report of Fire and Initial Response Dispatching

The Upper Yukon/Tanana Interagency Dispatch Center (AK-UYTC) will be responsible for initial attack dispatching on all Refuge fires. The Center will operate from 08:00 to 18:00 hours, 7 days per week. Center season and hours will be extended as needed and an after-hours contact protocol will be included in the *Eastern Interior Refuges Annual Preparedness/ Dispatch Plan (Appendix C)*. The Alaska Interagency Coordination Center (AICC) will be responsible for dispatching outside of AK-UYTC's operating season.

Upon discovery of a fire, AK-UYTC is responsible to determine, verify and document the incident location, management option, and cause, and implement the initial response based on the management option designation as described in the AIWFMP and mapped on the Map atlas maintained by AICC. Notification procedures are addressed in the AIWFMP and Clause 24 of the Alaska AOP and can be summarized as follows:

Fire notifications are required to the jurisdictional agency for any fires occurring on federal lands and Alaska Native village and regional corporations lands. A Wildland Fire Decision Support System (WFDSS) entry by the Protecting Agency, as described in **Section 4.1.4.6**, is required as part of the notification process. The following notification protocols will be followed:

- When a fire occurs on Refuge lands, the Refuge FMO or Duty Officer will be notified promptly by phone or other pre-arranged contact method.
- When a fire occurs on non-Service lands but threatens to burn onto Refuge lands, the Refuge FMO or Duty Officer will be notified.
- As a courtesy, the Refuge FMO or Duty Officer should be notified when a fire occurs within five miles of the Refuge ANILCA boundary.
- The Refuge FMO or Duty Officer will be notified of all false alarms and natural outs reported on Refuge lands.

All notification attempts should be documented. The notification process should not delay any initial response necessary within AIWFMP guidelines; however a non-standard response should not be initiated until the Refuge Manager or designee has been consulted, unless life or property are immediately threatened. AK-UYTC will initiate WFDSS documentation for all Refuge fires and will transfer ownership to the Refuge FMO or Duty Officer. At a minimum, fire notification will include the following information:

- DOI Fire Number
- State Fire Number (only applicable if State resources are assigned to the fire)
- Fire Name
- Management Option
- Date and Time Fire Reported
- Geographic Coordinates (Latitude/ Longitude)

- Legal Description (¼ ¼ Section, Township, Range, Meridian)
- Current Size
- Fuels
- Values Threatened

Initial response to Refuge fires will be in accordance with the AIWFMP procedures. Non-Standard responses will be approved by the Refuge Manager unless threats to life or property preclude this. Non-standard responses will be documented through a decision in the WFDSS process.

Reports of fires occurring in the Tanana Zone should be made directly to AK-UYTC or to the after-hours duty-officer at **1-800-237-3652**. The following information should be recorded before the person reporting the fire hangs up or leaves:

1. Name, phone number, and calling location of person reporting the fire:
2. Date and time report is received: / / AM/PM
3. Date and time fire was observed: / / AM/PM
4. Immediate threats/hazards:
5. Estimated fire size: (acres or length x width in feet).
6. Fire location (be as specific as possible, e.g. lat./long, street name, milepost, homeowner's name, etc.):
7. Topographical features (hillside, valley bottom, ridge top, etc.):
8. Fire behavior (i.e. smoldering, surface fire, torching trees, etc.):
9. Smoke color, direction of spread, and column description:
10. Anyone observed in the fire area or leaving the scene? (vehicle description, license #, etc.)
11. Fuel type (spruce, brush, tundra, dump, etc.):
12. Name of person receiving or recording this report:

When a fire is reported directly to Refuge personnel the reporting party should be kept available while the Upper Yukon/Tanana Zone Dispatch Center is called (on another line if necessary). If this is not possible, the information should be recorded and relayed to the AK-UYTC fire dispatcher immediately.

4.1.3.8. Incident Commander Responsibilities

Operational control of a Refuge wildfire is the responsibility of BLM AFS Tanana Zone. The Tanana Zone FMO will assign a qualified Incident Commander (IC) and provide supervision and support including oversight, direction and logistical support. When a fire is not staffed, the Tanana Zone FMO will retain operational control and will be the de facto Incident Commander. Tanana Zone will be responsible for fulfilling daily interagency incident reporting requirements directed in the AIMG and will complete the final fire report which will be provided to the Service.

The IC is a single individual responsible to the Tanana Zone FMO for all incident activities, including the development of incident management strategies and tactics, and the ordering, deployment, and release of resources. For fires on Refuge lands the Tanana Zone FMO is then responsible to the Refuge Manager. 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 management by suppression and/ or by wildfire for resource benefits as incident objective(s) and contact the Tanana Zone FMO with recommendations which will be relayed to the Refuge Manager.
- Use 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 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 for a 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 Refuge 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 the point of origin will be protected and the Refuge Manager will be consulted regarding further investigative actions.

4.1.3.9. Mutual Aid and/or Cross-Boundary Operations

4.1.3.9.1 *BLM AFS / Yukon 10 Mile Border Corridor Initial Attack Agreement*

This agreement allows protection agencies in Alaska and Canada to commence initial attack activity on any wildland fire within ten miles of either side of the border between the Alaska and the Yukon Territory.

4.1.3.9.2 *Northwest Wildland Fire Protection Agreement (Northwest Compact)*

Canadian resources may be ordered by DNR under the terms of the *Northwest Wildland Fire Protection Agreement* (Northwest Compact). While in Alaska, those resources must remain under the operational control of DNR unless inspected and certified by the appropriate federal agency.

4.1.4. Incident Management

4.1.4.1. Dispatching Beyond IA

The IC will notify AK-UYTC whenever it appears a fire will escape initial attack efforts, cross Service boundaries, or when fire complexity will exceed the capabilities of command or operational forces. When additional resources are needed, they will be ordered through the AK-UYTC, which will mobilize any additional resources, including higher level ICs and Incident Management Teams.

AK-UYTC or the Tanana Zone FMO will notify the Eastern Interior Duty Officer who will notify and provide technical assistance to the Refuge Manager through the decision making process:

- Assisting the Refuge Manager to complete a WFDSS analysis.
- Assisting the Refuge Manager to complete a Delegation of Authority for Type 3 and higher complexity incidents.

4.1.4.2. Delegation of Authority to Incident Commander (IC)

The Master Agreement will serve as the Delegation of Authority from the Refuge Manager to Tanana Zone to implement initial response activities in accordance with the AIWFMP. A written delegation will be developed jointly by the Tanana Zone FMO and the Refuge Manager with the assistance of the Eastern Interior FMO for All Type 1, 2, and 3 complexity fires. The delegation will be jointly signed by the Tanana Zone FMO and the Refuge Manager.

Tanana Zone and Kanuti NWR will participate in IMT in-briefings to provide information on local issues, personnel, facilities and identify key representatives. Tanana Zone will authorize and provide oversight for incident resources regardless of the complexity level and will assign a liaison to out-of-state IMT Type 1 & 2. Kanuti NWR may assign Resource Advisors and/or an Agency Administrator Representative.

Tanana Zone and Kanuti NWR will be given timely notification and will participate in IMT closeouts. Each agency may contribute to the written evaluation of IMTs' performance in the implementation of the direction contained in the Delegation of Authority. Lessons learned will be included as an Interagency Fall Fire Review agenda item. IMTs will be provided written After Action Reviews.

See the current Red Book for supporting guidelines including an Agency Administrators Briefing to an IMT. **Appendix F** displays a Sample Delegation of Authority from Agency Administrator to Incident Management Team.

4.1.4.3. Minimum Impact Suppression

No Changes.

4.1.4.4. Resource Allocation and Prioritization

Initial Attack priorities will be based on the following:

- AIWFMP Management Option
- Values at risk

- Resource Availability

Fire resources will be allocated and prioritized based on procedures outlined in the Alaska Statewide Annual Operating Plan. Under Alaska Preparedness Levels 1-3, the Protecting Agencies' fire operation leads set resource allocation priorities; under Preparedness Levels 4 and 5, the AMAC determines those priorities. Reference AMAC Handbook:

<http://fire.ak.blm.gov/administration/mac.php>

and Alaska Preparedness Levels in the AIMG:

<http://fire.ak.blm.gov/logdisp/aimg.php>

4.1.4.5. Regulatory Compliance for Managing Unplanned Ignitions

NEPA analysis is not required for wildfires because they are unplanned events. Suppression activities are Categorically Excluded from NEPA (516 DM 8.5(5)).

No endangered species or critical habitat on the Refuge are likely to be impacted by wildland fire or by fire management actions; however, restrictions may be placed on suppression aircraft flyover altitudes of certain waterfowl and raptor nesting areas depending upon time of year and amount of flyovers required.

Smoke assessments are the responsibility of both the Tanana Zone and Kanuti NWR. The need for air resource advisors is increasing and additional technical expertise for addressing air quality and health related issues may be available through the DEC. The AWFCG-approved "Smoke Effects Mitigation and Public Health Protection Protocols" are available at:

<http://fire.ak.blm.gov/administration/awfcg.php>.

