National Park Service

U.S. Department of the Interior

Katmai National Park and Preserve

Alagnak Wild River

Alaska

Wildland Fire Management Plan

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Wildland Fire Management Plan

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1.0 INTRODUCTION

1.1 Reason for the Fire Management Plan

The following Wildland Fire Management Plan (FMP) is a specific action plan for the implementation of agency-wide and park-specific policies for the management of fires on park/preserve lands. This plan will provide consistent operational guidance to management of a wildfire within its jurisdictional boundary. Additionally, National Park Service Policy (DO-18) was updated on January 1, 2008 and requires:

> *"Each* park *with burnable vegetation must have an approved Fire Management Plan that will address the need for adequate funding and staffing to support its fire management program. Parks having an approved Fire Management Plan and accompanying National Environmental Policy Act (NEPA) compliance may utilize wildland fire to achieve resource benefits in predetermined fire management units. Parks lacking an approved Fire Management Plan may not use resource benefits as a primary consideration influencing the selection of a suppression strategy, but they must consider the resource impacts of suppression alternatives in their decisions."*

1.1.1 Other Purposes of the Plan

This Wildland Fire Management Plan includes the goals and objectives for the fire management program. Fire management goals and objectives were derived from the general management plan (GMP), draft resource management plan (RMP), and other founding documents for Katmai National Park and Preserve and Alagnak Wild River. It is important to note that the Alagnak Wild River will be managed under the same policies as Katmai National Park and Preserve as stated in the GMP. These two national treasures share a common border and are both administered by National Park Service (NPS) staff at King Salmon. For the purpose of this FMP, they will be collectively referred to as Katmai National Park and Preserve or Katmai and all reference to fire management within Katmai shall include the Alagnak Wild River.

The GMP recognizes fires role as an important process in the perpetuation of natural ecosystems within Katmai. It also specifies that the park's Wildland Fire Management Plan "will outline objectives, procedures and responsibilities for the management of fire within Katmai and, that the overall objective is to "Let fires burn except where property or people would be threatened." (NPS, GMP, 1986) Further the GMP acknowledges the NPS commitment to cooperate in the development of fire management plans that include "establishment of priorities for the control of wildfires and use of prescribed fires."

The GMP reiterates that one of the many purposes of Katmai was "to preserve in their natural state extensive unaltered arctic tundra, boreal forest, and coastal rainforest ecosystems, to protect the resources related to subsistence needs…to maintain opportunities for scientific research and undisturbed ecosystem." (NPS, GMP, 1986)

The draft RMP for Katmai states several objectives in support of allowing fire to play a natural role, wherever possible. Two objectives are particularly relevant to fire:

1. "Manage human influences to maintain the natural and cultural environment as unimpaired as possible. The focus of this management is to protect resources by preserving ecological processes rather than protecting specific natural features of the park and preserve."

2. "Identify, protect, and perpetuate Katmai's outstanding wildlife, vegetation, water and volcanic features in their wilderness environment."

3. "Identify, preserve and protect the park/preserve's cultural resources…"(NPS, RMP, 1994)

This Wildland FMP provides park managers a concise communication tool for understanding actions, roles and responsibilities of involved fire personnel. It is designed to support management goals and objectives defined in the Katmai GMP and RMP but will additionally give clearly defined direction in regards to fire and its management within the Park/Preserve. It is vital that park managers are aware how fire is managed in Alaska, and how as NPS staff members they will be able to assist in ensuring fire management objectives are met when fire revisits the Katmai landscape.

Fire management has evolved considerably over the past 25 years (the latest RMP is from 1994, and a KATM FMP was found in the archives from 1983) and the FMP will be the most current management document regarding fire, and how it will be managed in Katmai National Park and Preserve.

1.2 General Description of the Park

1.2.1 Purpose of the Park/Preserve

Katmai National Park and Preserve

Katmai (Figure 1-1) was initially established in 1918 by Presidential Proclamation under the authority of the Antiquities Act. Its purpose was to preserve the living laboratory of its cataclysmic 1912 volcanic eruption, in particular, the Valley of Ten Thousand Smokes. In subsequent years portions of coastline, the lake systems and critical wildlife habitat were recognized as significant resources to the monument and were added to the initial acreage. In 1980 the passage of the Alaska National Interest Lands Conservation Act (ANILCA), added additional acreage and enabled Congress to re-designate Katmai as a national park and preserve and designate some 3.4 million acres as wilderness. Among the purposes for the establishment of Katmai include:

1. To preserve unrivaled scenic and geological values associated with natural landscapes;
2. To provide for the maintenance of sound populations of, and habitat for, wildlife species of inestimable value to the citizens of Alaska and the Nation, including those species dependent on vast relatively undeveloped areas;
3. To preserve in their natural state extensive unaltered arctic tundra, boreal forest and coastal rainforest ecosystems;
4. To protect the resources related to subsistence needs;
5. To protect and preserve historic and archeological sites, rivers, and lands, and to preserve wilderness resource values and related recreational opportunities including but not limited to hiking, canoeing , fishing, and sport hunting within large arctic and subarctic wildlands and on free flowing rivers;
6. To maintain opportunities for scientific research and undisturbed ecosystems." (ANILCA, Section 202(2)).

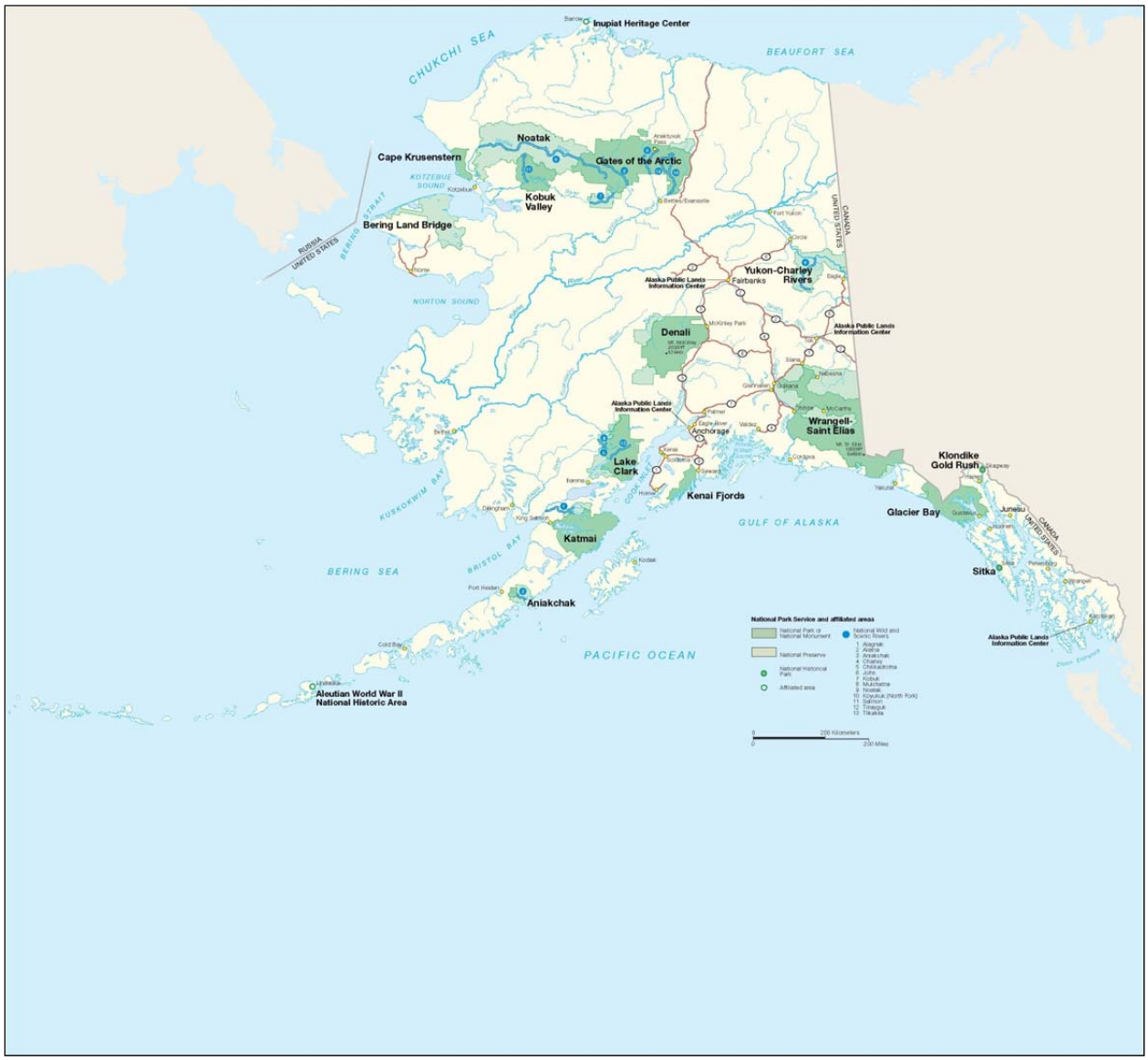


Figure 1-1. Katmai National Park and Preserve vicinity map.

Alagnak Wild River

In December of 1980 ANILCA designated the Alagnak River as a wild river under the provisions of the Wild and Scenic Rivers Act. The Alagnak was chosen because it possessed "outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values, and shall be preserved in free-flowing condition." It further specified that the river, its' designated tributaries "and their immediate environments shall be protected for the benefit and enjoyment of present and future generations." (Wild and Scenic Rivers Act, Section 10(a)).

1.2.2 Management Environment

1.2.2.1 Land ownership, significant resources, mission and management direction

Land Ownership

Katmai National Park and Preserve shares its boundaries with a variety of land owners. The eastern edge of the park is bordered by Shelikof Strait and Kamishak Bay. The United States Fish and Wildlife Service (USFWS) administers the land to the southwest as the Becharof National Wildlife Refuge. To the north, the State of Alaska owns the majority of lands, including The McNeil River State Game Sanctuary. Bureau of Land Management (BLM) land surrounds nearly all of the Alagnak Wild River management area. Privately owned Native Corporation lands are located within the border of the park/preserve at the west end of Kukaklek Lake as well as the west end of Naknek Lake. Numerous privately owned native allotments and inholdings exist within the park/preserve and are displayed in Figure 1-2.

Wilderness

Katmai National Park and Preserve encompasses 4,093,771 acres. Of that acreage, 418,699 acres are in the preserve. Within the park and preserve there are 3,384,358 acres in designated wilderness, while most of the remaining acreage is considered suitable wilderness. There is no wilderness in the Alagnak Wild River. All fire management activities within areas designated as eligible wilderness will conform to the basic principles of wilderness as described in Director's Order #41.

Wild and Scenic River

The Alagnak Wild River originates from Kukaklek and Nonvianuk Lakes within the preserve, and continues for 49 river miles outside the preserve within the area designated and managed as Alagnak Wild River (NPS, ALAG RMP, 1983). The Alagnak is a premier sport fishing destination in Southwest Alaska. Rich with natural resources, this area is managed under the same provisions as Katmai National Park and Preserve. (NPS, GMP, 1986)

National Historic Landmarks

"The region that Katmai National Park and Preserve is located in contains perhaps the richest prehistoric and proto-historic cultural resources in the greatest concentrations known in Alaska." Two examples of the cultural wealth of the area that lie within the boundaries of the park/preserve are the Brooks River Archeological District and Amalik Bay Archeological District, both of which have received National Historic Landmark status. Divided by the Aleutian Range, these archeological districts represent two distinct groups of prehistoric land use within Katmai. (NHL discussion Statement lifted from: http://www.nps.gov/akso/akarc/cr_katm.htm.)

Wildlife Populations

Katmai is world renowned for its brown bear and salmon populations. The park is home to some 2100 bears, the largest protected brown bear population in North America (Olson & Putera, 2007). Bears congregate to feed on the abundant salmon that run in Katmai's pristine waters. A significant portion of fish harvested in the Bristol Bay salmon fisheries utilized park waters for critical rearing habitat. Although the park/preserve is rich with wildlife, bears and fish are the keystone species that have helped


Katmai National Park and Preserve
Land Ownership and Special Management Areas
Pedro Bay
Iliamna
Newhalen
Iliamna Lake
Kokhanok
Igiugig
Kvichuk River
Levelock
Kamishak Bay
Kukaklek Lake
Alagnak Wild River
Nonvianuk Lake
Naknek
King Salmon
South Naknek
Naknek River
Katmai National Park and Preserve
Lake Coville
Lake Grosvenor
Naknek Lake
Brooks River Archeological District NHL
Lake Brooks
Iliuk Arm
Three Forks Overlook
Amalik Bay Archeological District NHL
Becharof Lake
Shelikof Strait
Upper Ugashik Lake
Karluk
Larsen Bay
Ayakulik
0 5 10 20 30 Miles
1:1,250,000
Legend
Towns / Villages
Roads
Katmai Boundary
Native Allotments
Management Areas within Katmai
Park
Park/Wilderness
Preserve
Preserve/Wilderness
Wild River (Alagnak)
Land Ownership
Private
State
Native
State and Native
National Park Service
U.S. Fish and Wildlife Service
Bureau of Land Management

Figure 1-2. Land Ownership and Special Management Areas, Katmai National Park and Preserve.

define Katmai. Thus special consideration should be given to these species when considering appropriate fire management operations within the park/preserve.

1.2.2.2 Overview of physical and biotic characteristics of park

Katmai National Park and Preserve

Katmai encompasses 4,093,000 acres of federal land near the north end of the Alaska Peninsula in Southwestern Alaska. It is bound to the east by Shelikof Strait on the Gulf of Alaska, across from the Kodiak archipelago. The north boundary loosely follows the divide between the Nonvianuk/Alagnak drainage and the Kvichak/ Iliamna drainage. The west boundary is the moraine west of Naknek Lake; the Naknek drainage above this point is enclosed within the boundary. The southeast boundary encompasses the headwaters of both the King Salmon and Kejulik River drainages. (NPS, RMP, 1994)

Alagnak Wild River

The Alagnak River, locally known as the Branch River, is a 74 mile long clear-water river originating in Kukaklek Lake, which lies within the boundaries of Katmai National Preserve, and empties into the Kvichak River. Its major tributary, the Nonvianuk River, is an 11 mile long clear water river originating at Nonvianuk Lake. The south bank of the Alagnak River forms a part of the northern boundary of Katmai National Park and Preserve. The last 18 miles of the Alagnak River have been conveyed to Levelock Natives Limited, and for this reason this segment of the river lies outside of the Wild River Management Unit. (ALAG, RMP, 1983)

Physiography

Four distinct physiographic regions can be distinguished in Katmai: the rugged coastline, the Aleutian Range, the Lake Country, and the Bristol Bay Lowlands. Both glaciation and volcanism have affected each of the different regions described below.

Coast - Characterized by fjord like bays, sandy beaches and rocky headlands, the coast is a complex ecosystem that includes rivers, marshes, beaches, estuaries, intertidal zones and coastal uplands. Here the climate is both warmer and wetter that the west side of the Aleutians, giving life to diverse aquatic and terrestrial communities. Grass and alder communities blanket upland slopes with less frequent pockets of willow, balsam poplar and Sitka Spruce. (NPS, RMP, 1994)

Aleutians Range - Rugged and remote, the Aleutian Range quickly rises from the Shelikof Straight to reach elevations exceeding 7,000 feet. Continuous violent storms, active volcanoes and glaciers continue to sculpt this dramatic and barren landscape. Arctic tundra species are the only plants adapted to survive the harsh climactic conditions representative of this mountain range.

Lake Country - Large northwest trending glacially carved valleys form massive lakes throughout the Lake Country. Numerous rivers and small streams feed these massive bodies of fresh water. Low rolling hills dominate the landscape covered by mixed forests of white spruce, balsam poplar and birch mainly below 1500 feet. (NPS, RMP, 1994) Typically these forested areas are interspersed with patches of grass, extensive marshes and prolific alder and willow dominated shrub communities.

Bristol Bay Lowlands - Composed of vast expanses of moist tundra, the lowlands support an abundance of low growing shrub communities and lichens. White spruce from the lake country lingers, especially along river drainages. This land cover type is characteristic of much of the west coast of Alaska. Permafrost and generally flat topography result in a landscape dotted with small ponds, marshes, and meandering streams.

Biological Resources

Katmai's terrain, remoteness, and relatively short summer season make conducting biological and cultural research, inventories and monitoring difficult in the park/preserve. For years these attributes have resulted in a basic lack of information on the status of biological and cultural resources within the park/preserve. Fortunately, information is currently improving due to the efforts of the Southwest Alaska Network (SWAN) Inventory and Monitoring program among other efforts for research in the park/preserve.