For current smoke information, forecasts, regulations, advisories, and educational materials, refer to the DEC website:

<http://www.dec.state.ak.us/air/anpms/index.htm>.

The *Alaska Enhanced Smoke Management Plan for Planned Fire* (ESMP) was developed by DEC in coordination with the AWFCG Air Quality Committee. The ESMP and its appendices are located at:

http://fire.ak.blm.gov/administration/awfcg_committees.php.

The ESMP outlines the process and identifies issues that need to be addressed by DEC and federal and state agencies or private landowners/corporations to help ensure that prescribed fire activities minimize smoke and air quality problems. The ESMP Appendices provide additional assistance for interagency sharing of information, the applicability and availability of current smoke management techniques, monitoring protocol, public education strategies, and emission reduction techniques.

4.1.4.6. Use of Decision Support Tools

Decisions for extended response, non-standard responses and escaped prescribed fires will be documented using the Wildland Fire Decision Support System (WFDSS), and will support the objectives listed in the AIWFMP and the Refuge Fire Management Plan. Tanana Zone will initiate the WFDSS process by entering the required information into the Incident Information tab within the WFDSS program. Tanana Zone will transfer the "ownership" as defined within

WFDSS to the Refuge WFDSS contact; both Tanana Zone and the Refuge will work collaboratively to complete documentation as required. For all incidents:

- Public and firefighter safety issues will continue to be the primary consideration.
- Tanana Zone and the Refuge will jointly complete a complexity analysis or operational needs assessment to determine the management level of the incident.
- Tanana Zone will authorize and provide oversight for all incident resources regardless of the complexity level.
- Operational guidelines for special management considerations are contained in the AIWFMP and in this FMP.
 - No retardant will be used on federal lands without prior approval of the agency administrator unless there is an immediate threat to life.
 - Each agency's structure and site protection policies will be reviewed and applied as directed by the Refuge Manager and based on priorities, the overall statewide fire situation and resource availability.
- IMT in-briefings and close-outs will be conducted jointly with Tanana Zone as the lead.

Approval authority for WFDSS decisions rests with the Refuge Manager. Tanana Zone may develop and implement incident tactics based on verbal approval from the Refuge FMO or Refuge Manager while WFDSS approvals are being finalized. WFDSS decisions exceeding two million dollars will additionally require BLM approval of costs with a CC to the FWS Region 7 Fire Management Coordinator. Tanana Zone will notify the Refuge when costs are approaching approval thresholds.

4.1.4.7. Wildfire Reporting Requirements

Accurate and timely completion of the Incident Status Summary is a critical factor in the allocation of available resources during multiple fire situations. The information included on the form often determines the priority of a given fire, and thus its share of the resources available.

Reports are generally required for incidents where life and/or real property are threatened or destroyed, on incidents with high resource damage potential, and complex incidents that could have political ramifications. Reports are filed on a daily basis until the incident is declared controlled. In addition to the national standard, Alaska requires an Incident Status Summary (ICS 209) for all fires (whether in Critical, Full, Modified or Limited) that have a commitment of 17 or more personnel for more than one burning period (overnight). ICS 209s are the primary source of Alaska fire activity information for national fire managers. AK-UYTC is responsible for completing ICS 209s in the event that the Incident Commander fails to submit one. Alaska ICS-209's should be submitted by 10:00 p.m. (2200 hrs.) Alaska DST.

The Alaska Interagency Coordination Center may also request ICS 209s for other fires not covered by the above criteria as determined by the Predictive Services section. Managers determine the allocation of firefighting resources on a national basis. ICS 209s are therefore an essential element in our ability to obtain national resources such as smokejumpers, airtankers, helicopters, and type 1 crews.

Fires with Resource benefit acres will be documented in the National Fire Plan Operations and Reporting System (NFPORS) by the FMO. For all wildland fires, a Fire Management Information System (FMIS) report will be submitted by the Refuge FMO within five days of receiving the final fire report from AICC or the burn boss.

4.1.4.8. Suppression Damage Repair

Repairing the impacts of suppression activities is the responsibility of the Incident Commander and is funded by the wildfire account. Such work should be completed by 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 that suppression activity damage repair is completed.

Repair of suppression damage can include:

- Removing all trash from incident facilities, work areas and firelines,
- Replace soil dug from any trenched 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 and peat overturned by plowing (with a grader or by hand) to preserve native grass rootstock and reduce thawing of permafrost by retaining the insulative properties of the vegetation mat.

4.1.5. 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 influence 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. Emergency stabilization activities were not used in Alaska until after the 2004 fire season. The Regional Fire Ecologist will be the primary contact person for ES activities in Region 7 and should be consulted if a plan is anticipated.

4.1.5.1. 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 Emergency Stabilization Rehabilitation (ESR) team. The Refuge Manager/Line Officer is responsible to order or assign teams to develop ES plans. The first step in developing a plan is to review available data about the fire and affected resources. Field inspections will likely be necessary to assess values at risk as a result of the fire. 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, although emergency stabilization funding can be used for up to three years following containment of the fire in order to monitor treatment effectiveness or to replace/repair emergency stabilization treatments if failure to do so would imperil watershed functionality or result in serious loss of downstream values. Funding beyond the first year requires an approved amendment to the plan. Funding beyond the first year cannot be used to continue seeding, plantings, or invasive plant treatments. The plan must be completed within seven calendar days of wildfire containment and approved within six business days of receipt by the approving office. An interdisciplinary team prepares this plan 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 (September 5, 2007) 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...” Reports of previous stabilization efforts in Alaska can be consulted for information about techniques.

4.1.5.2. 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.

ES actions likely to be needed deal with erosion, invasive plant infestation, 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.

Few invasive plants have been documented on the Refuge, but they are spreading throughout the state. Disturbed areas, such as burns, provide a favorable substrate for establishment of invasive plants. Invasive plants are associated with areas of human activity (e.g., trails, roads, cabins, airstrips), so these areas are likely seed sources. Fire crews, particularly those from outside the state, may import seeds of non-native, invasive plants on clothing and equipment. Helicopter buckets and tanks, and Canadair CL2-15 tanks are required to be cleaned prior to scooping water in Alaska to prevent the spread of aquatic invasive species. ES funds can be used to control invasive plants only if an approved management plan and existing program are in place addressing non-native invasive species control. It is allowable to conduct assessments to determine the need for treatment if there are known infestations, possibility of new infestation

due to management actions, or there are suspected contaminated equipment use areas. Systematic inventories are not allowed under ES funding. See the 2006 Interagency Burned Area Emergency Response Guidebook for additional information (http://www.fws.gov/fire/ifcc/esr/Policy/es_handbook_2-7-06.pdf). The Alaska Exotic Plants Information Clearinghouse (AKEPIC; <http://aknhp.uaa.alaska.edu/botany/akepic>) provides information about invasive plants, including species information, known location of infestations, and field data sheets.

Cultural resource sites, including prehistoric ones, can be exposed after fire removes vegetation and thick organic layers. Exposure of these sites can lead to loss of important artifacts and further degradation. The regional archaeologist should be contacted if you think cultural sites may have been exposed by fire. Efforts should be concentrated on known or suspected cultural sites; systematic inventories or surveys are prohibited.

Trail systems on the Refuge serve as more than a platform for recreational activities; winter trails are often primary inter-village transportation routes. Hazard trees can obstruct trails, making travel difficult or impossible. It is not allowed to use ES funds to improve a trail to a standard above its pre-fire condition.

4.1.5.3. ES Treatment Maintenance and Monitoring

Treatment monitoring protocols and maintenance requirements will be specified within individual ES plans. The Regional Fire Ecologist can help with developing these plans. See **Section 5.2** for an overview of effects monitoring.

4.1.5.4. ES Reporting Requirements

Annual accomplishment reports are required for ES activities, and accomplishment reports including treatment and activity information are also required in the National Fire Plan Operations and Reporting System (NFPORS). A Final Accomplishment Report documenting all accomplishments, implementation costs, and monitoring results will be archived in the Refuge project files with electronic copies sent to the RFMC and Branch of Fire Management in Boise, Idaho, no later than 3 years and 60 days following wildfire containment. The Eastern Interior FMO will be responsible for initiating ES reports and entering accomplishments in NFPORS prior to October 1 of the fiscal year in which they occur.

4.1.6. Burned Area Rehabilitation (BAR)

Burned Area Rehabilitation activities are “undertaken within three years of containment of a wildland fire to repair or improve fire-damaged lands unlikely to recover naturally to management approved conditions or to repair or replace minor facilities damaged by fire” (620 DM 3.3M). Information on the BAR process can be found in the 2006 Interagency Burned Area Rehabilitation Handbook (http://www.fws.gov/fire/ifcc/Esr/Policy/BAR_Guidebook11-06.pdf).

Rehabilitation treatments include only the following allowable actions:

1. Repair or improve lands unlikely to recover naturally from wildland fire damage by emulating historical or pre-fire ecosystem structure, function, diversity, and dynamics consistent with existing land management plans.

2. Chemical, manual, and mechanical removal of invasive species, and planting of native and non-native species, consistent with DM 3.8F, restore or establish a healthy, stable ecosystem even if this ecosystem cannot fully emulate historical or pre-fire conditions.
3. Tree planting to reestablish burned habitat, reestablish native tree species lost in fire, prevent establishment of invasive plants, and regenerating Indian trust commercial timberland as prescribed by a certified silviculturalist to not regenerate for ten years following the fire.
4. Repair or replace fire damage to minor operating facilities (e.g., campgrounds, interpretive signs and exhibits, shade shelters, fences, wildlife guzzlers, etc.). Rehabilitation may not include the planning or replacement of major infrastructure, such as visitor centers, residential structures, administration offices, work centers and similar facilities. Rehabilitation does not include the construction of new facilities that did not exist before the fire, except for temporary and minor facilities necessary to implement burned area rehabilitation efforts.

4.1.6.1. BAR Planning

A BAR plan is a document that specifies treatments required to implement post-fire rehabilitation policies; it is separate from the ES plan. A BAR plan may be developed at any time within three years from the containment date as long as work can be completed by the third anniversary of containment, but it will likely be developed in conjunction with the ES plan. BAR funds are competitive among DOI Bureaus. Refuge rehabilitation plans will be prepared by an interdisciplinary team of specialists; prior to developing a BAR plan, the Refuge should consult with the regional fire ecologist. Information and a BAR plan template are at the DOI ESR website at <http://fire.r9.fws.gov/ifcc/esr/home.htm>.

4.1.6.2. BAR Issues and Values to Protect

Likely post-wildfire BAR issues on the Refuge include:

- The establishment of invasive species within the burned area
- Damage to existing trails

Allowable actions concerning invasive species are similar to those allowed under ES funding. BAR funds cannot be used for restoration of any cultural resource or heritage site. Other issues correctable by any of the four allowable actions listed in **Section 4.1.6** may also merit BAR action.

4.1.6.3. BAR Regulatory Compliance

Two Categorical Exclusions (CX) may apply to BAR. The first is a DOI CX (516 DM 2, Appendix 1(1.13)) and the second is a FWS CX (516 DM 8.5(5)). When utilizing the FWS Categorical Exclusions, the Refuge/unit staff will complete and submit the most recent version of the NEPA Compliance Checklist (FWS Form 3-2185) with the BAR plan. Before using the DOI Cat X, consult with the Regional Office regarding its use.

BAR projects must comply with NHPA. Plans will be submitted to Regional archeologist for review and cultural / archeological clearance. To the greatest extent possible, project implementation will follow recommendations of the Regional archeologist and/or SHPO. BAR

projects that may affect Threatened & Endangered species/their habitats must comply with Section 7 of the ESA. Any such projects will be submitted for Section 7 consultation.

Routine BAR operations on the Refuge will be conducted using non-motorized means to the extent practical. Motorized equipment may be used with Refuge Manager approval.

4.1.6.4. BAR Monitoring Protocols

Treatment monitoring protocols and maintenance requirements will be specified within individual BAR plans. The Regional Fire Ecologist can help with developing these plans. See **Section 5.2** for an overview of effects monitoring.

4.1.6.5. BAR Contact Information

In addition to the Eastern Interior FMO, Refuge biologists 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. See the Communications section of the *Eastern Interior Refuges Annual Preparedness/Dispatch Plan (Appendix C)* for specific names and contact numbers.

4.1.6.6. BAR Public Information and Public Concerns

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

4.1.6.7. BAR Reporting Requirements

Reporting requirements for BAR are similar to those for ES treatments. An Annual Accomplishment Report is required for funding in years two and three. Detailed Annual Accomplishment Reports will be completed by fiscal year end to document actual accomplishments, costs and monitoring results. Reports will be kept in field unit project files, with a copy of the Annual Accomplishment Report sent to the Regional office and to the national office in Boise. Annual accomplishments are also summarized and reported in the NFPORS treatment/activity form. The final accomplishment report must be completed no later than 3 years and 60 days following containment of the fire. NFPORS Accomplishment updates are the responsibility of the Refuge FMO; 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.

4.2. Management of Planned Fuels Treatments

The Refuge's primary method of fuels reduction and habitat treatment is to allow wildfires to burn for resource benefit wherever possible. From 1986 through 2002, the Refuge conducted an active landscape scale prescribed fire program as authorized under the original 1987 CCP. Annual acreage targets were identified in the CCP, and landscape-scale prescribed fires were planned and implemented throughout this period. The 2008 CCP process identified Refuge and local concerns about the appropriateness of landscape-scale prescribed fire in an ecosystem identified as being relatively intact, and as having a functional natural fire regime. Treatment emphasis has shifted to appropriately scaled mechanical and prescribed fire treatments in the immediate vicinity of values at risk. Often these values are located off Refuge, and the bulk of Refuge fuels treatments are now planned and implemented on an Interagency basis and are

located on State and private lands. Potential treatment areas are identified in the Eastern Interior Multi-year Treatment Plan (**Appendix D**). Some projects are accomplished with Refuge force account labor, but most are carried out under agreements or contracts with the State, Village Councils, and/or private entities.

4.2.1. Processes to Identify and Prioritize Hazardous Fuels Treatments

Hazardous fuels reduction planning for the Tanana Zone, including the Refuge, is based on Community Wildfire Protection Plans (CWPPs) for local communities, and is accomplished on an interagency level. Partners include BLM AFS, Kanuti NWR, the Tanana Chiefs Conference, and individual communities. Potential treatment areas are identified in the Eastern Interior Multi-year Treatment Plan (**Appendix D**) and are often located on State and private lands. Refuge sponsored treatments will be identified in NFPORS by April of the fiscal year prior to implementation.

4.2.2. Prescribed Fire Project 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.

4.2.2.1. Prescribed Fire Planning

Prescribed fires may be used to accomplish hazardous fuels objectives and 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.

Hazardous fuels treatment projects must be identified in advance and entered into the National Fire Plan Operations & Reporting System (NFPORS) for funding consideration.

All prescribed fire plans will comply with the Alaska Enhanced Smoke Management Plan, and will include monitoring for smoke impacts. Test fires will be used to assess smoke dispersal. When necessary and available, spot weather forecasts will be obtained the day of the burn to aid in decision making for implementation.

Project planning generally begins six to ten months in advance of implementation. 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.

It is the responsibility of the Burn Boss to provide timely notification to and place orders with the AK-UYTC and to adhere to the DEC open burn approval stipulations. AK-UYTC will be notified daily of location planned ignition time and planned acreage; a point and method of contact will be established; and the contingency forces identified including their location and point of contact. The Burn Boss is responsible to order and inform the contingency forces of any planned burning and ensure their availability.

4.2.2.2. Prescribed Fire Operations

During the project, the Burn Boss will report acres burned to AK-UYTC each evening so that the information may be included in the AICC Daily Situation Report. Billing procedures and charge codes will be established prior to orders being placed and included in the project plan. Extended hours for AK-UYTC will be negotiated prior to ignition. Reimbursable costs may include required dispatch staffing beyond normal business hours, travel and transportation expenses, crew salaries, and other project expenses incurred by BLM AFS.

Ignition of prescribed fires is subject to National and Alaska Preparedness Levels. (Reference AIMG for Alaska Preparedness Level information.) Prescribed fires may be ignited during Regional or National Preparedness Levels 4 or 5 if requirements specified in the AIMG and the National Interagency Mobilization Guide are met.

Cooperators, contractors, and administratively determined (AD) casual or emergency hires may be used to implement prescribed fires. AD hires 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 *National Interagency Incident Management System Wildland Fire Qualification System Guide* (PMS-310-1) standards.

4.2.2.3. Prescribed Fire Public Notification

The public will be kept informed about the Refuge prescribed fire program through news releases, interpretive messages, and educational programs. Public notification of planned prescribed fire ignitions will be made according to the timeframes specified in the burn plan.

4.2.2.4. Multiple Prescribed Fire Projects

A burn boss may not manage multiple prescribed fires in non-adjacent burn blocks where ignition or active holding is being implemented.

4.2.2.5. Prescribed Fire on State and Private Lands

Refuge sponsored fuels projects on State and private lands may include prescribed fire treatments. Prescribed fires will be planned, conducted, and reported based on the policy of the Agency having operational control of the burn. The jurisdictional agency representative (i.e. mayor, 1st Chief) is the signing and responsible official for burn plans conducted on their lands.

4.2.2.6. Prescribed Fire Conversions and Reviews

If a Refuge prescribed fire is declared a wildfire, the Tanana Zone FMO will assume operational control with the cooperation of the Burn Boss and burn resources. A wildfire number will be assigned and all wildfire management costs will be charged to that number. The same analysis and WFDSS decision support documentation that applies to all wildfires is required.

As dictated by individual agency policy, the Refuge Manager is responsible for conducting the appropriate level of investigation when a prescribed fire is declared a wildfire. The level and scope of the review will be determined by policy and procedures of the *Interagency Standards for Fire and Fire Aviation Operations* and the *FWS Fire Management Handbook*.