Furbearers - The biological resources at Katmai are incomparable. The park is home to the largest protected population of brown bears (*Ursus arctos*) in North America with an estimated 2100 individuals. (Olson & Putera, 2007). Bears congregate at various salmon spawning streams throughout the park/preserve providing exceptional viewing for visitors who come by the thousands every summer for this unique opportunity. Other furbearers include moose, caribou, wolves, lynx, red fox, wolverine, beaver, river otter, mink, marten, weasel, snowshoe hare, red squirrel and coyote.

Avifauna – Over the years, the park/preserve has documented 164 bird species in Katmai. Although none are currently listed as threatened or endangered, over forty can be considered species of concern found on lists from authorities such as Audubon Alaska (Stenhouse and Senner, 2005), Partners in Flight (Rich et al., 2004), U.S. Fish and Wildlife Service (USFS, 2002), Alaska Shorebird Group (Alaska Shorebird Group, 2000 unpublished), and Boreal Partners in Flight (Boreal Partners in Flight Working Group, 1999). (Ruthrauff et al., 2007) Several candidate species for threatened and endangered status have been identified in Katmai; they are the Kittlitz's murrelet (*Brachyramphus brevirostris*), marbled murrelet (*Brachyramphus marmoratus*), olive-sided flycatcher (*Contopus cooperi*), and yellow-billed loon (*Gavia adamsii*). It is important to note that only breeding populations of Steller's eider are listed as federally threatened by the USFWS. These marine ducks have been observed in Katmai, but no nesting sites have observed along the Katmai coast.

Flora – In 2002 a vascular plant inventory was completed in Katmai by three Alaska Natural Heritage Program botanists contracted by the NPS. Collectively 317 different taxa were collected, identified and documented; of those were 146 new species yet to be inventoried in the park/preserve. Two species categorized as rare persist in the Mirror Lakes area northeast of Kukaklek Lake near the preserve boundary. They include the Chukchi primrose (*Primula tschuktschorum*) and the Aleutian cress (*Aphraymus eschscholtziqnus*).

Aquatic Resources

Katmai National Park and Preserve lies in a hydrologically complex environment in Southwestern Alaska. The park includes the largest freshwater lake and one of the longest continuous segments of marine coast in the National Park System. Also included are an intricate network of streams, wetlands and smaller lakes. Approximately 432,000 acres (12%) of this park unit is occupied by surface water. An additional 216,000 acres (6%) is made up of glaciers (Weeks, 1999).

Healthy water resources play an important role in the success of Katmai's diverse biota. The park's waters support significant sockeye salmon spawning habitat upon which the Bristol Bay commercial salmon fishery and the regional economy depend. From 1972-1991, the annual run of sockeye salmon bound for the Naknek and Kvichak drainages averaged 15.3 million fish, 53% of the total Bristol Bay run. Salmon at all stages of their lives provide a critical nutritional component vital to locally thriving ecosystems. An additional 24 species of fish also occupy these waters, making this region one of the most species rich fisheries in the region. (NPS, RMP, 1994).

Cultural

Of the known archeological and historic sites within the park/preserve, twenty-five have been recognized as nationally significant and have been placed on the National Register of Historic Places. Two areas have been granted National Historic Landmark status. Other cultural resources within the park/preserve vary from historic trapping, mining and research cabins, canneries and cemeteries, to prehistoric camps, villages, and burial grounds (Figure 1-3).

A historic resource study was conducted in the park/preserve, with findings summarized in the publication *Building in an Ashen Land* (Clemens & Norris, 1999). In 2005, a Historic Structures Inventory and Condition Assessment took place. Twenty of sixty known sites within the park/preserve boundary were visited, documented and evaluated. The remaining 40 known sites with the park/preserve still await evaluation for cultural resource significance and eligibility. Some of the sites have received a designation of fire management site protection level; sites that have not received a designation will be protected via a point-protection fire management strategy.

KATM considered executing a Programmatic Agreement among The Alaska State Historic Preservation Officer Regarding Implementation of the Fire Management Plan and Section 106 Compliance. However, KATM consulted with SHPO and determined that elements in the FMP itself, especially the element requiring annual meetings to confirm the roles and responsibilities of the fire management team provided adequate protection to historic properties to comply with NHPA Section 106. The NPS is developing a service wide programmatic agreement that will provide supplementary Section 106 guidance to park Fire Management Plans in the case of planned fires, wild land fires and structural fires.

Threatened and Endangered Species

The northern sea otter (threatened) and the Steller's sea lion (endangered) are two marine mammals listed on the federal threatened and endangered species list that reside in Katmai. The Limited Fire Management Options is selected for the entire Coast (private lands are generally identified as "Full" or "Critical" designations). Fortunately the Katmai coast experiences infrequent fire activity due to maritime weather patterns that dominate the region. These weather influences, coupled with few fire starts, result in little to no impact foreseen for these marine animal species. It is important to note that only breeding populations of Steller's eider are listed as federally threatened by the USFWS. These marine ducks have been observed in Katmai but no nesting sites have observed along the Katmai coast.

1.2.2.3 Role of fire in the park

Fire plays a less significant role in costal parks, such as Katmai, than it does in the Alaskan interior. Although the majority of the park does contain vegetation that is certainly capable of supporting fire, weather patterns during most years keep summers in the region wet and cool. The weather regime keeps convective storms infrequent and thus a low percentage of lightening ignitions occur. Fire occurrence,

Figure 1-3. Cultural sites at Katmai National Park and Preserve.

although rare, does exist as seen from historic fire data (Figure 1-4). In fact when weather parameters permit, the potential for large fire growth does exist within the park/preserve.

The majority of wildland fires have historically been human-caused; these fires can happen any time conditions and human activity (burning trash, accidents, camp fires, etc.) occur, and are independent of seasonality of weather regimes. In spite of cooler, wetter conditions, fires do occur, and can mostly be attributed to human activities. Figure 1-4, Map of fire history at Katmai National Park and Preserve, depicts the year, location, and source (natural or human source) of wildland fires.

Obvious vegetative changes have been occurring in Katmai in the relatively recent past, which could have a direct effect on fire's future role in the park. Spruce beetle kill at present has affected some 70,000 acres (Miller, 2010) within Katmai's Lake Country. Current research on spruce bark beetle is being conducted by the NPS SWAN Inventory and Monitoring program and will provide detailed findings to fire and resource managers regarding the health of spruce communities within Katmai. Additionally the significant die-off of alder communities has affected another 66,000 acres (Boucher et al, 2010) also concentrated in the lakes region west of the Aleutians. The die off of both species (Figure 1-5) is seen to be a natural part of ecological change, although climatic stress is being investigated as a partial culprit.

Based on fire modeling, we can expect fuel model changes can be anticipated over time. With the death of the overstory, presumably biomass added to the forest floor will, for a brief period of time, increase the fuel loading as well as expected species composition change. When fire weather patterns do occur in the region, these fuels coupled with local wind events have the potential to lead to rapid large fire growth.

Climate

The weather differs dramatically in the various parts of the park. In the western portion, temperatures are relatively mild; at Brooks Camp, for instance, summer high temperatures average 63° F, while lows average 44° F. The weather is predominantly cloudy or partly cloudy. In the wintertime, average high temperatures drop to 18.5° F, while winter lows drop to an average of -2.8° F. Winds are generally moderate; in the Brooks Camp area, however, summer winds are often strong. On the Katmai coast, summer temperature averages tend to be a bit lower than the western side of the Aleutians, while winter temperature averages trend higher; however, that is before considering wind chill, a dominant factor, especially in winter months. Cool temperatures, wind, clouds and precipitation are the rule rather than the exception.

1.3 Environmental Compliance

The FMP for Katmai National Park meets the requirements of NEPA, Section 7 of the Endangered Species Act (ESA), and Section 106 of the National Historic Preservation Act (NHPA), Wilderness Act, and ANILCA. The *Katmai National Park and Preserve Fire Management Plan/Environmental Assessment*, April 2012, and associated Finding of No Significant Impact (FONSI), May 2012, support this FMP.

Compliance with these acts is demonstrated as follows:

1. The Fire Management Plan is accompanied by an Environmental Assessment (EA) (Appendix D), which includes a substantive discussion of the effects upon Katmai natural and cultural resources by several alternative actions, including the proposed course of action.

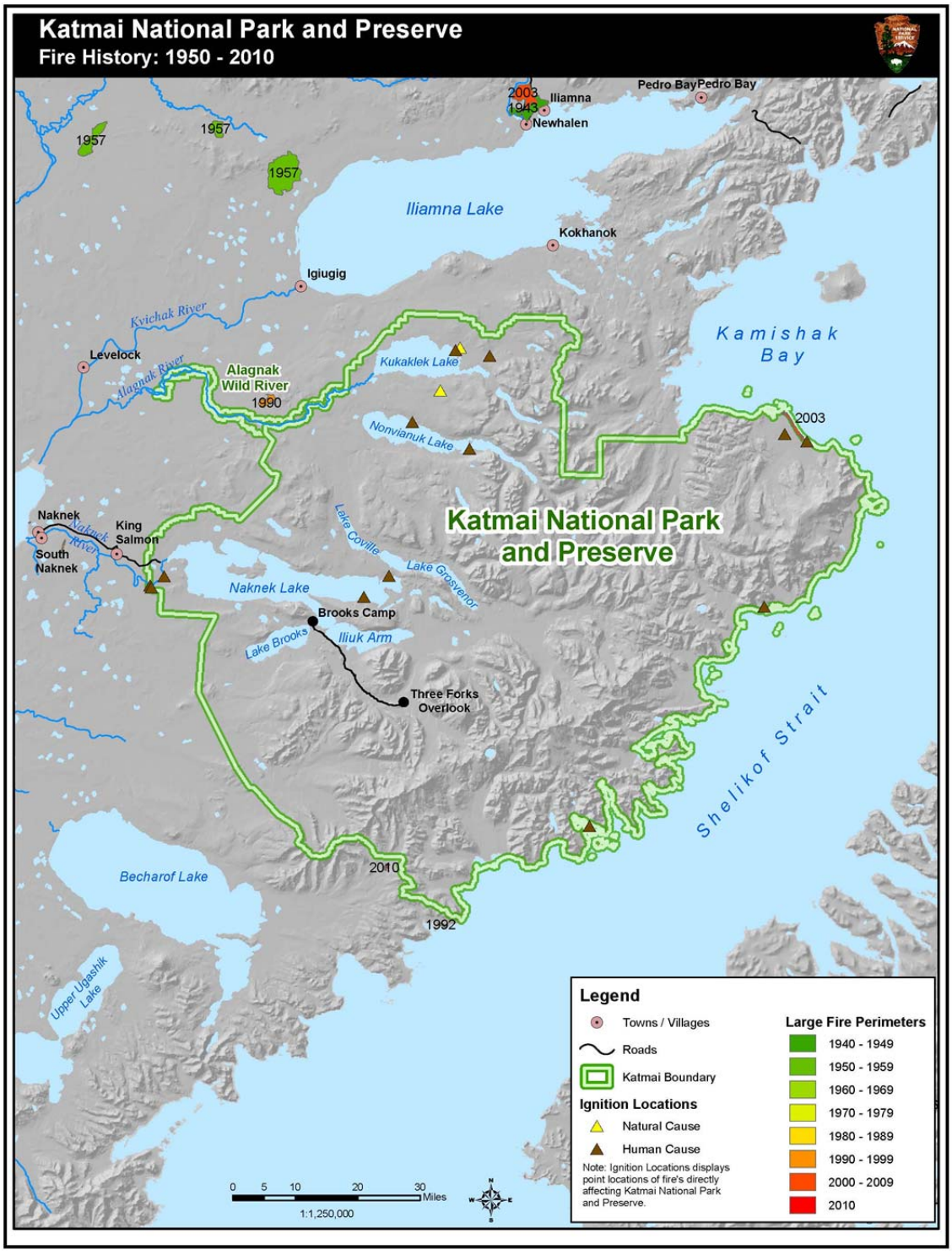


Figure 1-4. Map of fire history at Katmai National Park and Preserve.

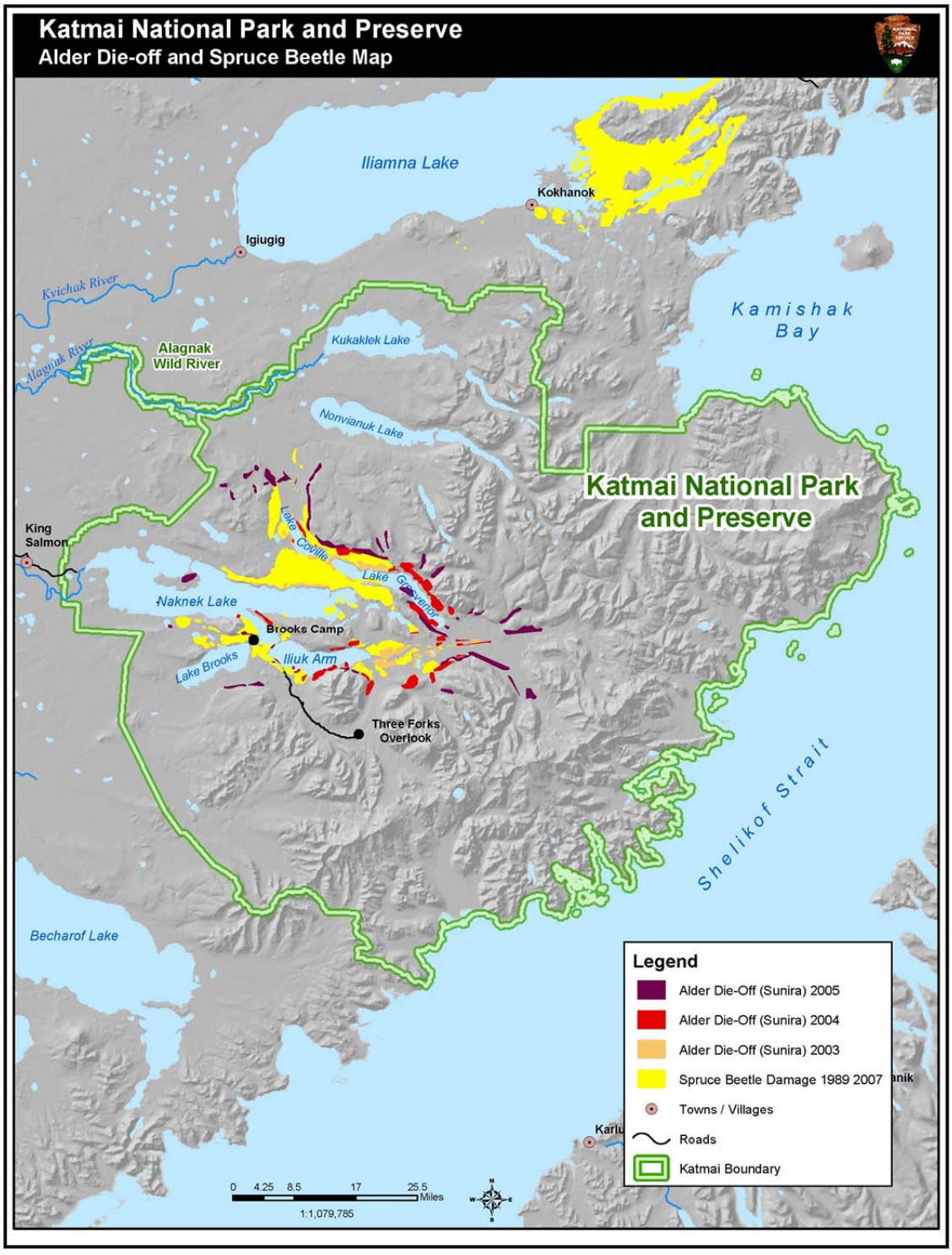


Figure 1-5. Map of alder die-off and spruce beetle kill at Katmai National Park and Preserve.

2. The EA, in turn, is accompanied by an ANILCA 810(a) Summary Evaluation and Findings document, an assessment of the impacts of the proposed actions upon subsistence activities within Katmai.

3. The FMP, EA, and 810(a) Summary Evaluation and Findings were submitted to NPS staff members at Katmai and to the Alaska Regional Support Office for review of operational soundness and compliance with federal policy.

4. The FMP, EA, and 810(a) Summary Evaluation and Findings were submitted for review to local communities, local native corporations, and to all state and federal agencies holding or administering lands adjacent to or in the proximity of the park.

5. A draft Programmatic Agreement among Katmai National Park and Preserve, Western Arctic National Parklands, Denali National Park, Lake Clark National Park and Preserve, the Advisory Council on Historic Preservation, and the Alaska State Historic Preservation Office specifies the actions to be taken by all park units in conjunction with their Fire Management Plans for compliance with the NHPA. The State Historic Preservation Officer (SHPO) reviewed the FMP and EA; in addition the SHPO reviewed all individual prescribed fire burn plans prior to their approval by the Superintendent, Suggest: "The SHPO addressed all prescribed fire criteria requiring approval for future burn plans."