4.2.2.7. Planning, Preparing and Implementing Non-Fire Hazardous Fuels Treatments

Refuge sponsored fuels projects typically include mechanical treatments followed by prescribed fire (often pile burns). Emphasis is on appropriately scaled treatments in the immediate vicinity of values at risk. Often these values are located off Refuge, and the bulk of Refuge fuels treatments are now planned and implemented on an Interagency basis and are located on State and private lands. Some projects are accomplished with Refuge force account labor, but most are carried out under agreements or contracts with the State, Village Councils, and/or private entities.

As with prescribed fires, non-fire treatments must be identified in advance and entered into the National Fire Plan Operations & Reporting System (NFPORS) for funding consideration. Project planning generally begins six to ten months in advance of implementation. Preparation of treatment areas may be assigned to qualified personnel or a contractor.

4.2.3. Hazardous Fuels Treatment Regulatory Compliance

4.2.3.1. NEPA

Fire management activities were analyzed in the Refuge CCP. The FMP is a step-down plan based on that document and is in compliance with DOI's wildland fire management policy (Departmental Manual (DM) 620 1-2) and the National Environmental Policy Act of 1969 (NEPA). NEPA requires that the environmental effects of proposed major federal actions be considered in the decision-making process. Fire suppression activities are normally categorically excluded from this requirement (516 DM 2 and 16 DM 6). Prescribed fires and fuel reduction activities require completing an initial NEPA Compliance Checklist. This usually results in a categorical exclusion for the project (621 FW 2), but if necessary the project may require an Environmental Assessment (EA) or an Environmental Impact Statement (EIS). Before implementing any fire management project, an EA or EIS will be prepared for those activities not categorically excluded.

4.2.3.2. Compliance with other Legislative Mandates

Refuge fire management activities must comply with all applicable laws including the Wilderness Act, the National Historic Preservation Act, the Wild and Scenic Rivers Act, the Endangered Species Act, the Alaska National Interest Lands Conservation Act (ANILCA), and the Clean Air Act.

Section 106 of the National Historic Preservation Act requires review of any project funded, licensed, permitted, or assisted by the federal government for impact on significant historic properties. The agencies must allow the State Historic Preservation Officer and the Advisory Council on Historic Preservation, a federal agency, to comment on a project. The Alaska Historic Preservation Act contains a provision similar to Section 106 ([A.S.] 41.35.070) which mandates that any project with state involvement be reviewed in a similar manner. For cooperative projects off Refuge lands the process may be initiated by the Service or the State.

Through the Section 106 review process, Alaska Office of History and Archaeology (OHA) staff work with federal and state agencies during the early stages of project planning to protect cultural resources. They do this by providing information on the location of sites and on cultural

resources surveys previously done in an area. If the potential to discover unknown sites is high, a survey may be recommended. When there are sites in a project area, OHA consults with the agency on National Register eligibility, on how the project will affect sites, and on ways to lessen unavoidable damage. A copy of the Request for SHPO Section 106 Review (36 CFR 800) form appears in **Appendix G**.

4.2.3.3. Smoke

The *Alaska Enhanced Smoke Management Plan for Planned Fire* (ESMP) was developed by DEC in coordination with the AWFCG Air Quality Committee. The ESMP and its appendices are located at http://fire.ak.blm.gov/administration/awfcg_committees.php. The ESMP outlines the process and identifies issues that need to be addressed by DEC and federal and state agencies or private landowners/corporations to help ensure that prescribed fire activities minimize smoke and air quality problems. The ESMP Appendices provide additional assistance for interagency sharing of information, the applicability and availability of current smoke management techniques, monitoring protocol, public education strategies, and emission reduction techniques.

The AWFCG-approved “Smoke Effects Mitigation and Public Health Protection Protocols” are available at <http://fire.ak.blm.gov/administration/awfcg.php>. For current smoke information and forecast, regulations, advisories, and educational materials, refer to the DEC website <http://www.dec.state.ak.us/air/anpms/index.htm>.

By reference, this section incorporates the text of the Red Book related to Smoke Management and Air Quality and will follow recommendations of the latest edition of the *NWCG Smoke Management Guide for Prescribed and Wildland Fire*.

4.2.4. Fuels Treatment Monitoring

4.2.4.1. Pre-treatment monitoring

For prescribed fires, the Burn Boss will review current and forecast weather prior to Burn Day. On Burn Day morning, a spot weather forecast from the local National Weather Service will be requested that will include time periods to complete ignition and holding and immediate mop-up needs.

Prescribed fires and mechanical treatments may be monitored for pre-treatment condition using similar protocols to post-treatment effects monitoring described in Section 5.2. When followed up with post-treatment effects monitoring this has the benefit of allowing direct comparison of treatment states.

4.2.4.2. Burn-day monitoring (Prescribed fire only)

Burn day monitoring will document that the fire is within prescription. Weather variables typically monitored are dry bulb temperature, relative humidity, mid-flame wind speed and direction, and cloud cover. Measurements are taken immediately prior to test fire ignition and at intervals specified in the burn plan. Documentation of first order fire effects such as rate of spread, flame length, etc. are desired if personnel are available.

4.2.4.3. Effects monitoring

Treatment effects monitoring protocols and maintenance requirements will be specified within individual treatment plans. The Regional Fire Ecologist can help with developing these plans. See **Section 5.2** for an overview of effects monitoring.

4.2.5. Fuels Treatment Reporting Requirements

4.2.5.1. Prescribed Fire Reporting

The burn plan is a primary report for an individual prescribed fire. In it, a Burn Boss will document fire and weather observations, actions and decisions, and assess attainment of project treatment objectives. A fire report must also be completed for the Service FMIS within one week of project completion.

4.2.5.2. Non-fire Treatment Reporting

Treatments completed under an agreement or contract typically have financial and accomplishment reporting requirements specified in the agreement or contract document. A treatment report must be completed for the Service FMIS within one week of project completion.

4.2.6. Fuels Committees and other Collaborative Groups

Hazardous fuels reduction planning for the Tanana Zone, including the Refuge, is based on CWPPs for local communities, and is accomplished on an interagency level. Partners include BLM-AFS, Kanuti NWR, the Tanana Chiefs Conference, and individual communities. Consideration is given to the AWFCG Fuels Committee State-wide prioritization of communities, though this list is currently out of date and not considered to be a true reflection of priorities.

4.2.7. Fuels Treatment Funding Processes

The fuels funding process is based on the Eastern Interior Multi-year Treatment Plan (**Appendix D**). Potential projects and treatments for individual Refuges are identified in the plan, approved by the appropriate Refuge Manager, and entered into NFPORS. Individual projects are capped at \$500,000 per year with no limit on the amount of treatments proposed. Projects are typically entered into NFPORS by April 1st of the year prior to funding.

Projects throughout the region are annually compared and prioritized according to FWS and DOI criteria. Project goals and objectives (i.e. WUI, Protects Treasured Landscapes, Hazardous Fuels, and Habitat) are extracted from NFPORS data entry and used in scoring the projects. The criterion for project scoring comes from the Office of Wildland Fire in negotiation with the DOI Bureaus and is subject to annual change.

The Region's program of work (POW) is usually fully developed by August, with room for nominal project substitution in September. Refuge units should have an estimation of funded projects at the start of the fiscal year.

4.2.8. Debris Burning

Debris burns may be implemented under State laws and regulations, and are not required to comply with prescribed fire requirements. In order to be exempt from prescribed fire requirements debris burners must:

- Burn no more than four piles at a given time.
- Limit pile size to less than 16' in diameter and 10' high.
- Have a valid State issued burn permit for the burn location and comply with its direction. There is currently no requirement for a burn permit in the Tanana Zone.
- Comply with all State laws and regulations pertaining to burning practices.
([AS 41.15.010-41.15-170](#) and [11 AAC95 Article 6](#)).
- Call AK-UYTC the day of the burn to confirm restrictions, suspensions, and closures are not in effect.

4.3. Prevention, Mitigation and Education

4.3.1. Wildfire Investigation and Trespass Policies

The inadvertent or intentional ignition of wildland fuels by humans is illegal. Agency policy requires any wildfire to be investigated to determine cause, origin, and responsibility. All fires suspected of being human-caused will be investigated to the degree possible by the initial response Incident Commander. The Refuge Manager will be notified immediately of suspected human-caused fire. The Refuge Manager will determine if the fire scene is to be formally investigated, and if so, will direct that an investigator be ordered. The Service will pursue any legal actions deemed necessary. When incidents impact multiple agencies lands, collections will be pursued jointly and cooperatively by each affected agency to the extent practical. The Incident Commander will:

- Locate and protect the point of origin of fire.
- Search for and protect evidence.
- Identify and document witnesses and other persons at fire scene (Name and contact information, if possible).
- Document observations, actions, and findings.

Wildland fire trespass refers to the occurrence of unplanned ignitions on Service lands where the source of ignition is tied to some type of human activity. Fire trespass is a legal/law enforcement activity and the appropriate local law enforcement authorities should be contacted and standard criminal and/or civil investigative procedures and reports used. The Red Book as well as the FWS Fire Management Handbook provides detailed information regarding investigation and trespass procedures.

4.3.2. Prevention/Mitigation Program

To date, the Refuge has not had a formally established fire prevention program. Prevention and Firewise homeowner defensible space messages have been incorporated into fuels treatment agreements and outreach products whenever possible, but without planned goals and objectives.

In FY 2012 the Eastern Interior Fire Management Program has established and filled a Prevention Technician position with the intent of establishing a formal prevention program for the District. The Refuge Prevention Technician will work with protection agencies, local communities, and other Refuge programs to develop and implement program specific prevention goals and objectives.

It is intended that specific prevention goals and objectives will be presented in the 2013 review of this FMP. Wildland fire prevention activities outlined in the plan will be coordinated with interagency partners and with other Kanuti Refuge and Regional programs.

Fire prevention activities for 2012 will include:

- Work with BLM and NPS to install a fire danger display at the Bettles Visitor Center to reflect current fire danger.
- Fire prevention literature and brochures will be made available at Bettles Visitor Center.
- Training in fire prevention and reporting procedures will be provided to Refuge employees.
- Fire danger restrictions will be posted at Refuge facilities.
- Prevention staff will participate in local CWPP efforts.
- Prevention staff will coordinate with protection agency prevention personnel to provide a consistent prevention message in an efficient manner.
- Prevention staff will work with interagency partners and local communities to identify and prioritize areas in need of fuels mitigation treatment.
- Trail and/or area closures may be implemented by the Refuge Manager during periods of extreme fire danger.

4.3.3. Education/Outreach Activities

Informing the public is an important part of fire suppression, fire prevention, and the FWS mission. During wildfires occurring on Service lands coordination among agencies is crucial in communicating with the public about fire. The following language in the Alaska Statewide Annual Operating Plan provides direction on how this coordination will occur.

The Protecting Agency and the Incident Management Team, when assigned, are responsible for the release of operational and public safety information to the media and public during the initial response to and during ongoing wildfires. The Protecting Agency and Incident Management Team will coordinate with the Jurisdictional Agency on the release of fire information, specific Jurisdictional Agency direction will be stipulated in the Delegation of Authority. Releases will be approved by the Incident Commander prior to release and copies distributed to all stakeholders. Jurisdictional Agency policy and messaging will be included when requested by the agency administrator. Policy questions will be referred to the

Jurisdictional Agency. A suggested format for incident news releases can be found in the Alaska Statewide Annual Operating Plan appendix.

The goal of Refuge fire management outreach efforts is to enhance knowledge and understanding of wildland fire management policies and fire effects through internal and external communication and education. Information about fire ecology and the differences between planned and unplanned ignitions will be incorporated into outreach programs and informal contacts. Information and education are critical to increasing support for prescribed fires. Education and outreach programs will include components of the nationally sanctioned FIREWISE program. Information about this program is available at www.firewise.org.

Public education is an important Refuge mission. At every opportunity the fire management staff will actively develop and contribute to fire education efforts on the Refuge and incorporate fire education efforts within fire management activities. These activities have included, but are not limited to:

- Communicating information on the role of fire in the boreal forest. The Fire Information and Resource Education Program includes prepared teacher packets (the statewide Role of Fire In Alaska Curriculum) emphasizing the important role natural and prescribed fires play in Alaska with particular regard to wildlife habitat enhancement. The packets include reference material and classroom activities for various grade levels. Fire effects field kits which include learning aids to supplement the curriculum are also available to be checked out. <http://alaska.fws.gov/nwr/visitor/fire/curriculum.htm>
- The Fire Management Slide Show and portable Fire Management Program display are used to provide information to the public. The Fire Management Program display is set up at the Tetlin National Wildlife Refuge Visitor Center, but is portable and can be taken to meetings or put on display elsewhere.
- Maintaining a library of fire education materials on the Refuge headquarters.
- Supporting the GLOBE Protocol learning initiative (<http://classic.globe.gov/>)
- Facilitating the attendance of Refuge fire management and public education personnel at fire education and scientific conferences

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5. Monitoring and Evaluation

Monitoring and evaluation are the functions used to determine if the FMP is being implemented as planned to meet its goals and objectives as well as to determine whether the goals, objectives, strategies, and procedures outlined in the FMP and other plans remain relevant. Wildland fire is one of the primary sources of disturbance on the Kanuti Refuge. As such, it is integral to the management of the Refuge's wildlife and plant communities. Through monitoring and evaluation methods, we seek to better understand the relationships between fire and other Refuge resources. Monitoring also helps us improve our WUI and Hazardous fuels treatment techniques, and provides documentation to show how we address our performance measures.

This chapter is divided into two primary sections:

- Fire Management Plan Monitoring - covers the five management components in this fire management plan, and provides guidance to insure that our actions within these areas meet the goals of the Refuge and are in compliance with other national and service policies.
- Effects Monitoring - focused on the ecological effects that result from fire management activities on the Refuge.

5.1. Fire Management Plan Monitoring

5.1.1. Annual FMP Review

The Fire Management Plan 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 region policies of the Fish and Wildlife Service.

FMPs are intended to be dynamic and reflect current situations and policies; therefore, to maintain currency, FMPs must be reviewed each year using the nationally established annual review process. Plans must be revised when significant changes occur or substantial changes in management are proposed. Minor plan revisions may be accomplished through an amendment added to the plan and signed by the Refuge Manager and Eastern Interior Fire Management Officer. Major scheduled revisions to fire management plans will follow the 15 year Comprehensive Conservation Plan revision cycle to provide consistency in objectives and management strategy formulation. Major revisions are reviewed by the Regional Fire Management Coordinator and approved by the Region 7 Chief of Refuges. Without a current FMP, prescribed fires cannot be conducted and response to unplanned ignitions can only consider suppression strategies. Preparedness and prevention activities can continue in the interim period as outlined in the expired plan. All new FMPs and those needing revisions due to significant change in land use or other circumstances will use the most recent Interagency Fire Management Plan Template and apply the most recent Service-specific guidance.

The following partners should be given the opportunity to review major revisions to the FMP:

Regional Native Corporations	
Doyon Regional Native Corporation	
Village Native Corporations	
Corporation	Village
K'oyitl'ots'ina Limited	Alatna/Allakaket
Evansville Inc.	Evansville
Tribes	
Council	Village
Alatna Traditional Council	Alatna
Allakaket Traditional Council	Allakaket
Evansville Tribal Council	Evansville
Local, State and Federal Agencies	
Unit	Agency
City of Bettles	
Alaska State Office	BLM
Department of Natural Resources	State of Alaska
Department of Fish and Game	State of Alaska
Alaska Region	BIA

Table 11: Kanuti NWR Fire Management Partners

5.1.2. Preparedness/Step-up Plan Review and Update

The Eastern Interior Preparedness/Step-up Plan will be reviewed annually, and updated as necessary.

5.1.3. Fire Management Options Review and Update

A review of Refuge Fire Management Options will be completed annually by March 1. Changes will be submitted in accordance with procedures outlined by the AIWFMP. Mid-season Management Option boundary changes will rarely be necessary but may be accommodated as outlined in the AIWFMP.

5.1.1. Known Sites Review and Update

A review of known sites on the Refuge and their default protection level will be completed annually by April 1. Changes will be submitted in accordance with procedures outlined by AWFCG.

5.2. Effects Monitoring

Effects monitoring can apply to all aspects of the fire program that involve changes on the ground. The goals of effects monitoring may include the following:

- Develop data that helps quantify the relationship of fire with Refuge resources.
- Develop data that helps quantify fire effects associated with a specific vegetation/fuel type in order to improve predictive capabilities for modeling fire distribution, spread, and behavior.
- Evaluate the effectiveness of a treatment (prescribed fire, mechanical treatment, or suppression action) in order to determine whether objectives have been met.
- Document unexpected treatment results.

This FMP outlines four management components that may require some level of effects monitoring and evaluation:

- Wildfire
- Prescribed fire
- Non-fire fuels treatment
- Emergency stabilization and rehabilitation

Similar monitoring methods and protocols can be applied to each of these activity types. The following sources are available for guidance if a post-fire monitoring program is implemented:

- AWFCG Fire Effects Monitoring Protocol. Contains Alaska-specific guidance. http://fire.ak.blm.gov/administration/awfcg_committees.php or <http://frames.nacse.org/5000/5585.html>
- FWS Fuel and Fire Effects Monitoring Guide. <http://www.fws.gov/fire/downloads/monitor.pdf>
- National Park Service Fire Monitoring Handbook. http://www.nps.gov/fire/download/fir_eco_FEMHandbook2003.pdf

For wildfires and prescribed fires, an evaluation of burn severity can provide a useful measure to understand fire effects and to predict vegetation response. For long-term monitoring sites detailed information on burn severity should be collected (for example the Composite Burn Index protocols by NPS <http://fire.org/firemon/lc.htm> or [burn severity transects described in the FETG Fire Effects Monitoring Protocol](http://fire.org/firemon/lc.htm)).