6. Notice of availability of the FMP and accompanying EA and 810(a) Summary were made available locally, with public comments accepted by the NPS for a period of thirty days thereafter.

2.0 POLICY, LAND MANAGEMENT PLANNING & PARTNERSHIPS

2.1 Fire Policy

2.1.1 Federal Fire Policy

On May 2, 2008, the Wildland Fire Leadership Council (WFLC) issued a memorandum entitled *Modification of Federal Wildland Fire Policy Guidance* (Appendix G.10). This memorandum directed federal agencies to test and *implement* new guidelines for wildland fire management. The modifications are clearly described in the document and were field tested in a number of units during the 2008 fire season.

In 2009 the National Wildfire Coordinating Group (NWCG) issued a memorandum to the NWCG executive board (NWCG#001-2009, January 7, 2009) that:

1. Affirms the soundness of the Review and Update of the 1995 Federal Wildland Fire Management Policy (January 2001),
2. Reiterates the policy changes stated in the May 2, 2008 WFLC memorandum entitled Modification of Federal Wildland Fire Policy Guidance,
3. States that the Wildland Fire Decision Support System (WFDSS) will replace existing analysis and decision processes, and
4. Confirms that the Interagency Strategy for the Implementation of Federal Wildland Fire Management Policy (June 20, 2003) will be replaced in 2009. This document, Guidance for Implementation of Federal Wildland Fire Management Policy (February, 2009), is that replacement.

The current policy clearly states that wildland fire analysis will carefully consider the long-term benefits in relation to risks both in the short and long term:

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 fire is based on ecological, social, and legal consequences of 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 management response to fire. (1995/2001 Federal Wildand Fire Management Policy)

2.1.2 NPS Policy

National Park Service *Management Policies 2006* section 4.5 gives guidance regarding wildland fire management in National Park administered lands. Detailed NPS guidance in particular to fire management can be obtained from Reference Manual 18 and Directors Orders 18. The Management Policies 2006 also proclaim that Fire management or suppression activities conducted within wilderness, including the categories of designated, recommended, potential, proposed, suitable, and eligible areas, will be consistent with the "minimum requirement" concept identified in Directors Orders #41: Wilderness Preservation and Management.

Reference Manual 18: Wildland Fire Management (RM 18) provides NPS field employees legal references, operating policies, standards, procedures, general information, recommendations, and examples to assist them in carrying out Fire Management Policies and Director's Orders.

Director's Order # 18: Wildland Fire Management (DO-18) recognizes the need of the NPS to foster healthy and natural fire ecology within individual parks, through the development of fire management programs designed around resource management objectives. Tailoring the FMP to park resource management objectives while still following national guidelines is central to the development of individual fire management plans for each park unit. To this end, each unit of the NPS is directed to prepare a fire management plan that supports cultural and natural resource management objectives while emphasizing safety for park visitors, employees, and developed facilities.

Director's Order #41: Wilderness Preservation and Management (DO-41) states that all fire management activities conducted in Wilderness will conform to the basic purposes of wilderness and that ideally, "natural fire should be considered as a fundamental component of the wilderness environment." Emphasis is placed on the methods used to suppress all wildland fires should be those that minimize the impacts of the suppression tactics (MIST) and the fire itself, commensurate with effective control and the preservation of wilderness values. Additionally, fire management plans must address the effects of fire management decisions on wilderness resources and character, air quality, smoke management, water quality, and other pertinent natural and cultural resource management objectives.

2.1.3 Alaska Policy

Alaska Wildland Fire Coordinating Group (AWFCG)

The mission of the Alaska Wildland Fire Coordinating Group (AWFCG) is to provide a forum that fosters cooperation, coordination, collaboration and communication for wildland fire management and related-activities in the State of Alaska. The AWFCG is the leadership focus for planning and implementing interagency fire management statewide. A comprehensive website contains all current AWFCG documents and educational materials through the Alaska Interagency Coordination Center (AICC).

Alaska Master Cooperative Wildland Fire Management and Stafford Act Response Agreement

The Alaska Master Cooperative Wildland Fire Management and Stafford Act Response Agreement, herein referred to as the Master Agreement, documents the commitment of all Parties (BIA, BLM, USFWS, NPS, USFS and the State of Alaska) involved and improves efficiency by facilitating coordination and exchange of personnel, equipment, supplies, services and funds among the parties to this agreement in sustaining wildland fire management activities. This includes prevention, preparedness, communication and education, fuels treatment and hazard mitigation, fire planning, response strategies, tactics and alternatives, suppression and post-fire rehabilitation and restoration. The Master Agreement

Alaska Interagency Wildland Fire Management Plan

Prior to 1980 the policy for fire in Alaska required the immediate suppression of all wildfires. This policy was costly, of questionable effectiveness, and had a negative effect on the diversity and productivity of the fire-dependent ecosystems in some regions of Alaska. In addition, during periods of high fire activity it was not possible to provide immediate or effective suppression on many fires because of the shortage of personnel, equipment, supplies or aircraft. It was soon recognized by all land agencies that an improved system was needed for establishing response priorities. Several progressions of fire management

planning documents evolved over the years until finally, in 1998, the Alaska Interagency Wildland Fire Management Plan (AIWFMP) was signed into action as the official response plan.

In 2010, necessary updates were made to respond to public requests for more information regarding Alaskan fire management practices, clarify interagency guidelines, polices and operational direction for responses to wildland fires and to modernize terminology. "This plan affirms that fire firefighter and public safety is the first priority on all fire management activities for all agencies. It also reaffirms the concepts presented in the 1998 plan and previous Alaskan interagency fire planning efforts for a consistent, cost-effective, interagency approach to wildland fire management." (AIWFMP, 2010) The updated 2010 AIWFMP is the interagency reference for wildfire operational information. The plan specifies direction for the response to a wildfire based on the management option designation and provides guidelines to jurisdictional and protection agencies for decision support direction as the complexity of a wildfire increases.

Multi-Agency Coordinating Group

The Alaska Multi-Agency Coordinating (MAC) Group 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 during periods of resource shortage. The Alaska MAC Group forum ensures coordinated: - Incident prioritization - Resource allocation and acquisition - State and federal disaster response or coordination - Political interfaces - Information provided to media and agencies involved - Anticipation of future needs - Identification and resolution of issues common to all parties. The MAC group convenes on an "as needed" basis or when reaching Preparedness Level 4+. Preparedness level definitions can be found in the Alaska Preparedness Plan (AKPP) of the Alaska Interagency Mobilization Guide (AIMG) Chapter 20, Section 26.2 and 26.3.

2.2 Park/Resource Management Planning

General Management/Wilderness Management Plan – The 1986 GMP recognizes that, "the vast majority of Katmai National Park and Preserve is designated as wilderness, the management plan for the area is essentially a wilderness management plan." The GMP continues that, "Although the frequency of wildfire in Katmai has historically been low, it is an important process in the perpetuation of natural ecosystems. The park's fire management plan outlines objectives, procedures, and responsibilities for managing fires in Katmai. The overall objective of the plan is to let fires burn except where property or people would be threatened." (NPS, GMP, 1986)

Foundation Statement – The foundation statement for Katmai also recognizes "Katmai National Park and preserve provides an outdoor laboratory for studying the effects of volcanism, climate change, and other large scale landscape processes on cultural and biological systems." (NPS, Katmai National Park and Preserve Foundation Statement, 2009)

Resource Management Plan – The current RMP for Katmai states several objectives in support of allowing fire to play a natural role, wherever possible, three of the objectives are particularly relevant to fire:

1. "Manage human influences to maintain the natural and cultural environment as unimpaired as possible. The focus of this management is to protect resources by preserving ecological processes rather than protecting specific natural features of the park and preserve."

2. "Identify, protect, and perpetuate Katmai's outstanding wildlife, vegetation, water and volcanic features in their wilderness environment."

3. "Identify, preserve and protect the park/preserve's cultural resources…"(NPS, RMP, 1994)

Alaska National Interest Lands Conservation Act (ANILCA) - Often called the most significant land conservation measure in the history of our nation, the statute protected over 100 million acres of federal lands in Alaska, doubling the size of the nation's National Park and refuge system and tripling the amount of land designated as wilderness. With this acquisition also came a responsibility of preservation of various Alaskan ways of life, traditional use, natural processes, wildlife habitat, and unique natural character of vast undeveloped expanses.

In 1980 the passage of ANILCA added additional acreage and enabled Congress to re-designated Katmai as a National Park and Preserve and designate 3,425,811 acres as Wilderness. Among the purposes for the establishment of Katmai include:

- "To preserve unrivaled scenic and geological values associated with natural landscapes;
- To provide for the maintenance of sound populations of, and habitat for, wildlife species of inestimable value to the citizens of Alaska and the Nation, including those species dependent on vast relatively undeveloped areas;
- To preserve in their natural state extensive unaltered arctic tundra, boreal forest and coastal rainforest ecosystems;
- To protect the resources related to subsistence needs;
- To protect and preserve historic and archeological sites, rivers, and lands, and to preserve wilderness resource values and related recreational opportunities including but not limited to hiking, canoeing , fishing, and sport hunting within larges arctic and subarctic wildlands and on free flowing rivers;
- To maintain opportunities for scientific research and undisturbed ecosystems." (ANILCA, Section 202(2).

This plan was created by the combined efforts of the NPS Alaska region fire management staff in coordination with all of the interagency fire cooperators in the state of Alaska as well as the management at Katmai National Park and Preserve

During the planning process fire management related issues identified were:

1. Fire management operations in Katmai that must comply with fire operations in Wilderness
2. Fire season coinciding with sockeye salmon runs, and high brown bear and visitor use of the "Critical" protected Brooks Camp
3. Bear/firefighter interactions when preparing to protect Brooks Camp and other structures in the park, and the safety implications regarding those interactions that must be considered
4. The lack of a viable evacuation strategy, or a self-sufficient fire protection plan at Brooks Camp
5. The effects of aerial fire retardant applications on the fisheries resources

2.3 Partnerships

The National Park Service, Alaska Region, is a participant in all of the Interagency planning efforts that take place with regard to the management of wildland fire in Alaska. The AWFCG, the AIWFMP, Master Agreement, and the interagency MAC group are all products of a cohesive interagency working group of which the NPS is a vital cooperator. The effect of such interagency organizations is a professional, efficient and responsible way to manage fire over large landscapes.

3.0 PARK-WIDE & FIRE MANAGEMENT UNIT CHARCTERISTICS

3.1 Park-wide Fire Management Considerations

Under the AIWFMP, the NPS, other land management agencies, and private landowners are given the opportunity to evaluate their lands based on values to be protected and resource management objectives. Once fire protection needs are determined, lands or properties are placed in Critical, Full, Modified, or Limited management option units. The plan allows for each agency to evaluate its designated protection levels annually, and change protection level designations as desired. During the annual evaluation, if it is deemed necessary to change the protection level, the Fire Management Officer will work with the servicing Protection Agency Zone Fire Management Officer to change the management option (protection level) commensurate with the values at risk and land management objectives. The fire management strategies selected varies from initial attack and sustained suppression efforts in the Critical and Full management areas to active monitoring/surveillance in the Limited management areas. Annual evaluation of these selections is required by the AIWFMP to ensure selected strategies remain consistent with changing values at risk and land management objectives.

Site protection designations have been employed dating back to the 1980's. Site designation provides the land manager the opportunity to acknowledge significance of a particular point within the landscape scale management option designation. Critical, Full, Avoid, and Non-sensitive were the categories created for assignment to these particular sites. Critical and Full sites are afforded the same protection priority of their landscape scale counterparts. Avoid designation applies to sites where fire suppression activities should be avoided. At these sites the effects of suppression actions may likely be more detrimental than the effects of the naturally occurring fire. Aircraft should be restricted from these areas. Non-sensitive sites are those acknowledged by the NPS; yet no protection, action, or consideration is warranted for the site.

For its own management purposes, the NPS has added a fifth site designation that applies to its historic structural resources. **Non-sensitive/Defensible space -** Fires immediately threatening this designation will be allowed to burn under the influence of natural forces within predetermined areas while continuing protection of human life. Defensible space will be built prior to any fire starts.

This designation is reserved for those properties where cultural resources are not eligible for the National Register, but are representative of historical themes established by the park unit and have a decrease in structural integrity, or Cultural resources that are in the process of assessment for the National Register. Upon the signing of this fire management plan, a cabin survey to assess fire management designation status and eligibility for the National Register will be pursued to ensure all cabins are granted fire protection status commensurate with their cultural significance in the park/preserve.

The Department of Natural Resources, Division of Forestry, State of Alaska, herein referred to as DNR or the Protection Agency, provides suppression services for all lands generally south of the Alaska Range regardless of ownership. This includes Katmai National Park and Preserve.

The utilization and implementation of the AIWFMP management options in Katmai provides the most efficient use of resources throughout the state. Areas of critical concern are prioritized to receive resources first while simultaneously allowing fire to fulfill its natural role in large undeveloped regions. By using this management strategy the NPS succeeds at its dual mission to protect life, property and

valuable resources while simultaneously allowing natural ecological process to complete their natural cycles.

3.1.1 Fire Management Goals and Objectives

AIWFMP (State and Park-Wide Fire Management Options/Units)

Goals and objectives differ depending on the fire management option selected for each management area. Goals and Objectives in the AIWFMP are both broadly defined solely because all agencies across the State of Alaska needed to find common ground from which to operate. These goals, listed below are taken directly from the 2010 AIWFMP and provide a basis for which the protecting agency can operate.

Goals:

1. Emphasizing firefighter and public safety as the single, overriding priority.
2. Defining criteria for prioritizing the allocation of resources in response to a wildland fire.
3. Using ecologically, operationally and fiscally sound principles.
4. Integrating fire management, mission objectives, land use, and natural resource goals.
5. Maintaining a flexibility that allows agencies to adhere to their policies and respond to changes in objectives, fire conditions, land use patterns, resource information and technologies.
6. Promoting cooperation, collaboration and partnerships for fire management between federal, state, and local governments, Alaska Native groups and other organizations.

Objectives:

1. Protect human life.
2. Prioritize areas for protection actions and allocation of available firefighting resources without compromising firefighter safety.
3. Use a full range of fire management activities to achieve ecosystem sustainability including its interrelated ecological, economic, and social components. (fire suppression, monitoring, prescribed fire, thinning and other vegetation treatment projects, prevention and education programs, scientific studies, etc.)
4. 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.
5. Manage vegetation through various fuels treatment techniques to reduce and mitigate risks of damage from wildland fire.
6. Balance the cost of suppression actions against the value of the resource warranting protection and consider firefighter and public safety, benefits, and resource objectives.

7. 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.

8. Minimize adverse environmental impact of fire suppression activities.

9. Maintain each jurisdictional agency's responsibility and authority for the selection and annual review of fire management options for the lands that they administer.

10. Adhere to state and federal laws and regulations

NPS – Katmai National Park and Preserve – Strategic Objectives

1. Let fires burn except where property or people would be threatened. (NPS, GMP, 1986)

2. Maintain unimpaired the water habitat for all fish native to the park/preserve. (KATM, Foundation Statement)

3. Identify, protect, and perpetuate Katmai's outstanding wildlife, vegetation, water and volcanic features in their wilderness environments. (NPS, RMP, 1994)

4. Identify and afford protection to the Park and Preserve's fire-sensitive cultural resources. (NPS, RMP, 1994)

5. Ensure that fire management activities conducted in designated or suitable Wilderness within Katmai conform to the basic purposes of wilderness. (DO-41)

3.1.2 Wildland Fire Management Actions

Allowing for use of varied management applications regarding wildland fire and its associated fuels will provide managers with every opportunity to obtain desirable results post treatment. Regarding unplanned ignitions, the Use of Wildland Fire will be both emphasized and utilized heavily in the 3,970,418 acres of Limited Fire Management Option lands within Katmai as directed in the park objectives, RMP, GMP and DO 41. Use of Wildland Fire will also be considered in the other management options on a case by case basis at the discretion of the Regional Fire Management Officer and Agency Administrator. The Protecting Agency can make recommendations based on resource availability and operational feasibility, but they do not have final say in strategic direction the park desires. Negotiations may take place, but the final decision rests solely with the Agency Administrator.

Planned fuel treatment projects utilizing both mechanical and prescribed fire, sometimes in tandem, will be an alternative to protect valuable park resources. These tools can be implemented to provide increased protection to park resources regardless of the fire management option selection surrounding the resource. Suppression actions that employ a full spectrum of response options will be used as a tool predominantly where Critical and Full management options prevail as directed and agreed upon in the 2010 AIWFMP. If there are opportunities to manage a given fire for multiple objectives, it could be, for example, suppressed on one perimeter and managed as a benefit (fuels treatment, prescribed fire) fire, even in Critical and Full fire. This is called a "Non-Standard Response" in the AIWW FMP and can be used at the discretion of the Agency Administrator.

No matter the tools selected to manage wildland fire and protect park resources, continual evaluation will be implemented to ensure fire and resource management goals and objectives are being met and wilderness values upheld. Monitoring and research findings will be reviewed and incorporated into future management decisions as outlined in Section 5.0 Adaptive Management Strategy, as well as RM 18-Chapter 7-Fuels Management.

3.2 Fire Management Unit Specific Characteristics

Determination of Fire Management Units (FMU) (Figure 3-1, Table 3-1) within Katmai is a result of interagency agreements based on NPS management directives outlined in the GMP, RMP, foundation statement and NPS RM 18. These land management option selections are also in agreement with the broader AIWFMP. Predetermined responses are clearly defined by the AIWFMP and understood by all participating agencies within Alaska.

NPS selections were based upon laws, enabling legislation, mandates, and policies applicable to fire management within the NPS. Values and resources to be protected, fire behavior and ecology, and human use patterns were critical components to the selection process. If adjacent land manager/owners selected different options for their lands, attempts were made to negotiate an agreement on the selected option or determine reasonable boundaries if options differed. Every effort was made not to use administrative boundaries but to select option area boundaries that were identifiable from the air and were feasible considering operational and fire behavior concerns. (AIWFMP, 2010) These selections are evaluated annually and updated when changes to land management objectives or values at risk dictate the necessity.

3.2.1 FMU Description

Due to the immense scale of lands in Alaska and associated fire management units within Katmai National Park and Preserve, detailed descriptions of each of the Fire Management Options are not practical. Instead original intent of the management option will be given, accompanied by general descriptions and maps that will help familiarize the reader to the Fire Management Option selections and their surroundings.

CRITICAL

Intent: 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.

Two parcels of Critical were assigned within the boundaries of Katmai National Park and Preserve which together compromise 1,761 acres. The larger of the two parcels is 1,191 acres of Native owned lands on the west end of Naknek Lake. Multiple permanent residences, lodges, and associated structures are situated in this area with the highest concentration being on the west shore of Pike Lake. This housing area is also within close proximity to the town of King Salmon and the larger Critical protection designation associated with it.

The Brooks River Archeological District is the second noteworthy critical area within the park. Registered as a National Historic Landmark this 570 acre area represents nearly 4,000 years of human

habitation of the Brooks River. Numerous historic structures, private lodges, park administrative buildings, employee housing facilities and various other infrastructures are located here. This area serves as the epicenter of park activity during the summer months as silver salmon runs and high brown bear concentrations coincide with elevated visitor use.

Table 3-1. Fire Management Units.

Katmai Fire Management Units	NPS Rationale for FMU Determination	Pre-determined Responses
Critical 1,761 acres Brooks Camp-Lake Camp	• Presence of permanent residences and valuable cultural resources, including National Historical Landmarks. • Private land is afforded protection by the State.	Aggressive Suppression, all starts regardless of ignition source will be aggressively suppressed. Ranks highest priority for protection from wildland fires
Full 130,214 acres	• Presence of private structures and of structures included on the National Register of Historical Places. • Proximity to Critical FMU.	Aggressive suppression actions dependent upon the availability of resources for all fires within or immediately threatening this management option.
Limited 3,970,418 acres	• Wilderness • Presence of fire-dependent ecosystems. • Relative lack of significant fire-sensitive resources.	Fires are allowed to burn under natural influences. Protection of human life and site-specific values within the management option. Surveillance, monitoring.
Modified -associated conversion date dictates response 9, 855 acres	• Proximity to Critical and Full FMUs. • Presence of fire-dependent ecosystems. • Balance of social and ecological costs	Receives lower priority when resources are scarce than Critical or Full designation. Fires will be suppressed unless requested by NPS and documented in WFDSS. Treated as Limited following conversion date.

Figure 3-1. Fire Management Units, Katmai National Park and Preserve.

FULL

Intent: To protect cultural and historical sites, uninhabited private property, natural resource high-value areas, and other high-value areas that do not involve the protection of human life, and inhabited property.

Full protection status was assigned to 130,214 acres within the NPS management area. These areas are located on the west end of Naknek Lake, the north and west of end of Kukaklek Lake, and the lower half of the Alagnak Wild River. Higher densities of values at risk, private land ownership, adjacent land management strategy and proximity to Critical lands are all rationale for the Full management option designation of these areas. Over thirty smaller parcels of private land and/or native allotments have also been selected for full fire management protection within the boundary of the park/preserve.

LIMITED

Intent: To recognize areas where the exclusion of fire may be detrimental to the fire dependent ecosystem, the environmental impacts of fire suppression activities may have more negative impacts on the resources than the effects of the fire, or the cost of suppression may exceed the value of the resources to be protected.

Over 96% of the management area falls under this designation. The limited management options allows fire to burn naturally with limited or no intervention as directed in the GMP and DO 41: Wilderness Preservation and Management. Additionally this option allows for the achievement of specific objectives that relate to fire as stated in the Resource Management Plan for Katmai. These objectives are:

1. "Manage human influences to maintain the natural and cultural environment as unimpaired as possible. The focus of this management is to protect resources by preserving ecological processes rather than protecting specific natural features of the Park and Preserve."

2. "Identify, protect and perpetuate Katmai's outstanding wildlife, vegetation, water and volcanic features in their wilderness environment."

3. "Manage the biological and physical resources of the park/preserve to ensure the perpetuation of the factors basic to the area's establishment."

4. "Identify, preserve, and protect the park/preserve's cultural resources…" (NPS, RMP, 1994)

MODIFIED

Intent: Provides an adaptable option management level between Full and Limited that allows the NPS to consider environmental conditions into their decision making process. As indicated by the 2010 AIWFMP, the NPS will determine management response in this selected management unit based on . the conversion date for a given year (typically July 10).

The area where the Alagnak Wild River leaves the preserve boundary begins the only lands that fall into the modified management option within the management unit. Seasonal variability coupled with interagency consultation (DNR and NPS) will dictate how fires ignited within this area are responded to.

3.2.2 Fire Management Site Designations

AIWFMP

Critical, Full, Avoid and **Non-sensitive** site designations have been established to identify the appropriate actions to be taken within the landscape-scale management option areas. These site designations give protection agencies specific guidance for structures, cultural and paleontological sites, small areas of high resource value and threatened and endangered species nesting areas.

1. Critical sites are to be protected from fire and receive the same priority as Critical Management Option areas.

2. Full sites are to be protected from fire and receive the same priority as Full Management Option areas.

3. Avoid sites are areas where fire suppression activities should be avoided and effects from suppression efforts minimized. Aircraft should be restricted from these areas.

4. Non-sensitive sites have been located and identified by the jurisdictional agency and do not require any type of protection, suppression actions, or considerations (see additional guidance below)

When a structure is located during fire management activities and no designation has been recorded, the jurisdictional agency will be notified immediately and they will determine actions to be taken. (AIWFMP, 2010)

NPS

The NPS has developed recommended criteria in order to provide consistency in the evaluation of cultural resources when determining their site designation categories. Additional to the AIWFMP site designation criteria, cultural resource managers for Katmai have defined criteria for each of the categories and added a fifth. Non-Sensitive/Defensible Space, was added to the management strategy for site specific considerations within the park/preserve. Because a cabin/structure evaluation project has not been initiated in Katmai, this designation provides managers with a more flexible option when considering the protection of potentially valuable resources. Within the designation, defensible space will be created either through a fuels management project ideally preceding the fire start, or during an incident before fire impacts the area, this may decrease the likelihood of damage from wildfire but firefighters will not be required to stay and perform suppression actions at the site. Fuels mitigation work will follow project standards and may be implemented by either NPS fire personnel from neighboring programs or Katmai maintenance personnel. These sites will receive the lowest priority for suppression resources from the protection agency.

CRITICAL recommended criteria:

1. Any historic property designated as a National Historic Landmark.

2. Any cabin or building that has been specified as actively occupied on a resident use permit granted to the user by the NPS.

3. Any property that is essential to the park/preserve's management and resource operations; examples include: ranger stations, remote base camps, etc.

FULL recommended criteria:

1. Any historic property designated, or determined eligible for, inclusion on the National Register that retains structural integrity (i.e., standing with a roof).

2. Any property that has received NPS funds for stabilization or rehabilitation, or is designated to receive funds in the future.

3. Administrative sites (i.e., public use cabins, actively used airstrips, etc.).

4. Cultural resources that are representative of historical themes established by the park unit and retain a high degree of structural integrity.

AVOID recommended criteria:

1. Archeological Sites

2. Threatened/Endangered/Rare Species habitat

3. Burial Sites

NON-SENSITIVE recommended criteria:

1. Trespass structures that do not meet any of the criteria listed above

2. Cultural resources that are not eligible for the National Register

3. Historic properties that lack significant structural integrity

4. Stand-alone log buildings/structures that consist of four courses of logs or less

5. Stand-alone frame buildings with one or more collapsed wall(s)

6. Stand-alone tent frames and other camp features (meat racks, fish wheels, etc.) that are less than 50% intact

7. Stand-alone mining features (adit, penstock, flume, dam, etc.) that are less than 50% intact

8. Multi-component properties in which the majority of the contributing structures are less than 50% intact

9. Bridges, trestles, aerial tramways, or other transportation-related features that are less than 50% intact

10. Machinery, vehicles, or other equipment that has degraded to the extent that function and/or interpretive value has been compromised

NON-SENSITIVE/DEFENSIBLE SPACE recommended criteria:

1. Cultural resources that are not eligible for the National Register, but that are representative of historical themes established by the park unit and have a decrease in structural integrity.

2. Cultural resources that are in the process of assessment for the National Register.

3. Historic properties that have a decrease in structural integrity:

    a. Stand-alone log buildings/structures with a collapsed roof
    b. Stand-alone frame buildings with a collapsed roof
    c. Stand-alone tent frames and other camp features (meat racks, fish wheels, sheds, outhouses, etc.) that are less than 75% intact
    d. Stand-alone mining features (adit, penstock, flume, dam, etc.) that are less than 75% intact
    e. Multi-component properties in which the majority of the contributing structures are less than 75% intact
    f. Bridges, trestles, aerial tramways, or other transportation-related features that are less than 75% intact

Note: See the 2005 "Alaska NPS Structure Protection Procedures" for the latest Guidance.

FMU Approved Strategic Direction

Katmai National Park and Preserve aims to use fire for the benefit of the resource whenever possible. Under the new National Fire Policy direction, increased opportunities for the Use of Wildland Fire for resource benefit may become more available in Katmai. The Regional Fire Management Officer (FMO) and Agency Administrator will assess every opportunity for managing fire for the benefit of the resources within the park/preserve (Table 3-2).

3.2.3 FMU Goals and Objectives

AIWFMP (2010)

Critical

1. Protect human life.

2. Prioritize areas for protection actions and allocation of available firefighting resources without compromising firefighter safety.

3. Protect area from wildland fire.

4. Provide for protection actions on fires that threaten human life, qualifying properties, or high-value resources with available firefighting resources and without compromising firefighter safety.

Table 3-2. Approved Strategic Direction/ Fire Management Actions.

Katmai Fire Management Units	Approved Strategic Direction	Approved Fire Management Actions
Critical	Protect human life and high-value resources by making this designation the highest priority for firefighting resource allocation.	Response to Wildland Fire Suppression Prescribed Fire Mechanical Fuel Reduction
Full	Minimize damage to resources without compromising human safety. Contain fires with initial action forces. Manage fire for multiple objectives.	Response to Wildland Fire Suppression Use of Wildland Fire Prescribed Fire Mechanical Fuel Reduction
Modified	Maintain flexibility to respond to fire conditions and tailor the initial action to those conditions. Allows for accomplishment of NPS objectives under suitable conditions while providing protection to identified sites.	Response to Wildland Fire Suppression Use of Wildland Fire Point Source Protection Prescribed Fire Mechanical Reduction
Limited	Allow fire to fulfill its natural ecological role. Environmental impacts from fire suppression activities may exceed damages incurred from fire effects or suppression costs may exceed value of resources to be protected.	Response to Wildland Fire Use of Wildland Fire Point Source Protection Prescribed Fire Mechanical Fuel Reduction

Full

1. Prioritize areas for protection actions and allocation of available firefighting resources without compromising firefighter safety.

2. Minimize damage to the identified sites and areas from wildland fire.

3. Control all wildland fires at the smallest acreage reasonably possible with initial action forces.

Modified

1. Use a range of fire management responses: *Before the conversion date*: Contain fires with initial action forces. *After the conversion date*: Use wildland fire to protect, maintain, and enhance

natural and cultural resources and, as nearly as possible, allow fire to function in its ecological role and maintain the natural fire regime.

2. Weigh costs and associated environmental impacts of the suppression actions against the values to be protected.

3. Realize short and long-term cost effectiveness and efficiencies.

4. Moderate the adverse effects of fire suppression efforts.

Limited

1. 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.

2. Weigh the costs and associated environmental impacts of the suppression actions against the values to be protected and consider firefighter and public safety, benefits and resource objectives.

3. Realize short and long term cost effectiveness and efficiencies.

4. Minimize the adverse effects of fire suppression efforts.

NPS - Katmai National Park and Preserve - The objectives outlined below apply across all fire management units within Katmai:

1. Maintain unimpaired watersheds as habitat for significant salmon populations, rainbow trout and other fish native to the park/preserve. (KATM, Foundation Statement)

2. Identify, protect, and perpetuate Katmai's outstanding wildlife, vegetation, water and volcanic features in their wilderness environments. (NPS, RMP, 1994)

3. Identify and afford protection to the park and preserve's fire-sensitive cultural resources. (RMP 1994)

4. Let fires burn except where property or people would be threatened. (NPS, GMP, 1986)

5. Ensure that fire management activities conducted in designated or suitable Wilderness within Katmai conform to the basic purposes of wilderness. (DO-41)

3.2.4 FMU Management Constraints and Guidance

The majority of Katmai National Park and Preserve is designated or suitable wilderness and critical resources that could be adversely affected by fire suppression activities exist throughout the Park/Preserve. Therefore restrictions pertaining to Katmai are to be applied across all management units (Table 3-3). Only the Agency Administrator can approve deviation from the restrictions described below.

Table 3-3. Fire Management Constraints across all Management Units.

FMU	Constraints Specific to Katmai National Park and Preserve.
ALL	Avoid aerial fire retardant applications within 300 feet of waterways. MIST tactics will be an objective on all fires (See Section 4.4.1) Consider requesting alternative deployment methods of suppression resources to avoid excessive helicopter use. (ie. Smokejumpers, float plane, boat) Conduct water pump operations away from critical salmon habitat when possible to avoid undesirable bear interactions, and unintentional fuel spillage.

The use of water rather than retardant is preferable except under the most extreme circumstances. If used, retardant will not be applied within a 300 foot buffer of waterways. Waterways are defined in the Interagency Redbook as "Any body of water including lakes, rivers, streams and ponds whether or not they contain aquatic life." As is specified in the 2010 AIWFMP, retardant use in park/preserve will only be used upon authorization of Agency Administrator or designee.

3.2.5 FMU Safety Considerations

Fire management unit boundaries have no effect on safety considerations in Katmai and therefore will be discussed in Section 4.1 of this Plan.

FMU Operational Information

Specific operational information can be obtained from the Alaska Statewide Annual Operating Plan, which is located in Exhibit C of the Master Cooperative Wildland Fire Management and Stafford Act Response Agreement. (Appendix G.3.1). The Annual Operating Plan (AOP) will be updated annually to reflect changes in organizational structure, policy, and legal mandates as it relates to all interagency cooperators. The AIWFMP 2010 plan provides overall guidance for all lands in Alaska regardless of ownership. FMU options are delineated and topics of intent, priority, objectives, operational guidance and general fire occurrence are defined and discussed.

4.0 WILDLAND FIRE OPERATIONAL GUIDANCE

4.1 Safety

The foremost guiding principle of *Federal Wildland Fire Management Policy, January 2001* is that firefighter and public safety is the first priority in every fire management activity. The AIWFMP and this Fire Management Plan and the activities defined within reflect this commitment. The commitment to and accountability for safety is a joint responsibility of all firefighters, managers, and administrators. Individuals must be responsible for their own performance and accountability. Every supervisor, employee, and volunteer is responsible for following safe work practices and procedures, as well as identifying and reporting unsafe conditions. All firefighters, fireline supervisors, fire managers, and agency administrators have the responsibility to ensure compliance with established safe firefighting practices.