Remote sensing techniques are available for development of burn severity maps for fires greater than 300 acres. The normalized burn ratio technique (dNBR) developed by the NPS is described on the FIREMON website at <http://fire.org/firemon/lc.htm>.

Unfortunately recent research, some of it conducted on the Refuge, suggests that this method does not adequately differentiate along the range of moderate to high burn severity in

Alaskan boreal forests. Caution should be used in interpreting dNBR and ground-based validation should be invested in if the objective is to develop a burn severity map that captures the full range of variability in site conditions and provides a basis for predicting vegetation change in boreal forests (Murphy *et al.* 2008).

Monitoring protocols will be treatment/ incident specific and will be detailed in the appropriate planning document (prescribed fire plan, treatment plan, ES plan, BAR plan).

Appendices

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Appendix A. *List of Acronyms*

Terminology in this Plan is defined in the National Wildfire Coordinating Group Glossary of Wildland Fire, located at <http://www.nwccg.gov/pms/pubs/glossary/index.htm>. Additional terms that appear in this document but are not listed in the glossary are defined below:

AD= Administratively Determined Pay Plan

ADEC = Alaska Department of Environmental Conservation

ADF&G = Alaska Department of Fish and Game

AFS = Alaska Fire Service

AICC = Alaska Interagency Coordination Center

AIWFMP = Alaska Interagency Wildland Fire Management Plan

AK-DOF = Alaska Department of Natural Resources, Division of Forestry

AMAC=Alaska Multi-agency Coordination (Group)

AMD = (DOI) Aviation Management Directorate

AMR = Appropriate Management Response

ANCSA = Alaska Native Claims Settlement Act

ANILCA = Alaska National Interest Land Conservation Act

AOP= Annual operating plan

ATV= All-terrain Vehicle

AWFCG = Alaska Wildland Fire Coordinating Group

BAR= Burned Area Rehabilitation

BIA = Bureau of Indian Affairs

BLM = Bureau of Land Management

BUI = buildup index

CCP = comprehensive conservation plan

CDI = Canadian drought index

CFFDRS = Canadian Forest Fire Danger Rating System

CFR= Code of Federal Regulations

DC = drought code

Department = U.S. Department of the Interior

DM = departmental manual

DMC = duff moisture code

DNR=(State of Alaska) Department of Natural Resources

DOF = (State of Alaska) Division of Forestry
DOI = U.S. Department of the Interior
EA = environmental assessment
EFF = Emergency Firefighter
EIS = Environmental Impact Statement
ES = Emergency Stabilization
ESMP = (Alaska) Enhanced Smoke Management Plan
ESR = Emergency Stabilization Rehabilitation
FFMC = fine fuel moisture code
FMIS = (FWS) Fire Management Information System
FMO = fire management officer
FMP = fire management plan
FMU = fire management unit
FRCC = fire regime and condition class
FWS = U.S. Fish and Wildlife Service
IC = Incident Commander
IMT = Incident Management Team
IQCS = Incident Qualifications and Certification System
IRPG = Incident Response Pocket Guide
MAC = multi-agency coordination
MIST = minimum impact suppression tactics
MMA = maximum manageable area
Mph = miles per hour
NEPA = National Environmental Protection Act
NFDRS = National Fire Danger Rating System
NFPORS = National Fire Plan Operations and Reporting System
NPS = National Park Service
NWR = National Wildlife Refuge
OHA = Alaska Office of History and Archaeology
POW = Program of Work
Refuge = Kanuti National Wildlife Refuge
Refuge Manager = Refuge Manager, or, if unavailable, the Deputy Refuge Manager, or Refuge FMO, or their designee

RFMC = Regional Fire Management Coordinator

RH = relative humidity

Service = U. S. Fish and Wildlife Service

TES = threatened, endangered and sensitive (species)

UTV = All-terrain Utility Vehicle

VFD = Volunteer Fire Department

WFDSS = Wildland Fire Decision Support System

WFIP = Wildland Fire Implementation Plan (obsolete)

WFSA = Wildland Fire Situation Analysis (obsolete)

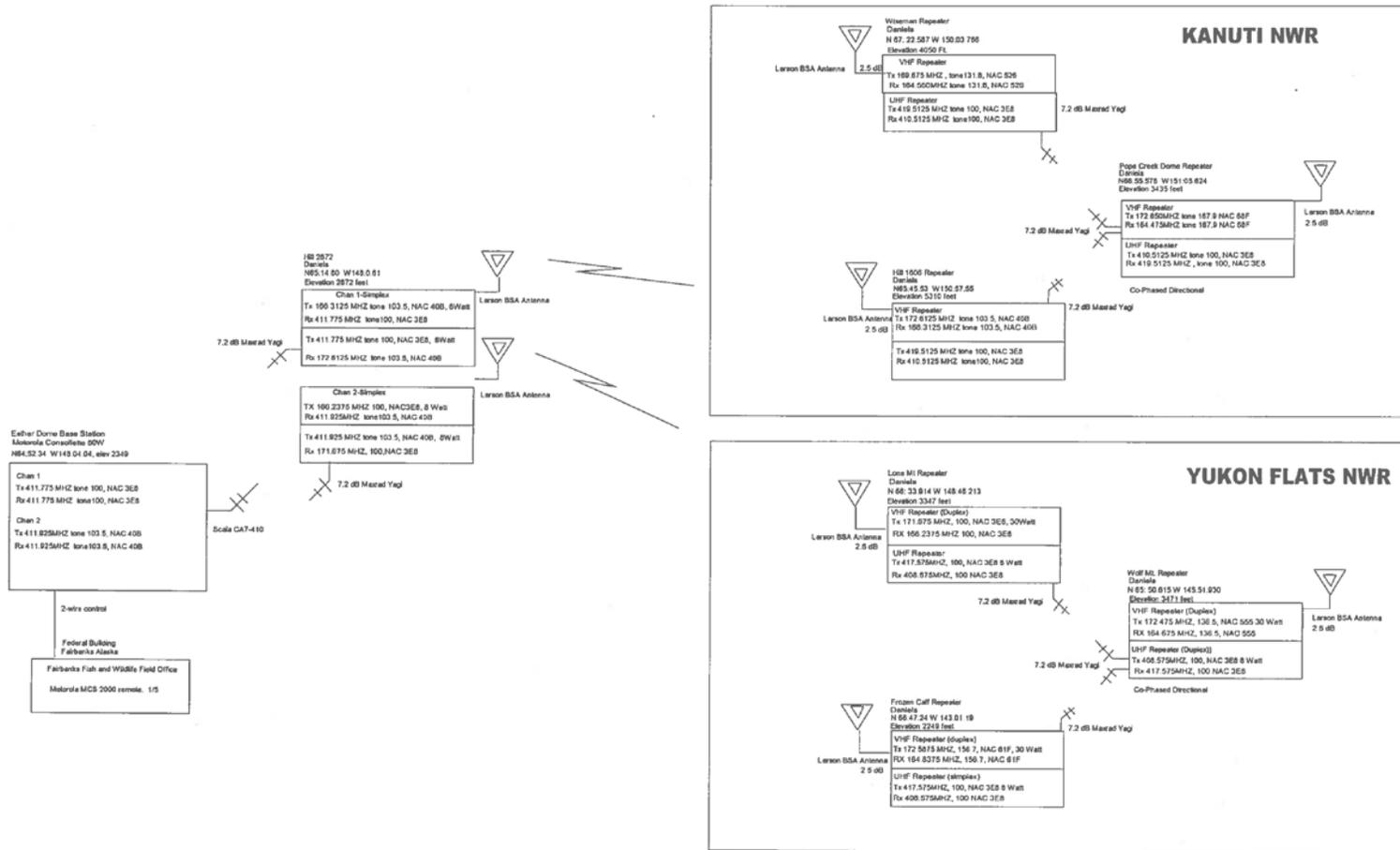
WFU = Wildland Fire Use (obsolete)