All actions defined in the Fire Management Plan will conform to safety policies defined in agency and departmental policy, including, but not limited to:

1. Interagency Standards for Fire and Fire Aviation Operations (Redbook)
2. NPS Director's Order 18 Wildland Fire
3. NPS Reference Manual 18, Chapter 3 - Standards for Operations and Safety"
4. DOI Departmental Manual 485 (appropriate sections)

4.1.1 Firefighter Safety

4.1.1.1 Transportation safety

Aviation Safety – As is the case in most of Alaska, air travel is the predominate mode of transportation in and around Katmai. Inherent risks are reduced by following existing Federal Aviation Administration safety policies and procedures and more Federal Aviation Administration safety policies and procedures and more specific Interagency Standards for Fire and Fire Aviation Safety as cited in NPS Reference Manual 18.

The inherent remoteness of Katmai National Park and Preserve demands that safety be a priority to all personnel involved in fire operations and associated project work. Aviation operations become routine in Alaska and it is not unusual for personnel to become complacent. Access to many private lodges within the park/preserve is by airplane only and therefore routine low level fixed wing aircraft are to be expected during the busy summer months. Excessive air traffic is the norm at Brooks Camp and around King Salmon. An aviation hazard map has been developed by experienced park pilots intimately familiar with flying in Katmai. A copy of that map is attached in Appendix G.4 and should be provided to Incident Management Teams in order to orient them to aviation hazards in the local area.

Watercraft and all-terrain vehicles (ATV) also provide routine transportation. Operation of any watercraft will be done by a qualified operator who has passed the agency Motorboat Operator Certification Course

as outlined in DOI DM 485 Safety and Occupational Health Chapter 22: Watercraft Safety. Additionally any personnel operating ATV's on NPS land will adhere to regulations clarified in NPS Reference Manual 50B Section 6: Motor vehicle Safety, specifically section 6.1 which addresses ATV safety in particular.

Weather – Weather patterns in this region of Alaska are exceptionally inhospitable and inclement weather should be expected. This includes fog, gale force winds for days at a time and low ceilings among other things and special attention should be given to weather forecasts for the fire area. Grounding of air and watercraft are common and therefore additional clothing, supplies and food should be the standard for operations being conducted within Katmai.

Brown bears – Katmai is home to the largest protected population of brown bears in North America. Bear densities are such that personnel working in Katmai should expect and be prepared for encounters with bears. This includes special attention to food storage and use of water from critical salmon spawning streams during the summer runs. Whenever possible, water will be pumped for fire operations from ponds or small lakes, devoid of salmon to avoid disturbing bear feeding habits during peak salmon runs. It is mandatory that firefighters allow brown bears the right of way in all circumstances in order to avoid negative human/bear interactions. For personnel and animal safety, Katmai staff will make brown bear safety orientation mandatory for personnel participating in extended fire operations within the park//preserve. Protecting Agencies go through their own bear safety training which is not necessarily like the training that would be received at KATM as bear safety practices in the park are different than elsewhere in the state (NPS, 1990).

4.1.1.2 Requirements for fire personnel

All personnel participating in fire management activities within Katmai will be required to comply with all National Firefighting standards and complete the following before an NWCG Red Card will be issued:

1. Pass routine physical examination as required.
2. Participate in Annual Firefighter refresher and safety training
3. Succeed at completing the Work Capacity Test requirements
4. Participate in routine physical fitness training (Primary FFT = Mandatory, Secondary FFT = highly encouraged) when appropriate.

After the completing of the aforementioned requirements, a Red Card will be issued providing current NWCG qualifications and training needs where appropriate. Annual participation is required in order to keep Red Card currencies. Additionally, qualified fire personnel operating on assignments in Alaska and nationally, will adhere at all times to the following safety guidelines:

1. Know and Follow the 10 Standard Fire Orders
2. LCES (effectively use Lookouts, Communication, Escape routes, and Safety zones)
3. Recognize the 18 Watch Out Situations
4. Recognize the Common denominators of Tragedy Fires

5. Follow the WORK/REST GUIDELINES as outlined in Chapter 7-Safety of the Interagency Redbook

6. Follow the Risk Management Process (Appendix G.5)

4.1.1.3 Refusing an assignment

At no time will any employee be asked to perform duties outside of their current qualification status unless the task is being used for training purposes, in which case, a qualified trainer will oversee the operation. All firefighters have the right to a safe assignment. All employees have the right to turn down unsafe assignments; they also have the responsibility to identify alternative methods of accomplishing the mission. For more information on proper protocols, refer to the *Incident Response Pocket Guide* (IRPG) (NFES1077, PMS 461) under "How to Properly Refuse Risk." All personnel are authorized and obligated to exercise emergency authority to stop and prevent unsafe acts.

4.1.1.4 Standard Operating Procedures

Job Hazard Analysis (JHA): Requirements for completed Job Hazard Analysis are outlined in Chapter 7- *Safety and Risk Management* of the Interagency Standards for Fire and Fire Aviation Operations. It is the responsibly of the supervisor or line manager to ensure JHA's are reviewed and signed prior to any non-routine task or at the beginning of the fire season. (Appendix G.6: Preparedness plan for further information pertaining to JHA's)

After Action Review (AAR): An AAR is a learning tool intended for the evaluation of an incident or project in order to improve performance by sustaining strengths and correcting weaknesses. An AAR is performed as immediately after the event as possible by the personnel involved. An AAR should encourage input from participants that is focused on (1) what was planned, (2) what actually happened, (3) why it happened, and (4) what can be done next time. It is a tool a supervisor can use to get maximum benefit from the experience gained on any incident or project. Appendix G.7 contains guidance for conducting an AAR.

Serious Accident/Incident Review/CISM: Certain situations warrant investigations and review processes according to both National and NPS policy. Detailed guidance for the review and investigation requirements and protocols are outlined in NPS RM 18 Chapter 3, *Standards for Operations and Safety* and the 2010 Interagency Standards for Fire and Fire Aviation Operations Chapter 18, *Reviews, Investigations & Analysis.* In conjunction with serious accident/incident occurrences, Critical Incident Stress Management (CISM) may be appropriate. Responsibilities and protocols regarding the initiation of a CISM team is outlined in the Interagency Redbook and located in Appendix G.8 of this Fire Management Plan.

4.1.2 Public Safety

Public safety concerns at Katmai include threats posed by fire and smoke to visitors, local residents, employees. Due to the remote nature of the park/preserve fixed and rotor-winged aircraft and watercraft represent additional safety concerns, especially under conditions of heavy smoke.

Visitor use will not be allowed near fire perimeters. Every attempt will be made to inform all visitors throughout the course of an incident of any known wildland fire activity within the park/preserve, and signs will be posted on nearby roads, villages and at airports if smoke produced during wildland and prescribed fire creates a safety concern. The Superintendent may initiate a temporary closure of some or all of the park/preserve if large or erratic fire behavior endangers visitor and employee safety to a significant degree. Closures may also apply to airspace.

4.1.2.1 Emergency evacuation procedures

The Alaska Division of Homeland Security and Emergency Management has developed standard procedures for the evacuation of personnel and/or public due to risks posed by fire and/or smoke. A FIRE INCIDENT DRAFT EVACUATION OPERATION PLAN is available for viewing online. The Incident Commander may request the Alaska Division of Homeland Security and Emergency Management to implement evacuation procedures for the park/preserve or neighboring communities. This could range from the evacuation of an individual adversely affected by smoke to community evacuation due to the threat of fire. Any fire related evacuation effort will be coordinated with the Protection Agency FMO or Incident Commander and NPS Rangers.

At present it is important to note that certain weather situations may prevent evacuation efforts of the Brooks Camp area in the event of a wildfire. This fact is an inherent risk of visiting bush Alaska and should be understood by all visitors. NPS will consider appropriate measures to initiate additional safety restrictions when fire indices reach critical thresh holds indicating that ignitions may rapidly grow and become difficult to contain. The regional FMO or delegate will notify the Superintendent when fire weather indices reach concerning levels for the Katmai area. Delegated authority may be given to Duty Officer designee, or an Acting. Service may also be provided by NPS AK Western Area FMO if requested by RFMO.

4.1.2.2 Burn restrictions and bans

The Code of Federal Regulations, Title 36 – Parks, Forests and Public Property Chapter 1 (7-1-02), Section 2.13 (c) states: “During periods of high fire danger, the superintendent may close all or a portion of a park to the lighting or maintaining of a fire.” Section (d) states: “The regulations contained in this section apply, regardless of land ownership, on all lands and waters within the park area that are under the legislative jurisdiction of the United States.”

The AWFCG established procedures for implementing statewide or regional burn restrictions/bans at Preparedness Levels I-V. Either fire protection organizations or land managers can recommend a burn restriction/ ban based upon fire indices, risk factors, air quality, forecasted weather and the regional or statewide fire situation. If the AWFCG concurs, the recommendation is forwarded to the Deputy Director of Fire and Aviation (DNR) for implementation by the State Forester. The areas affected by the burn restriction/ban will be delineated using Alaska Department of Fish & Game management units along with a text description of the area. If the NPS units or a portion of NPS units are included in the burn restriction/ban area the Superintendent has the option to implement a burn restriction/ban using the legislated authority described above. The NPS will support the regional or statewide burn restriction/ban, unless extenuating circumstances exist. Public Orders and new releases will announce the burn restriction/ban and will be posted on the BLM http://fire.ak.blm.gov/ and DNR http://www.dnr.state.ak.us/forestry/fire/ internet websites. The NPS will prepare press releases as needed and will use NPS communication systems to inform NPS employees and stakeholders of the burn

restriction/ban. A copy of the State of Alaska Burning Restrictions and Burn Ban Procedure, 1997 are on file in the Regional Wildland Fire Management office.

At Preparedness Levels I, II, and III, the local jurisdictional agency FMO after contacting local land managers or local land managers may recommend a burn restriction/ban. The appropriate Area/Zone FMO will determine if the burn restriction/ban is necessary. Public orders will be prepared by the protection organization. The Superintendent has the authority to determine the course of action for the park unit. If the superintendent elects to follow the burn closure, the park will prepare and disseminate a press release in coordination with the protection organization.

Burn restrictions/bans will be rescinded after sufficient recovery of fire indices, improvement of air quality, reduction of risk factors impacting the regional/statewide fire situation. The burn restriction/ban may be rescinded for a portion of the affected geographic area, if the exempted area can be clearly delineated and articulated to the general public. Press releases will be prepared as a collaborative effort by NPS and the protection agencies to announce the rescission of burn restrictions/bans.

4.2 Preparedness

Preparedness activities provide detailed procedures and standards for wildland fire operations, including pre-season and ongoing activities throughout the fire season. It also includes pre-planned procedures for initial response and incident management procedures.

4.2.1 Protection Planning

The NPS and DNR will review management option selections for Katmai annually as defined in the AIWFMP. Changes are submitted through the AWFCG procedures found at http://fire.ak.blm.gov/administration/awfcg.php. The NPS is responsible for setting the strategic fire direction for the park/preserve and completing and/or reviewing other WFDSS pre-season entries.

4.2.2 Protection Area Boundaries

Changes to the protection area boundaries (Fire Management Option selections) may be made at the recommendation of the Protecting Agency staff or NPS Regional FMO. Clear direction for the process and proper documentation procedures for these changes are given in the Alaska Statewide AOP.

4.2.3 Fire Protection and Suppression

The DNR will provide fire detection coverage for Katmai based on lighting activity levels, human use or at the request of the NPS. Upon discovery the DNR will verify and document fire location, management option and cause of fire. Initial response will be implemented according to AIWFMP and the NPS Regional FMO or designated NPS Duty Officer will be notified. The DNR will initiate a WFDSS entry as part of the notification process.

4.2.4 Prevention

A Step-Up Communications Plan has been developed by the NPS Alaska Regional Fire Education and Communications Specialist in collaboration with other agencies, regarding fire prevention. This plan provides access to detailed information on the current fire situation and emphasizes the likelihood of unwanted wildfires due to careless human acts. Details of this plan are described in detail in Section 4.6.2 Communication and Education.

4.2.5 Public Use Restrictions

See section 4.1.2 - *Public Safety* of this FMP regarding Burn Bans and fire area closures.

4.2.6 Prescribed Fire and Fuels Management

Mechanical fuels treatment and prescribed burning, or a combination of the two, may be used in the park/preserve to achieve resource management goals. The protection of National Historic Landmarks and classified structures listed on the National Register of Historic Places, or eligible for listing, could warrant these preventative measures. Fuel reduction measures may also be used to protect other Critical and Full protection points that exist in the park that may not fall under the above categories (i.e., NPS administrative buildings). Mechanical fuel reduction projects will strictly adhere to Fuels Management Plan Guidelines (Section 4.5- *Management of Planned Fuels Treatment*), and any plans for prescribed burning will constitute the development and approval of an official Prescribed Fire Burn Plan. (See Section 4.5.3- *Prescribed Fire Treatments*)

4.2.7 Coordination and Dispatching

The AIWFMP is the operational reference document for fire response on all lands throughout Alaska, regardless of ownership. The AIWFMP works in unison with the Statewide AOP, the Master Cooperative Wildland Fire Management Agreement, local area AOP's and this Fire Management Plan for managing wildland fire in Katmai National Park and Preserve. The purpose of the AIWFMP is to "Promote cooperative, consistent, cost-effective, interagency approach to wildland fire management." (Alaska Statewide AOP) The AWFCG is the interagency team that reviews and updates these governing documents regarding Wildland Fire Management in Alaska. The NPS Regional FMO is delegated authority and responsibility by the NPS Alaska Regional Director to represent National Park Service interests on the AWFCG.

The Alaska Interagency Coordination Center (AICC) serves as the geographic coordination center for Alaska. AICC provides statewide tactical resource coordination, logistics support, and predictive services for all state and federal agencies involved in wildland fire management in Alaska.

The DNR Southwest Area dispatch center in McGrath provides fire dispatching services to the Katmai area. Southwest Area dispatch determines appropriate staffing levels in accordance with current and forecast fire weather and fire danger rating indices. The Southwest Area Orientation Guide contains dispatch and other applicable contact information and is located in Appendix G.3.2.

4.2.8 Preparedness Activities

Alaska wildland fire preparedness activities include a wide range of readiness activities and program elements that are essential to dealing with unplanned ignitions and fuels treatments. Alaska preparedness levels are determined independently from the National Preparedness scale. Alaska preparedness levels are posted daily on the AICC website at the top of the Wildland Fire Situation Report. Definitions of each preparedness level are given and correlated with the appropriate management action and the assignment of responsibility.

4.3 Management of Unplanned Ignitions

4.3.1 Preparing for Unplanned Ignitions

Operational control of wildfire incidents within Katmai National Park/Preserve is the responsibility of the Alaska DNR. The Alaska Statewide AOP contains all specifics regarding the response to, and management of, unplanned ignitions throughout Alaska. This includes initial response direction, WFDSS initiation, cooperation and requirements, Federal Emergency Management Agency reimbursable expenditures guidance, surveillance and monitoring protocols, and post fire activities. Relevant operational guidance regarding unplanned ignitions is also found in the Statewide Master Agreement (clauses 24-33) regarding fire notification, closest forces concept, NPS independent actions, response to a wildfire, "special management considerations", delegations of authority, incident priorities and the preservation of evidence.

1. Objectives - Established goals and objectives for each management option guide pre-planned responses in each of the four management options within Katmai National Park and Preserve. Rooted in founding documents for park purpose and management, these objectives are clearly described in in section 3.1.1 of this plan as well as the 2010 AIWFMP.

2. Risk Assessment – A primary factor used to select the appropriate fire management option for a given areas within the park/preserve. Risks evaluated include nearby communities, private residences, private property, valuable natural and cultural fire- sensitive resources, and proximity to critical management units. The modified management option allows managers flexibility to incorporate Fire Weather Seasonal Tracking information into their decision making process when choosing the appropriate conversion date and management response.

3. Implementation – See Statewide AOP (Clause 29- Response to Wildfire).

4. Staffing – See Statewide AOP (Clause 11-Interagency Dispatch, Clause 12-AICC, Clause 13-Interagency Resources)

5. Information – Communication and education regarding wildfire in and around Katmai will follow protocols outlined in the Katmai National Park and Preserve Communication and Education Plan (Appendix H) and developed by the Regional Fire Communication and Education specialist.

6. Record Keeping – The following contents will be kept in a permanent file for each incident occurring within Katmai National Park and Preserve.
    a. WFDSS Report

b. ICS 209
c. WFMI Report
d. Monitoring data, reports, and findings
e. Revalidation and certification documents (if applicable)
f. Funding codes and cost accounting: The Protecting Agency has operational control of the incident, they generate the fire code and track the costs of the incident. They also keep the Jurisdictional Agency informed of operational costs and expenditure levels, as it is the Jurisdictional Agency's strategic direction that can have an effect on cost outcome. The NPS AK Regional Office fire staff will provide the NPS specific fund code from the fire code for all NPS employees resource ordered/involved in the fire response effort. The Master Agreement and Annual Operating Plan delineates the mechanics of incident record keeping for incidents.
g. Project Maps- generated by aerial surveillance and given to NPS to include in their Geographic Information System (GIS) database, if NPS fire management staff is not present on fire.
h. Aerial Photographs
i. Any other pertinent information relating to the incident

4.3.2 Expected Fire Behavior

Fire behavior is a result of fuel type, fuel loading, fuel moisture content, topography, and local weather conditions. The fuels in Katmai are not uncharacteristic of other parts of Western Alaska. It is not the fuel but the maritime weather influences that drive the low fire occurrence rate in the park/preserve. This being said, Katmai does exhibit several major fire behavior systems of vegetation that can be described as fuel types: grass/tundra, deciduous forest/shrublands, mixed forests and conifers (Figure 4-1). Under each major fuel type, subsequent breakdowns occur. This breakdown facilitates a more representative depiction of fire behavior in each of the sub-types when burning conditions present themselves.

Fuels

Grass/Tundra – This fuel type is characterized by continuous grass cover, with occasional trees or shrubs that do not appreciably affect fire behavior. Three subtypes are found in this system: matted grass, common after snowmelt in the spring; standing dead grass, common in late summer to early fall; and tussock/tundra. The live to dead ratio and wind speed in grasslands has a pronounced effect on fire spread.

Matted/Standing Dead Grass – Fire behavior in these two grass subtypes is relatively easy to suppress. These fuel type burns during the spring and fall. The burning period is shorter due to less solar radiation and high humidity recovery at night, a condition referred to as diurnal effect. The rate of spread can be high in this fuel type but there is limited smoldering and mop-up (extinguishing or removing burning material along or near the control line) is relatively easy.

Figure 4-1. Landcover at Katmai National Park and Preserve.

Tussock/Tundra – Fire behavior in the tussock/tundra type is substantially different than other grass models. Tussocks form an extensive layer of dead leaves at the base of the plant creating grassy knobs. The dense thatches of dead leaves that make up the tussock mound are small in diameter and loosely compacted. The fuel wets and dries very rapidly, burns quickly, and, because there is typically a substantial amount of fuel, the fires can be remarkably intense when burning under dry, windy conditions. This fuel situation presents a set of control problems unique to the fuel type, as extinguishment can be extremely difficult due to thick mats of dry mosses, lichens and other organic matter. Travel on the ground is also difficult in tussock tundra.

Pure Deciduous Forest – This fuel type is represented by pure stands of deciduous forest species including but not limited to alder, willow, aspen, and birch. Stages in leaf development (leafless, green-up, leaf fall) drastically effect fire behavior and fuels present in this system. Fires in this type usually occur in spring before leaf-out or in fall after leaves have fallen. During this time, leaf litter is the primary carrier of the fire and usually results in low to moderate fire intensities except under the most severe weather conditions. Fires can burn in this fuel type post green-up (leaf-on) but fire behavior is greatly reduced due to shading of fuel by the forest canopy thus increasing relative humidity and decreasing fuel temperatures. Fires that do occur during the leaf-on stage carry in grasses, dry herbaceous, and various understory shrubs.

Deciduous Shrublands – Dwarf birch and Ericaceous species comprise this fuel type. These shrub species grow in mosaic like patterns with all varieties of tundra communities. The shrub layer forms a continuous fuel bed that often burns midsummer with green leaves intact unlike the pure deciduous forest fuel type above. Dwarf birch particularly has an elevated resin content that leads to an increase in fire behavior intensity. This fuel model burns similarly to a combination of Andersons brush models used in the lower 48. Although existing throughout Alaska this fuel type is not clearly defined nor is its fire behavior well documented in currently available literature.

Mixed forests – Aspen, willow, cottonwood, birch, black and white spruce characterize the mixed forests fuel type. On any specific site, individual species can be present or absent from the mixture; however, spruce must be present to meet this classification. In Katmai, black spruce is largely absent from the mixed forest classification. Stand mixtures exhibit wide variability in age and stand structure. Two phases associated with the seasonal variation in the flammability of the hardwoods are recognized: the leafless stage occurring during the spring and fall, and the green stage during summer. Rate of spread in both fuel types is weighted according to the proportion of softwood and hardwood components. In areas where the proportion of hardwoods is greater than softwoods and when the deciduous overstory and understory are in leaf, fire spread is greatly reduced with maximum spread rates only 1/5 that of spring or fall fires under similar burning conditions. During spring and fall when the deciduous overstory and understory are leafless, the leaf litter can burn similar to the grass models because the diurnal effect shortens the burning period and there is little smoldering. In areas where the proportion of softwoods is greater than hardwoods, the dryness of the organic matter will dictate the difficulty of extinguishment. The rate of spread will be relatively slow in these areas unless there is a very large grass component and conditions are extremely dry.

Spruce-Lichen Woodland – This fuel type is characterized by open, white spruce. Stands occupy well-drained upland sites. Forest cover occurs as widely spaced individuals and dense clumps. Tree heights vary considerably, but bole branches that emanate from the trunk of the tree (both live and dead) uniformly extend to the forest floor and layer development is extensive. Woody surface fuel accumulation is usually very light and scattered, and shrub cover is exceedingly sparse. The ground surface is fully exposed to the sun and commonly covered by a nearly continuous mat of reindeer lichens, averaging 3-4 cm in depth. The spruce-lichen woodland fuel type may support a high rate of spread, but

may or may not support a continuous crown fire. Mop-up may be difficult if the organic mat is deep and dry. For the most part, fires occurring in this fuel type are relatively easy to control because they are primarily surface fires, which can be extinguished by firefighters on the ground.

CFFDRS

The Canadian Forest Fire Danger Rating System (CFFDRS) is utilized to track fire danger throughout the state (Table 4-1). Specific analysis regarding CFFDRS and large fire occurrence has not been completed for Katmai National Park and Preserve. The CFFDRS moisture components and indices commonly monitored further in the interior of the state are the Fine Fuel Moisture Code (FFMC), Duff Moisture Code (DMC), Drought Code (DC), Initial Spread Index (ISI) and the Buildup Index (BUI). The following Table illustrates the thresholds that can elicit extreme fire behavior or a high potential for growth.

Table 4-1. Canadian Forest Fire Danger Rating System.

	FFMC	DMC	DC	ISI	BUI	FWI
Low	<74	0-30	15-150	0-2	0-30	0-5
Moderate	75-88	31-60	151-275	3-7	31-60	6-13
High	89-91	61-90	276-375	8-10	61-90	14-24
Very High	92-93	91-120	376-500	11-20	91-120	25-30
Extreme	>94	>120	>501	>121	>120	>31

4.3.3 Initial Response Procedure

Initial responses to wildfires throughout Alaska are predetermined and clearly defined in the AIWFMP and statewide AOP. Fires can be categorized as Critical, Full, Modified, or Limited depending on the Fire Management Option selection given to the area the fire is burning in. Responses to these ignitions are predetermined and range from aggressive initial attack (Critical) to periodic aerial surveillance (Limited).

Critical – Fires occurring in or immediately threatening this designation will receive highest priority for protection from wildland fires by immediate and continuing aggressive actions dependent upon the availability of suppression resources.

Full – Fires occurring within or immediately threatening this designation will receive aggressive initial attack dependent upon the availability of suppression resources.

Modified – Before the conversion date, fires will receive initial attack, dependent upon availability of suppression resources, unless otherwise directed by the land manager/owner(s) and documented in WFDSS. After the conversion date, the default action for all fires occurring within the Modified management option areas will be routine surveillance to ensure that identified values are protected and

that adjacent higher priority management areas are not compromised. Critical and Full management areas are higher priorities for suppression resources than Modified management areas.

Limited – Wildland fires occurring within this designation will be allowed to burn under the influence of natural forces within predetermined areas while continuing protection of human life and site-specific values within the management option. Generally this designation receives the lowest priority for allocations of initial attack resources; however, surveillance may be a high priority.

In most cases, response to fires within a given fire management option is the same whether the ignition is natural or anthropogenic, though human-caused fires will be given extra scrutiny in the decision support process. In wilderness areas, human-caused fires degrade the untrammeled quality of wilderness. The Agency Administrator may request a non-standard response to fires within Katmai in consultation with the Regional FMO. The protection agency FMO must also be consulted about operational feasibility before implementation procedures of a non-standard response may be initiated. All non-standard responses will be reviewed at the Interagency Fall Fire Review.

Information Needed To Set Initial Response Priorities

Wildland fire management options selections are the basis for the selection of initial response priorities. The fire management option selections were based upon an evaluation of legal mandates, policies, regulations, resource management objectives, and local conditions. Local conditions include but are not limited to fire history, fire occurrence, environmental factors and identified values to be protected.

Incident Documentation and Reporting

The Protection agency is responsible for all fire reporting commensurate with national standards and more specifically, as specified in the Alaska Interagency Mobilization Guide Chapter 20 Section 25.1.01. Once a fire is declared out, the Protection Agency will submit its final report to the Jurisdictional within the Annual Operating Plan's denoted timelines to check for completeness and accuracy.

The NPS is responsible for completing and submitting a Wildland Fire Report Form and any additional fire reporting as required by RM 18 Chapter 11- Wildland Fire Reporting. This report is generated from the incident record submitted by the Protecting Agency. The Regional FMO will ensure accuracy of the report and have it entered into the WFMI Fire Reporting Module by designated regional fire staff within time frames as spelled out in the Annual operating Plan. A permanent hardcopy of the fire report is filed at the Alaska Regional Fire Management Office in the Ranger Services Division.

The NPS Regional FMO and DNR will work collaboratively to develop WFDSS documentation as required by National Fire Policy (Redbook) and the Alaska Statewide AOP. WFDSS reports are initiated by the protection agency. Ownership is then transferred for extended decision support by the NPS. The protection agency will develop and implement incident tactics based on verbal approval from the NPS Regional Fire Management Officer or Agency Administrator while the WFDSS approvals are being finalized.

Criteria for Selecting the Initial Response

The NPS has selected wildland fire management options based upon an evaluation of legal mandates, policies, regulations, resource management objectives, values at risk and local conditions. Local conditions include but are not limited to fire history, fire occurrence, and environmental factors. The NPS should revisit fire management option selections as part of their fire management program Coastal Areas

Adaptive Management Strategy Meetings to ensure their selections remain consistent with current park management goals and objectives.

Response Times

Response times for fires occurring within KATM will vary depending on the Fire Management Option selected for the area, coupled with the current fire preparedness level across the state of Alaska. When Alaska Preparedness reaches Level 4 or 5, the Alaska Multi-Agency Coordinating group is assembled. The MAC group ensures:

1. Incident prioritization
2. Resource allocation and acquisition
3. State and federal disaster response or coordination
4. Political interfaces
5. Information provided to media and agencies involved
6. Anticipation of future needs
7. Identification and resolution of issues common to all parties

Response times will be greatly determined by fire activity across the entire state of Alaska and the MAC group incident prioritization process.

Management Requirements and Restrictions

See Section 3.2 FMU Specific Characteristics.

Non-Standard Response

The four fire management options address a high percentage of wildland fire situations that occur in Alaska. On rare occasions, however, situations arise where non-standard responses to the selected management options are prudent and justifiable. Non-standard responses will be agreed upon by the protection agency FMO and the N0PS Regional FMO prior to implementation. Examples of Non-Standard Responses are discussed in detail on pages 34/35 of the AIWFMP. All non-standard responses that occur will be reviewed at the annual fall fire review.

4.3.4 Transition to Extended Response and Large Fire

Criteria for Transition

Type 3 Incidents in Alaska range from small complex fires to less complex fires that grow to hundreds or thousands of acres. As incidents escalate, continual reassessment of the complexity level should be completed to validate that the Type 3 organization remains appropriate, or if the need exists for a higher level Incident Management Team. The Interagency Redbook, Chapter 11 contains typical characteristics of various levels of Incident Management.

Implementation Plan Requirements and Responsibilities

WFDSS will be used to develop and document decisions and support extended response needs within Katmai National Park and Preserve. In the event higher complexity fires occur within the jurisdictional boundary of the NPS, the Regional FMO may utilize the virtual Decision Support Center and/or assemble a team of advisors (i.e., Superintendent, Chief of Resources, Chief Ranger, etc.) who will assist in the development and review of the WFDSS process.

Delegation of Authority

Delegations of Authority will be cooperatively developed by the NPS and the State DNR and will document procedures and criteria that specify direction, authority, and financial management guidelines to Incident Commanders of fires within Katmai. Fires that are Type 3 and above will receive written delegation of authority (see example in Appendix G.9) signed by both the NPS Agency Administrator and the Protecting Agency Incident Commander. Only after written authority is received may the Incident Management Team assume authority to manage (suppression) actions of the incident. (AIWFMP, 2010)

Communications throughout Katmai National Park and Preserve are a continual challenge. Recognizing this, the Incident Commander, to the best of their ability, will notify the Agency Administrator or delegate of progress and activities occurring on the incident. Then, the NPS can disseminate correct and current information to local community members affected by the fire.

The Resource Advisor is responsible for anticipating the impacts of fire operations on natural and cultural resources and for communicating protection requirements for those resources to the Incident Commander (IC).

The park should fill this position with a knowledgeable and qualified staff member to ensure the best possible protection of irreplaceable park resources. This position additionally ensures the IMT's compliance with the Resource and Fire Management Plans for Katmai, and provides counsel to the IC regarding sensitive issues within the park/ preserve. A complete list of position responsibilities and issues to be considered is available in the Resource Advisor's Guide for Wildland Fire (NWCG PMS 313, NFES 1831, Jan 2004 and the Interagency Redbook, Chapter 11, Page 11.

4.4 Burned Area Emergency Response (BAER)

4.4.1 Minimum Impact Suppression Tactics (MIST)

It is the policy of the National Park Service that all fire management activities will be executed using Minimum Impact Suppression Technique (MIST) guidelines in Wilderness. Since the majority of Katmai National Park and Preserve is designated Wilderness or de facto Wilderness, MIST will be a requirement. These guidelines have been developed collectively by the jurisdictional land management agencies and recently updated in the Guidelines and Constraints section of the 2010 AIWFMP. Further direction specific to Katmai National park/preserve and its associated resources is described in the NPS section below.

AIWFMP MIST- To the extent possible, minimum impact suppression tactics should be used.

- Firelines will be constructed in a manner that minimizes erosion and will follow natural contours wherever possible. Indirect attack will be used to the extent practical. A fireline rehabilitation plan for wildfire suppression activity damage, as approved by the jurisdictional agency(s), must be completed before the final demobilization occurs.

- The use of tracked or off-road vehicles (for example, bulldozers or all-terrain vehicles) requires written authorization by the jurisdictional agency(s) on a case-by case basis prior to use.

- Application of aerial fire retardant near lakes, wetlands, streams, rivers, and sources of human water consumption or areas adjacent to water sources should be avoided. A minimum of 300 feet is identified in the Red Book. Individual jurisdictional agencies may have more restrictive retardant guidelines.

- Base camps, spike camps, helispots and other support areas should be located in natural clearings if possible. The construction of helispots should be minimized. Any opening created for support areas will be cut with an irregular perimeter. Such areas will be kept clean so as not to attract animals and will be cleaned up before departure of the last suppression personnel.

- Support areas such as camps, staging areas, and helibases will not be located on Native allotments. No resources will be removed from a Native allotment (e.g. firewood) without an approved agreement. The BIA or the local BIA service provider may prepare the agreement.

- Flight patterns and suppression activities will be restricted around areas designated Avoid. Examples include peregrine falcon nesting areas, threatened or endangered species, or sensitive sites identified by the jurisdictional agency.

- Suppression activities on or near non-structural cultural sites must be coordinated with the jurisdictional agency per 2010 AIWFMP.

Jurisdictional agencies should be consulted concerning any operational restrictions in designated wilderness areas as directed in Guidelines and Constraints section of the 2010 AIWFMP.

NPS MIST

1. Use water rather than retardant whenever possible; when retardant is necessary, use fugitives if available. If used, retardant will not be applied within 300 feet of waterways. Waterways are defined in the Interagency Redbook as “Any body of water including lakes, rivers, streams and ponds whether or not they contain aquatic life.” As is specified in the 2010 AIWFMP, retardant use in park/preserve will only be used upon authorization of Agency Administrator or designee.