WUI = Wildland/ Urban Interface

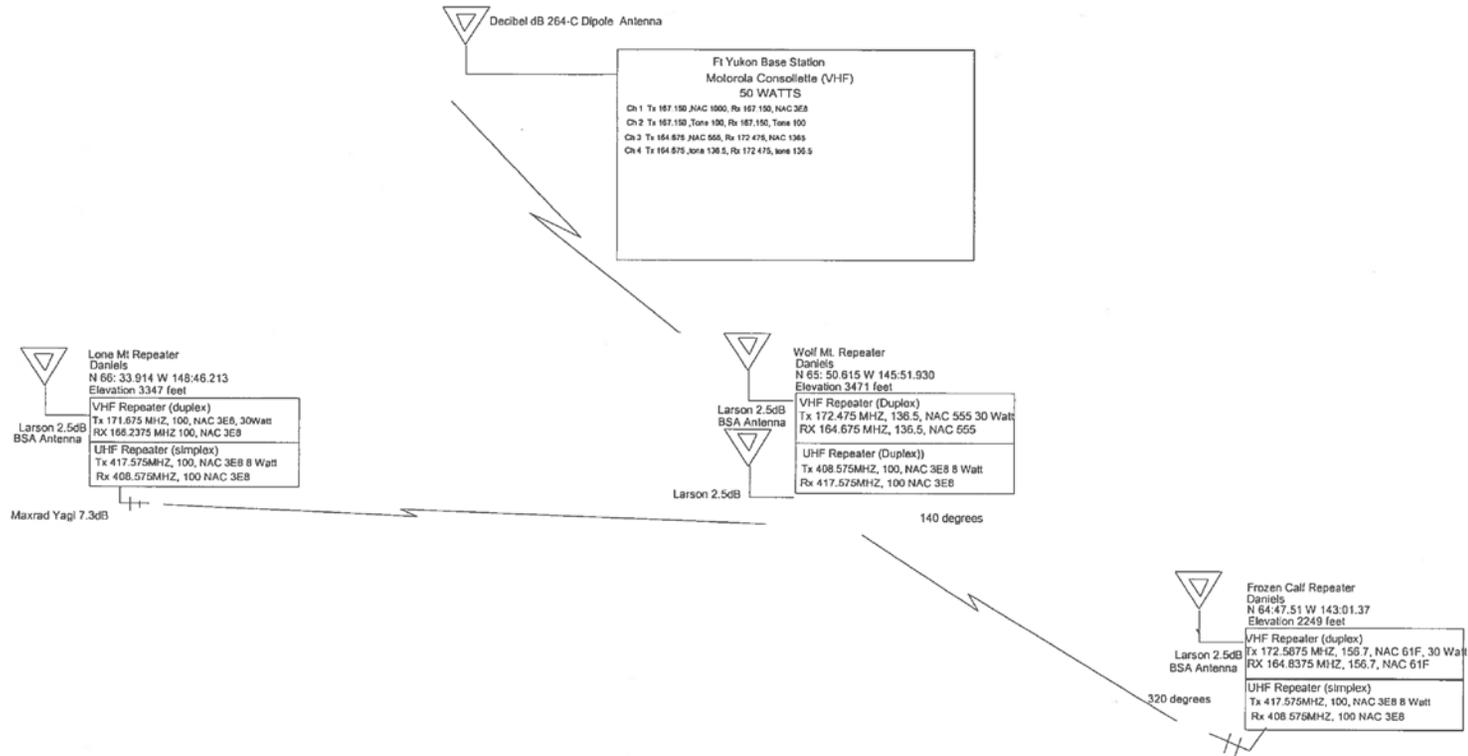
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Appendix B. Fairbanks Based Refuge Radio System

Joint Dispatch-Kanuti, Yukon Flats, Arctic NWR 2009



Yukon Flats National Wildlife Refuge Radio System FY 2009



Appendix C. *Eastern Interior Annual Dispatch/Preparedness Step-up Plan*

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Appendix D. *Eastern Interior Multi-year Treatment Plan*

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Appendix E. *FMO Delegation of Authority & Template*

Template Delegation of Authority for the Arctic, Kanuti, Tetlin, and Yukon Flats Fire Management Officer

Peter Butteri, Fire Management Officer for the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges is delegated authority to act on our behalf for the following duties, actions and expectations:

1. Represent the US Fish and Wildlife Service in the local area Multiagency Coordinating Group in setting priorities and working to assist the Protecting Agencies in fire emergencies.
2. Provide direction, supervision and leadership to the Refuge Fire Management Program outlined in the respective Refuge Fire Management Plans and provide a liaison to the Protecting Agencies for all wildfire activities on the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges.
3. Coordinate with and provide timely and accurate reports to the Refuge Managers, Deputy Refuge Managers or Acting Refuge Managers, and Regional Fire Management Coordinator for all wildland fire management activities on the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges.
4. Responsible for coordination and oversight of the fire management budget for the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges to assure adherence to agency fiscal guidelines.
5. Coordinate prescribed fire and hazardous fuels management activities for the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges including requests and oversight of funding for Hazardous Fuels projects (F31, F32 accounts).
6. Request and oversee distribution of Severity and Emergency Preparedness Funding for Arctic, Kanuti, Tetlin, and Yukon Flats Refuge fire activities in collaboration with Protecting Agency FMO's.
7. Ensure all Arctic, Kanuti, Tetlin, and Yukon Flats Refuge wildfire incidents are managed in a safe and cost-effective manner in collaboration with Protecting Agency FMO's.
8. Provide for the management of inventories and property records for supplies and equipment purchased with fire program funds.
9. Oversee the recruitment and hiring of fire management personnel on the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges as required.
10. Ensure all personnel participating in prescribed fire and wildfire operations on the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges are fully qualified for assigned positions.
11. Responsible for representing the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges and/or the Region in assigned interagency wildland fire management program activities and

collaborative efforts such as AWFCG sub-committees and working teams.

12. Coordinate wildfire prevention and mitigation activities and provide appropriate program direction and guidance for the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges.
13. Hire emergency firefighters for prescribed fires conducted by the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges in accordance with Department of Interior "Pay Plan for Emergency Workers." Coordinate FWS hosted emergency hires with Protection Agency FMO's.
14. Manage the Incident Qualification Certification System (IQCS) and certify Incident Qualification Cards for the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges. Coordinate incident management resources status (ROSS) with dispatch centers.
15. Initiate and Certify NWCG Position Task Books for Arctic, Kanuti, Tetlin, and Yukon Flats Refuge personnel per NWCG and agency guidelines.
16. After initial implementation of the Wildland Fire Decision Support System (WFDSS) by the Protection Agency, continue the WFDSS documentation through completion for fires occurring on the Arctic, Kanuti, Tetlin, and Yukon Flats Refuges.
17. In the rare event a Refuge Manager and Deputy Refuge Manager **are absent**; the FMO may approve the WFDSS, and Periodic Fire Assessment.
18. In the absence of the FMO the above listed authorities may be delegated to AFMO, Brian Haugen.
19. This delegation will be reviewed and signed annually prior to fire season.

(Arctic NWR Refuge Manager)

Date

(Kanuti NWR Refuge Manager)

Date

(Tetlin NWR Refuge Manager)

Date

(Yukon Flats NWR Refuge Manager)

Date

Appendix F. *Incident Commander Delegation of Authority Template*

Delegation of Authority
BLM Alaska Fire Service
Tanana Zone

As of **1800, May 20, 2010**, **IC Name** is delegated authority to manage the **Black Hills Fire #123**. Within the authority, regulations and policies of the Alaska Division of Forestry you are responsible for adhering to the guidelines and considerations established by this delegation and the WFDSS:

1. Provide for firefighter and public safety.
2. Manage the fire with as little environmental damage as possible.
3. Key cultural features requiring priority protection are:
4. Key resources considerations are:
5. Restrictions for suppression actions include:
6. Minimum tools for use are:
7. My agency Resource Advisor will be:
8. Keep fire south of
9. Manage the fire cost-effectively for the values at risk.
10. Provide training opportunities for the resources area personnel to strengthen our organizational capabilities.
11. Minimum disruption of residential access to private property, and visitor use consistent with public safety.

(Signature and Title of Agency Administrator)

(Date)

Amendment to Delegation of Authority

The Delegation of Authority dated **May 20, 2010**, issued to Incident Commander **IC Name** for the management of the **Black Hills Fire #123** is hereby amended as follows. This will be effective at **1800, May 20, 2010**.

12. Key cultural features requiring priority protection are:
13. Use of tracked vehicles authorized to protect Escalante Cabin.

(Signature and Title of Agency Administrator)

(Date)

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Appendix G. Request for SHPO Section 106 Review

Request for SHPO Section 106 Review (36 CFR 800) May also be used for review pursuant to Alaska Statute [A.S.] 41.35.070

Please use this form as a checklist and provide responses as an Appendix to this application. Incomplete forms may be returned. At this time, we are unable to accept this application electronically.

Please print, complete, and mail this form and accompanying material (typed) to:

STATE HISTORIC PRESERVATION OFFICE | OFFICE OF HISTORY AND ARCHAEOLOGY | DEPARTMENT OF NATURAL RESOURCES
550 West 7th Avenue, Suite 1310, Anchorage, AK 99501

Please note: that as stipulated in 36 CFR 800.2(a), other consulting parties such as the local government and Tribes are required to be notified of the undertaking. Information provided by other consulting parties may cause us to re-evaluate our comments and recommendations. Please note that our comment does not end the 30-day review period provided to other consulting parties.

REQUIRED AGENCY INFORMATION

It is the statutory obligation of the Federal agency to fulfill the requirements of section 106 (36 CFR 800.2(a)). The agency official remains legally responsible for all required findings and determinations (36 CFR 800.2(a)(3)).

- Federal or State involvement? (Check all that apply) Funding Jurisdiction Permit, license, approval
- Federal or State Agency contact information (include name, title, and contact information for agency official)
- Signature of agency official
- Secondary Contact Information (if different from above)

I. GENERAL INFORMATION

- Project Name
- Landowner
- Project Address / Location
- USGS Quad Map Name
- Meridian: Township: Range: Section:
- NAD 83 Latitude/Longitude: (Decimal Latitude) (Decimal Longitude)

II. GROUND DISTURBING ACTIVITY

Examples include, but are not limited to excavation, trenching, grading, tree removal, hydroexcavation, utility installation, new construction, access roads, borrow areas, and staging/storage areas.