2. Use cold-trailing or wet-lining techniques when feasible.

3. Utilize soaker hoses or foggers in mop-up; avoid “boring” or other scarring hydraulic actions.

4. Minimize the falling of trees and the cutting of shrubs; limb vegetation adjacent to fireline only as needed to prevent additional fire spread.

5. Emphasize appropriate Leave No Trace practices by personnel on the fireline and/or in spike camps, particularly with regard to human waste disposal, selection of durable campsites, and food storage in bear country.

6. Minimum impact suppression tactics and Leave No Trace ethics will be identified as an objective on all wildland fire incidents occurring in KATM. Minimum Requirement/Minimum Tool Analysis will guide suppression tactics in wilderness.

4.4.2 Burned Area Emergency Response

Because the majority of land within Katmai National Park/Preserve is categorized within the Limited Fire Management option, relatively limited suppression actions will be necessary and thus minimal adverse effects to the management area can be expected. In the event wildfires start in or threaten Full or Critical management areas, more aggressive suppression actions can be expected. In the event where suppression actions are required, MIST will be strongly emphasized. The need for emergency response for the stabilization and prevention of unacceptable degradation of natural and cultural resources resulting from the effects of the fire will be promptly determined by the Management Staff at Katmai and communicated by the agency administrator to the IC. Rehabilitation standards will be developed on a case by case basis in accordance to specific needs on incidents occurring within the park/preserve. Additionally Section 4.3 C-5 Management Requirements and Restrictions provide absolute guidance regarding management constraints by FMU. These constraints will assist NPS in its mission to protect invaluable resources within the park/preserve.4.4.3 Emergency Stabilization

4.4.3 Emergency Stabilization

Suppression activity damage repairs are the responsibility of the Incident Commander and are funded using the suppression account. It is the responsibility of the agency administrator to ensure suppression activity damage repair is completed prior to the demobilization of the incident. The Agency Administrator will ensure that the Incident Commander consults with natural resource managers/resource advisors as needed, regarding any site specific rehabilitation needs. When possible, burned areas will be allowed to regenerate naturally. Due to the magnitude of NPS management units that could potentially be adversely affected by fire, rehabilitation needs will be determined on a case by case basis by park resource management staff within an appropriate time frame for the necessary stabilization work to be completed. For Emergency Stabilization and Rehabilitation timeframes, priorities, policies and procedures to mitigate fire effects on federal lands, reference 620 DM 3, , the Interagency Burned Area Emergency Response Guidebook (Feb 2006) and the Interagency Burned Area Rehabilitation Guidebook (Oct 2006.)

4.4.4 Burned Area Rehabilitation

Burned Area Rehabilitation (BAR) is a continuation of Emergency Stabilization efforts that occur immediately post fire. BAR efforts focus on repair or replacement of minor facilities as well as damage incurred to natural and cultural resources as a result of the fire. The BAR phase usually occurs within one to three years after the fire is extinguished. It is the responsibility of the Agency Administrator to ensure that BAR efforts are completed to the satisfaction of resource management staff at Katmai. A Burned Area Emergency Response (BAER) Plan may be appropriate if significant damages are incurred during a wildfire incident in Katmai National Park and Preserve. At the request of the Agency Administrator, an

interdisciplinary team (BAER Team) of specialists may be ordered to prepare a plan with specific rehabilitation guidelines to be carried out during or immediately following the containment of a wildfire.

Appropriate use of funding is described in detail for BAR activities on federal and native lands are outlined in the following interagency departmental manuals. DOI 620 DM 3 and the Interagency Fire Business Management Handbook.

4.5 Management of Planned Fuels Treatments

At present there is no fuels project planning in progress for Katmai National Park and Preserve. The approval of this Fire Management Plan will commence the evaluation and need for planning of fire related projects within the management area.

4.5.1 Fuels Planning and Documentation

If/when a fuels management program is approved for Katmai, the program will implement fire management policies and help achieve resource management and fire management goals as defined in:

1. Federal Wildland Fire Management Policy and Program Review
2. Managing Impacts of Wildfires on Communities and the Environment (USDA, Oct 13, 2000)
3. Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy (USDOI/USDA)
4. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan.

Identify Participants

The Fuels Management Program for NPS lands in Alaska is at present still evolving. Park specific fuels management plans are operational for those parks with higher fire frequency and therefore, higher regional priority. Coastal Park units along the Gulf of Alaska historically see less fire activity and therefore a current regional approach to fuels management is being considered in these management areas. The Regional Office is responsible for administering fuels management activities in coastal parks that do not fall under the management of an NPS Area FMO. Other key members to fuels project decisions for KATM may include:

1. Regional FMO or delegate
2. DNR Division of Forestry FMO/ Program Representative
3. Superintendent
4. Chief Ranger
5. Chief of Resources
6. Archeologist
7. Regional Fire Ecologist
8. Regional Fire GIS Specialist
9. Wilderness Coordinator

Identify Candidate Projects

Upon the development of a Fuels Management Plan, criteria will be defined in which to determine potential candidate projects.

There are currently no candidate projects for Katmai as an approved Fuels Management Plan is not in effect for the park/preserve. Upon FMP completion candidate projects will be identified and prioritized.

Project Prioritization Criteria

As projects are identified under a fuels management plan, suitable criteria will be developed to justify and prioritize projects. Such criteria may include but are not limited to:

1. Degree of Hazard
2. Proximity to Values at Risk
3. Fire Management Option selection
4. Maintenance Cycle
5. Logistical Feasibility
6. Implementation requirements
7. Logical Project Sequence

Updating the Fuels Treatment Plan

If fuels projects are identified, fuels treatment plans will be developed, approved and submitted as appendices to this Fire Management Plan. Accordingly, section 4.5 – Management of Planned Fuels Treatments will need revision and approval. Annual review of any fuels treatment plan will be incorporated with the review of this FMP and addressed at the Coastal Parks Adaptive Management Strategy Meetings held annually. Any adjustments to Fuels Treatment plans will follow policy guidance as stated in Chapter 7-Fuels Management of RM18 and use the NPS Environmental Screening Form (ESF) to ensure new or updated projects remain in compliance with previously approved compliance documentation. Special attention will be given to NEPA, NHPA Section 106, ESA Section 7, wilderness minimum requirements, and the CAA when updating or amending the Katmai Fuels Treatment Plan. If current projects specifications fall outside of previously approved compliance, a new compliance process will be initiated. Guidance for the appropriate action required may be obtained from park or regional compliance specialists and found in Director's Orders 12.

4.5.2 General Fuels Management Implementation Procedures

Guidance

Prescribed fire planning and implementation will be in accordance with RM 18 Chapter 7, Fuels Management.

Annual Actions

Prescribed Fire Burn Plans will be created for each project identified within Katmai. Fuels Management Plans will be reviewed annual and updated as necessary.

Implementation Standards

Activities proposed in the Fire Management Plan will be planned and implemented in accordance with Reference Manual 18, Chapter 7-Fuels Management, the Interagency Standards for Fire and Fire Aviation Operations and any applicable sections of the Alaska Statewide Master Agreement.

Planning & Reporting Requirements

Fuels – The Regional FMO or delegate will be responsible for inputting proposed and completed projects for Katmai into the National Fire Plan Operations and Reporting System (NFPORS). Project funds will be requested via NFPORS Treatments and Activities Module. NFPORS project requests will be uploaded into PDS by the FMPC by April 19 of each year. The Regional FMO will recommend and prioritize activities and treatments for funding based upon justification, effectiveness, collaboration, and probability of completion within the fiscal year.

Activity or treatment approval, along with line items, will be entered into the PDS Treatment Approval module by the Regional FMO or delegate, no later than May 18th. The Regional FMO will activate funding for treatment when funding is needed to initiate work and the probability of project completing is acceptable.

Prescribed Fire – All prescribed fire activities planned for implementation within Katmai will go through the prescribed fire planning process and have an approved prescribed fire Burn Plan and Wilderness Minimum Requirements Analysis if applicable

Escaped prescribed fires within the park/preserve will follow protocols outlined in the Statewide AOP, Clause 28- Escaped Prescribed Fires. A WFDSS report will be initiated and the fire will be declared a wildfire and treated as such.

Monitoring reports and documentation will follow protocols defined in the Regional NPS Monitoring Protocols. (Appendix F)

Monitoring

Prescribed fire and non-fire fuels treatments should be designed to meet the objectives of each project and therefore the components of monitoring should be developed based on the project objectives. The following guidance for monitoring prescribed fire and non-fire fuels treatment are described in RM-18 and provided below:

Prescribed Fire* Monitoring *Required, RM-18, Chapter 8, 4.4.2 (2008)

> "Data collected to determine the immediate or short-term effects of a fire or fire management activity, at a level sufficient to evaluate whether stated management objectives were achieved." **Note:** Plots are not required in each specific project, but the monitoring program should include representative data for each key vegetation and fuel complex with specific objectives (monitoring type) in the park prescribed fire program.

Non-fire Treatment Monitoring Required, RM-18, Chapter 8, 4.4.3 (2008)

> "Non-fire fuels treatments must be monitored for pre- and post-treatment conditions at a level sufficient to determine whether the objectives of the treatment were met." **Note:** Plots are not

required in each specific project, but the monitoring program should include representative data for each key vegetation and fuel complex with specific objectives (monitoring type) in the park prescribed fire program.

Monitoring objectives and methods are required component of the Prescribed Fire Plan and Fuels Plans for all projects. Monitoring should be designed to meet the objectives of each project and therefore the components of monitoring should be developed based on the project objectives. Guidelines for monitoring prescribed fires and mechanical treatments within KATM are provided in Section 5.2 Monitoring and protocols for monitoring are provided in Appendix F.

Historic Treatment Map

There have been no previous fuel mitigation projects in Katmai National Park and Preserve and thus no treatment map is available.

4.5.3 Prescribed Fire Treatments

Guidance

At present there are no plans for prescribed fire treatment in Katmai National Park and Preserve. Future Prescribed fire use in the park/preserve may be considered when paired with mechanical fuel treatments to reduce fuels around critical fire sensitive resources within the boundary of the park/preserve. Any prescribed fire projects will strictly adhere to Interagency Standards for Fire and Fire Aviation Operations Chapter 17, and the Interagency Prescribed Fire Implementation Procedures Reference Guide, as well as incorporate guidance from RM 18, Chapter 7-Fuels Treatments. Additionally, fire staff conducting the prescribed fire will adhere to all stipulations as outlined in the 2010 Statewide Master Agreement Clause 22- Prescribed Fire and Fuels Management.

Treatment Review

NPS staff involved in fuels treatments in Katmai will utilize an adaptive management process to plan, implement, and evaluate the fuels management program. See RM 18-Chapter 7-Fuels Management for specific guidance.

4.5.4 Non-Fire Fuel Treatments

There are currently no approved non-fire fuels treatments projects for Katmai. The approval of this plan will initiate the development of a regional approach to fuels management for Alaska coastal parks. Current park fuels will undergo evaluation and candidate projects identified under direction given by the Regional Fuels Management Program. The use of mechanical fuel treatments may prove a viable option for concerns regarding fire-sensitive resources in the park/preserve.

Guidance

The planning and implementation of non-fire fuels management projects will be in accordance with Reference Manual 18, Chapter 7- Fuels Management and Chapter 8- Fire Ecology and Monitoring.

Planning

Planning efforts for Non-Fire fuels treatments will be in accordance with requirements described in RM 18 Chapter 7 Section 6 - Non-Fire fuels treatment. A non-fire fuels treatment template will be prepared and added as an appendix to this FMP.

Treatment Review

Post treatment reviews will be an integral part of the continuation of fuels treatments. An AAR style approach will be taken regarding each project receiving treatment during the field season. Fire staff will provide monitoring data and analysis, digital photographs, and appropriate maps to Park Management and Regional Fire staff to aid in the evaluation process. Chapter 5.0 – Adaptive Management of this plan describes in detail the adaptive management process.

4.6 Prevention, Mitigation & Education

The effectiveness of prevention and mitigation efforts is highly dependent on the education of the appropriate audience. The NPS will make every effort to inform the public on all issues pertaining to wildland fires in Alaska and specifically, in Katmai National Park and Preserve. Emphasis will be placed on the responsible use of fire in an effort to minimize unwanted human ignitions and the acceptance of lightning ignitions and their ecological role in the ecosystem in which the park resides. Interagency cooperation will be used in every applicable instance to ensure a unified prevention message is being sent to all Alaskans.

4.6.1 Prevention/Mitigation

Katmai National Park and Preserve has historically experienced relatively low fire occurrence when compared to other managed lands of comparable size in interior Alaska. However, that does not mean that fires do not periodically make their presence known in the local area. On the unique summer, when weather patterns follow drying trends in this normally wet region, dangerous fire indices can be reached in a matter of days. Fire history data shows evidence of several large fires in this region over the past 80 years (Table 4-2). Although rare, when optimal burning conditions are reached in Katmai National Park and Preserve, the Regional Fire Management officer will notify the Agency Administrator of the current situation. Management staff at Katmai will utilize the Fire Communication and Education Plan guidelines for educating, local residents, visitors and park employees of the dangers of the present fuel conditions.

4.6.2 Communications/Education

Program Capabilities

Katmai National Park and Preserve is committed to providing high-quality, proactive and coordinated fire communication and education to target audiences. Park staff, the Regional Fire Communication and Education Program and the Regional Fire Management Program, in concert will fulfill the plan outlined below as appropriate in order to increase internal and external awareness and support. Fire management spans a broad spectrum of programmatic areas including operations, ecology, prevention, GIS, predictive

services, fuels, leadership, etc. Based on evolving programs and situations, the park can determine the focus area as appropriate. The Public Information and Education Communication Plan is found in Appendix H.

Table 4-2. Katmai Area Fire History.

Years	Number of Fires	NPS Acres Burned	Total Acres Burned
1950 - 1959	1	2	2
1960 - 1969	1	0.3	0.3
1970 - 1979	1	5	5
1980 - 1989	2	2.2	2.2
1990 - 1999	3	17.5	17.5
2000 - 2009	7	458.4	871
2010 - 2011	0	0	0
Total	15	485.4	898

Note: All fires human caused except for one natural caused fire in 1957 and one natural caused fire in 1984

Contact List

Visit http://www.nps.gov/akso/nature/fire/contact.cfm for a list of current fire staff or contact the Regional FMO. For current information about agency leadership and staff beyond fire management, local emergency responders, clinics, neighbors, local and regional tribal officials, local schools, researchers, and community members, contact the KATM headquarters or the Chief of Interpretation based in King Salmon, AK. Download an Alaska media contact list from http://bit.ly/AkByV5, the InsideNPS Alaska Region Wildland Fire Communicator's Toolbox. KATM specific target audiences are also listed in the KATM fire communication plan located in the appendix.

Materials

The Alaska Region Fire Management Program maintains a cache of NPS and interagency fire materials such as a wildland fire education trunk which contains curriculum, books, and videos, banner stands, tabletop and 10' x 10' displays, and brochures such as Wildland Fire in National Parks, Firewise Alaska, Smoke and Fire in Alaska, Safe Burn Barrels, and Safe Campfires. Visit InsideNPS Alaska Region Wildland Fire Communicator's Toolbox at http://bit.ly/AkByV5, http://www.nps.gov/akso/nature/fire/CommEd.cfm and/or contact the Regional Fire Communication and Education Specialist for materials. Alaska interagency brochures can also be downloaded from http://fire.ak.blm.gov/administration/awfcg.php. General interagency fire management print-on-demand documents are located at http://fire.ak.blm.gov/administration/awfcg.php. Information about wildland fire key messages and non-personal communication methods is in the KATM fire communication plan, located in Appendix H.

Press Kit

This package is put together for the media, generally for a specific event/incident. It should include, at a minimum, a news release about the incident, fact sheets, incident maps, the park brochure or park

newspaper, wildland fire brochures, and additional information reporters might need (a map with telephone and power outlets highlighted, for instance, if they are actually at headquarters). Since having a reporter at the park to cover an incident is a good opportunity to tell a broader story, a press kit is also a good vehicle to include recent news releases, story tips, materials on other park events and partnerships. Don't reinvent the wheel; rather draw from and improve a rich assortment of best practices and templates located at: http://bit.ly/AkByV5.