DOES THIS PROJECT INVOLVE GROUND DISTURBANCE? YES NO

- Description of length, width, and depth of proposed ground disturbance
- Previous and current land use, condition, and disturbances
- Are there archaeological resources on the property? YES NO How was this determined?

III. DESCRIPTION OF THE PROJECT (UNDERTAKING)

- Detailed written description of the project
- Attach localized project map
- Attach photographs of the project area (Current, historic, and aerial photos are helpful)

IV. AREA OF POTENTIAL EFFECTS (APE)

The APE is the geographic area or areas within which an undertaking or project may cause direct or indirect changes in the character or use of historic properties. Every undertaking has an APE.

- Identify the APE on the USGS map and localized project map
 - Explain how the APE was developed and how it encompasses potential direct and indirect effects
-

V. IDENTIFICATION OF HISTORIC PROPERTIES

Defined as prehistoric or historic sites, buildings, structures, objects, districts, landscapes, or properties of traditional religious and cultural importance to Tribes included in, or eligible for, the National Register of Historic Places (NRHP).

Record each cultural resource within the APE using the AHRIS Data Form (<http://dmr.alaska.gov/parks/cha/ahrs/ahrsform.pdf>) and/or the AHRIS Building Form (<http://dmr.alaska.gov/parks/cha/ahrs/buildingform.pdf>).

- Describe the steps taken (methodology) to identify cultural resources in the APE
- Describe, date, map, and photograph all cultural resources located in the APE.

Please select one or more of the following:

- Previously-unknown cultural resources present in the APE. Proceed to Section VI.
- Known or previously-reported cultural resources present in the APE. Proceed to Section VI.
Using professional judgment, determine if a site reevaluation and updated DOE is necessary. Provide basis for decision.
- No cultural resources present in the APE. Proceed to Section VII. Note: finding of effect will be "No historic properties affected."

Alaska Heritage Resources Survey (AHRIS) REQUIREMENTS

AHRIS numbers are required for all cultural resources in the APE. Shape files should be submitted for each AHRIS site location as well as for surveyed areas. Alternatively, you may include a table containing survey and AHRIS site boundary metadata in the report. To obtain AHRIS numbers or for questions regarding AHRIS requirements and shapefile schema, contact our office at 907.259.8721 or visit: <http://dmr.alaska.gov/parks/cha/ahrs/ahrs.htm>.

VI. DETERMINATION OF ELIGIBILITY

A determination of eligibility (DOE) should be provided for each cultural resource in the APE. Only a qualified professional in an appropriate field of study should make these determinations. Please see "How to Apply the National Register Criteria for Evaluation" available at: <http://www.cr.nps.gov/nr/publications/bulletins/nrb15/>. Provide the basis for each NRHP eligibility assessment using the following.

- Category of Historic Property (district, site, building, structure, object, other)
- Historic Context specific to the property type(s)
- Areas of Significance
- NRHP Criteria for Evaluation (A, B, C or D and criteria considerations A-C)
- Level of Significance: local, state or national
- Seven Aspects of Integrity (location, design, setting, materials, workmanship, feeling and association)

- Cultural resources present within the APE but none is eligible for inclusion in the NRHP. Note: finding of effect will be "No historic properties affected."
 - Historic properties (38 CFR 800.16[d]) present within the APE. Note: the next step is to determine if the effect will be adverse. Apply Criteria of Adverse Effect at 38 CFR 800.5.
-

VII. FINDING OF EFFECT

Please provide the basis for your finding.

- No historic properties affected [38 CFR 800.4(c)(1)].
- No Adverse Effect [38 CFR 800.5(b)]. See examples of adverse effects at 38 CFR 800.5(a)(2).
- Adverse Effect [38 CFR 800.5(c)(2)]. If an undertaking results in an adverse effect, further consultation must occur to resolve the adverse effect.

Consulting parties: Has this material been provided to other consulting parties (38 CFR 800.2(c)) such as the local government and Tribes? Please explain / describe the nature of this consultation. We request being involved in the consultation process with other consulting parties, as appropriate, if additional information is provided that is relevant to the consideration of historic properties.

Appendix H. *Employee Fitness & Conditioning Agreement Template*
Eastern Interior Fire Management Physical Fitness Agreement

National policy authorizes physical fitness conditioning during duty time for firefighting personnel (Interagency Standards for Fire and Fire Aviation Operations 2012, 13-6).

FWS policy further defines the conditions under which this training will occur:

Employees serving in wildland fire positions that require a fitness rating of arduous as a condition of employment are authorized one hour of duty time each workday for physical fitness conditioning. Employees not having a fitness rating of arduous as a condition of employment, but who are required by a Critical Performance element or other written agreement to maintain an arduous level, will be authorized three hours per week of duty time for physical fitness condition. All other wildland firefighting personnel holding qualifications requiring ratings of moderate or arduous may be authorized, by their supervisor, up to three hours per week of duty time for fitness conditioning. Prior to any duty time being allowed for physical fitness conditioning, employees and supervisors must agree, in writing, what physical conditioning activities the employee will engage in, and when and where they will occur. Activities outside of the agreement will not be authorized or allowed. A combination of activities designed to increase both physical strength and aerobic fitness, while minimizing the possibility of physical injury, should be utilized (FWS Fire Management Handbook 2012, 13-3).

This agreement is in accordance with the above cited policies, and authorizes _____ to engage in physical fitness conditioning activities while on duty for up to _____ hour(s) per _____.

All duty time physical fitness conditioning activities will be performed during the employee’s regular tour of duty. Overtime or compensatory time will not be authorized.

Workout facilities and equipment are absent at FWS duty stations in Tok and Fairbanks. Therefore, employees are authorized to seek out other means for exercise including:

- Cooperator Facilities (AK-DOF, AFS)
- Commercial gym facilities
- On and Off-site outdoor locations
- Home workout equipment

Authorized Activities include:

- Stretching/Calisthenics
- Weight training
- Cycling
- Running/Walking/Hiking
- Nordic Skiing
- Fitness equipment exercises
- Swimming
- _____
- _____
- _____

Team sports are not authorized.

Employee Signature

Date

Supervisor Signature

Date

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Appendix I. *References*

1. Authorities

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

- A. 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.
- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. 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.
- G. 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.
- H. 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.
- I. 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.

- J. 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.
- K. 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.

2. Other Policy References

- A.** A Collaborative Approach for Reducing Wildfire Risks to Communities and the Environment: 10-Year Strategy Implementation Plan (December 2006)
- B.** Alaska State Statues 41.15.010 – AS 41.15.170
- C.** Bureau of Indian Affairs Act, as amended (67 STAT. 495:16 U.S.C.1b)
- D.** Cooperative Forestry Assistance Act of July 1, 1978, as amended (16 U.S.C. 2101) (FS)
- E.** Cooperative Funds Act of June 30, 1914, (16 U.S.C. 498) (FS)
- F.** Cooperative Funds and Deposits Act of Dec 12, 1975, (P.L. 94 148, 16 U.S.C. 565) (FS)
- G.** Department of the Interior and Related Agencies Appropriations Act, 1999, as included in P.L. 105-277, section 101(e);
- H.** 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.
- I.** Federal Land Policy and Management Act of Oct. 21, 1976, (P.L.94 579; 43 U.S.C.)(BLM)
- J.** Granger-Thye Act of April 24, 1950, (16 U.S.C., Sec 572) (FS)
- K.** Homeland Security Act of 2002 (H.R. 5005-8)
- L.** Homeland Security Presidential Directive-5 (HSPD-5)
- M.** Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide, September 2006
- N.** Interagency Standards for Fire and Fire Aviation Operations, also known as the “Red Book.”
- O.** National Fire Plan (September 2001) and Healthy Forest Initiative (August 2002)
- P.** National Indian Forest Resources Management Act (P.L. 101-630, Title III) (Interior Agencies)
- Q.** National Wildlife Refuge System Wildland Fire Management Strategic Plan (May 2006)
- R.** Region 7 Policy for Management of Permitted Cabins on National Wildlife Refuges in Alaska (RW-1)
- S.** Robert T. Stafford Disaster Relief and Emergency Assistance Act (P.L. 93-288) (Federal Agencies)

- T. Taylor Grazing Act of June 28, 1934, (48 Stat. 1269; 43 U.S.C. 315) (BLM, FS)
- U. United States Fish and Wildlife Service Fire Management Handbook
- V. 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.
- W. Watershed Restoration and Enhancement Act of 1998, P.L. 105-77;
- X. Wildland Fire Leadership Conference Call Notes, March 24, 2008 “Modifying Guidance for Implementation of Federal Wildland Fire Policy (AMR), published on the Internet at <http://www.forestsandrangelands.gov/leadership/meetings/index.shtml>

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