Online Resources

KATM currently has a deactivated fire information web page. Within 24 hours of a fire igniting at the unit, the park web manager will activate the information web page with current fire information. The public will be able to access it from the park's home page. Fire staff or a Public Information Officer will write consistent and timely content for the page, and send the information to the park web manager for posting. Fire staff or a PIO will also upload current fire information, photos, and maps to NPS Fire News, an online portal for fire information. A link to Fire News is located on the park current fire information web page. Review the Alaska National Parks Current Fire Information Web Page Standard Operating Procedures at http://bit.ly/AhcOXG. KATM maintains a Twitter account @KatmaiNPS and the Alaska region maintains a Twitter account @AlaskaNPS. The Alaska region also has a Facebook account and a YouTube account @AlaskaNPS, in order to reach new virtual audiences and highlight all Alaska parks and programs. Other salient online resources include:

1. http://www.nps.gov/katm
2. http://www.nps.gov/akso/nature/fire/index.cfm
3. http://www.nps.gov/fire/
4. http://fire.ak.blm.gov/
5. http://www.nifc.gov/
6. http://www.inciweb.org/

Communications Step-Up Plan

A step-up plan is located at the Alaska Region Wildland Fire Communicator's Toolbox, Best Practices http://bit.ly/AhcOXG.

4.7 Air Quality/Smoke Management

4.7.1 Air quality issues

The majority of the state, including the entire area within Katmai National Park and Preserve, is classified as a Class II airshed. Two class I airsheds exist in SW Alaska. The closest, Tuxedni Wilderness area, lies approximately 20 miles to the north across Kamishak Bay. Historically fires in the coastal areas of Katmai have had limited opportunity for growth. General maritime weather influences and predominate geographic weather patterns dictate fire size and duration and make it unlikely that fire events that occur would significantly impact Tuxedni. The Simeonof Wilderness area lies approximately 260 miles southwest of Katmai and 40 miles off Aniakchak National Monument to the south, southwest. Only a northerly flow pattern would provide any chance for air quality impairment of these remote islands. Northerly flow during fire season normally coincides with significant drops in temperature and typically does not set up for extended periods of time during the summer fire season. (Correspondence with Heidi Strader, Fire Weather program manager, AFS, August, 2010)

Wildfire smoke could impact local towns and villages in the surrounding area. Appropriate air quality advisories will be issued to effected communities in accordance with interagency Smoke Education Communication Strategy policy.

Regional Haze Program

According to Regional Haze Rule Section 51.308 every state that contains a Class I airshed must work to improve its visibility through the year 2064. Several Class I airsheds exist in Alaska. The closest to Katmai are Tuxedni and Simeonof. Remote automated sensors have been collecting air quality data in these locations since the fall of 2001. At present, data collected is not available for six months, making subtle air quality differences difficult for fire managers to assess during incidents. Over time if trends in the data show visibility standards not meeting federal regulations, land managers may have to reconsider fire management options in the neighboring management units. In addition, if smoke conditions reach obvious undesirable levels in Southwest Alaska, the interagency MAC group may make decisions regarding suppression actions on affected area lands regardless of their management option selection.

It is however recognized that fire and its associated smoke is a part of the natural condition in Alaska and complexities such as differentiating transport of smoke and dust from Russia, China, Canada and other Northern European countries need to be quantified. A copy of the current Regional Haze Program is available from the Department of Environmental Conservation.

Environmental Protection Agency Tile 18, Chapter 50: Air Quality Control Section 50.030: State Air quality Control Plan is the current compliance document in effect in the state of Alaska.

4.7.2 Smoke Management Program

Smoke assessments are the responsibility of both the Jurisdictional and Protecting agencies. The need for air resources advisors is increasing and additional technical expertise for addressing air quality and health related issues may be available through the Alaska Department Environmental Conservation (ADEC). The ADEC is the regulatory agency responsible for air quality and smoke management in Alaska and is represented on the AWFCG.

The AWFCG approved Smoke Effects Mitigation and Public Health Protection Protocols strive to explain the inevitable presence of smoke during the Alaska fire season. The protocols give detailed guidance to the agencies relevant to information dissemination to the public and other agencies about forecast and current smoke management concerns.

Current smoke information and forecast, regulations, advisories, and educational materials are available at the ADEC website. The ADEC also issues open burning permits. These permits are required prior to the use of any pre-planned ignitions

The Alaska Enhanced Smoke Management Plan for Planned Fire was developed by ADEC in coordination with the AWFCG Air Quality and Smoke Management Committee of which the NPS is an active participant. The optimal goal of a smoke management plan and program is to protect public health and the environment while allowing for reasonable resource management (e.g. The use of Wildland Fire and Prescribed Fire). Addressing smoke management concerns is a critical component of a Prescribed Burn Plan and wildland fire planning efforts and decision support systems (WFDSS). The ESMP and its appendices are available online.

All fire management actions at Katmai will be conducted in full compliance with local, state, and interstate air pollution control regulations as required by the Clean Air Act, 42 U.S.C. 7418.

4.8 Data & Records Management

Immense investments of time, effort and finances go into obtaining fire information needed for federal reporting purposes, thus it is imperative that the data be preserved, safeguarded and permanently archived accordingly. NPS reference manual 18 clearly states the data's many purposes in the dialogue below.

> "Information collected is important data used in long-range wildland fire planning, operational decisions, general information reporting, and programmatic performance analysis. It is imperative that the park collect, record, and input wildland fire data accurately and promptly and store permanent records accordingly. The data contained in the wildland fire reporting system is frequently requested and used to fulfill a number of queries from interested members of the public, lawmakers, and researchers – all who rely on the accuracy of the reports." (NPS, RM 18)

4.8.1 Fire/Fuels/Budget Submission and Reporting

The NPS Wildland Fire Report is the standard format for submission of fire data into the Department of Interior Wildland Fire Management System (WFMI). On KATM incidents an initial DNR Incident Report Form 10-2161(equivalent DOI form DI-1202) will be prepared by the protection agency. The NPS Regional Fire Management Officer will take the initial information, verify all information contained in the report is correct, complete a hardcopy Wildland Fire Report and then have it entered into WFMI on behalf of the park/preserve. The regional FMO will also ensure prescribed fires and fire use fires entered in the National Fire Plan Operations and Reporting System (NFPORS) also have a hardcopy fire report and are entered accurately into WFMI. Reporting timeliness will remain in compliance with standards specified in Chapter 11 of RM 18. Original hardcopy reports, and all associated incident supporting documentation will be permanently archived in the Regional Fire Management Office, in the Ranger Services Division in compliance with *NPS Records Management Handbook,* under *Director's Order 19, Records Management*. Copies will be provided to Katmai NPS managers as requested.

Decision support processes and analysis that help determine and document decisions regarding the management of individual ignitions will follow national direction. The Current national policy for the National Park Service as well as all agencies in the State of Alaska is to use the Wildland Fire Decision Support System (WFDSS) and analysis tools such as FARSITE, FlamMap, and FSPro.

Further guidance pertaining to fire reporting and associated details are available in Chapter11 of RM 18.

Fire reporting will be handled by the AK NPS Regional Fire Management staff (Table 4-3) until determined that workload dictates alternative staffing solutions be explored.

Table 4-3. Reporting Requirements and Responsibility

Action	Responsible Party	Annual Deadline
Budget Submissions	RFMO	June
Fuels Treatment Plans	RMFO or Delegate	October
Annual FMP Review	RMFO or Delegate	March
Preparedness Planning	AFS/DNR- Protection Agencies	April
Incident Reporting	RFMO or Delegate	November
Fiscal Year Reporting	RMFO or Delegate	September
Program Accomplishments	RFMO or Delegate	October

Source: NWCG, 2009

4.8.2 Geographic Information Systems

Point locations of fires affecting Katmai National Park and Preserve will be available as a GIS dataset stored in the NPS Alaska Region's GIS Permanent Data Set. The Regional Fire GIS Specialist is responsible for updating this layer on an annual basis. Final fire perimeter polygons will be housed in the interagency statewide polygon fire history layer (maintained by the BLM Alaska Fire Service) as well as any NPS agency specific polygon fire history datasets. The Regional Fire GIS Specialist is responsible for insuring that final fire perimeters are incorporated into these datasets and for insuring that current versions of these datasets are available through the Alaska Region's GIS Permanent Data Set.

4.8.3 NPS/USGS Burn Severity

For fire's greater than 500 acres in size, a burn severity assessment will be completed following the protocols of the NPS/USGS Burn Severity Mapping Project and/or the Monitoring Trends in Burn Severity Project. These projects map the burn severity of wildland fires using pre- and post-fire Landsat satellite imagery. If conditions allow, both an Initial Assessment and Extended Assessment will be completed for each fire. Once the assessments are completed, burn severity data will be available for download from the NPS/USGS Burn Severity Mapping Project (http://burnseverity.cr.usgs.gov/) and/or the Monitoring Trends in Burn Severity Project website (http://www.mtbs.gov/). In addition, the burn severity data and associated Landsat satellite imagery will be available through the NPS Alaska Region GIS Permanent Data Set. The Regional Fire GIS Specialist is responsible for requesting burn severity

assessments for Alaska NPS fires and for incorporating burn severity GIS data deliverables into the NPS Alaska Region GIS Permanent Data Set.

4.9 Organizational & Budgetary Parameters

4.9.1 Alaska Interagency Cooperation and Organizational Structure

To ensure safe and efficient operations, a basic understanding of the cooperative relationship between the NPS fire management program and the other land management agencies in Alaska is imperative for all personnel. The 2010 AIWFMP, Alaska Statewide Master Agreement and its associated AOP as well as the 2009 AIMG work together to describe the consolidation and coordination of wildfire suppression services for all lands in Alaska. According to aforementioned documents, the DNR, Division of Forestry, Southwest area provides suppression services and maintains operational control for implementing wildfire suppression operations on NPS administered lands within the park/preserve. It is the duty of the Katmai staff together with the NPS Regional Fire Management Officer to ensure that all fire response services contribute to the achievement of the management goals of the park/preserve as well as that of the National Park Service. The establishment of this fire management plan gives NPS managers the opportunity to develop strategic objectives for Katmai, and in effect, influence how wildfires will be managed within the park and preserve.

4.9.2 NPS General Organizational Structure

The Alaska Regional Fire Program (Figure 4-2) provides fire administration, planning and support efforts to Katmai National Park and Preserve as well as the following NPS coastal park units; Aniakchak National Monument and Preserve, Kenai Fjords National Park, Klondike Gold Rush National Historical Park, Sitka National Historical Park, and Glacier Bay National Park and Preserve. Due to the fact that suppression services are rendered by the State of Alaska DOF in this region, coupled with historically low frequencies of large fires in Katmai, dedicated fire staffs are not practical and therefore not assigned. The acting regional fire management office duty officer (usually the RFMO) will serve as the liaison between Katmai park management staff and the protecting agency FMO during suppression activities within the park/preserve. Necessary fire related project work, fire research and additional monitoring mandated by NPS policy will be coordinated from the NPS regional fire office as warranted.

Fire Management program oversight for all remaining NPS park units in Alaska fall under either the NPS Western or Eastern Area Fire Management Programs. These programs encompass NPS units that lie within Interior and Arctic Alaska and therefore see considerably higher fire occurrence. The Fire Management Officers from each area program have dedicated fire support staff and report to direct supervisors in their management units. The NPS Regional FMO provides specific fire support, program oversight and counsel for the area programs as well as the remaining coastal park units.

NATIONAL PARK SERVICE

ALASKA REGION

FIRE MANAGEMENT PROGRAM ORGANIZATION

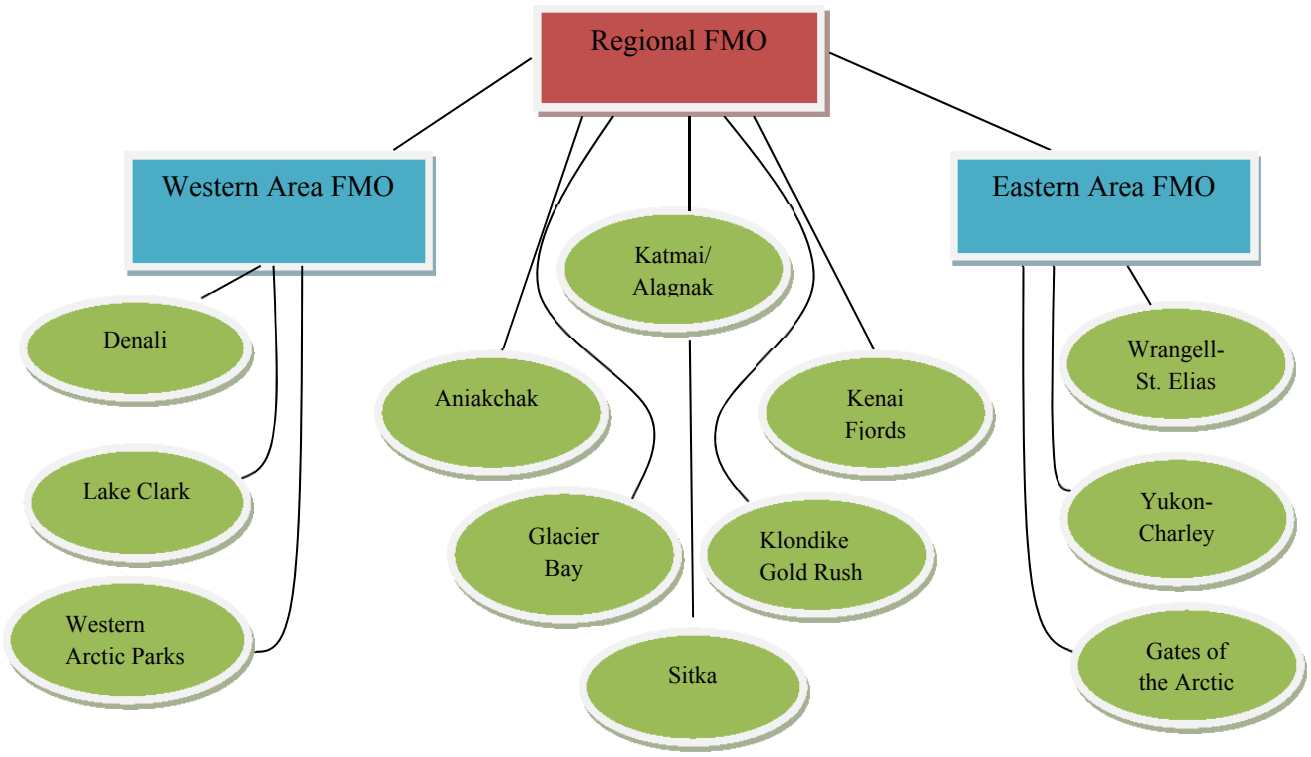


Figure 4-2. NPS AK Fire Management Organization.

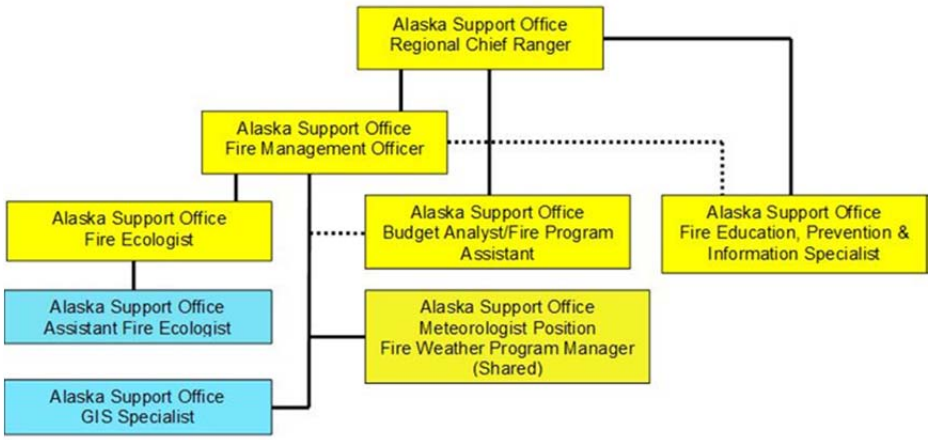
Unless otherwise delegated, the Park Superintendent will act as the Agency Administrator for their Park Unit. The RFMO also has been delegated the authority by the Regional Director to act on the behalf of a Superintendent if the they or a designee are not available to make a decision. The Agency Administrator retains responsibility for ensuring that Fire Management within Katmai is managed in accordance with current governing land management documents (General and Resource Management Plans, Wilderness Management Plan, Subsistence Management Plan, etc.).

The Agency Administrator, unless delegated otherwise, acts as the key communication link between Katmai and the Regional Fire Management Office regarding fire management issues and concerns.

4.9.2.1 Duty officer

An NPS duty officer is assigned at all times during the summer season when fire potential exists. The duty officer for Katmai is routinely the regional FMO. When the RFMO cannot fulfill the role of the duty officer, one will be assigned and a delegation of authority given to them by the Agency Administrator. The duty officer oversees and documents fire operations in the park/preserve and does not function in any ICS role during their role as duty officer. The primary role of the NPS duty officer is to ensure compliance of NPS policy on incidents within the park/preserve. They also serve as a vital communication link between park management and the Protecting Agency. Similarly, the protecting agency will also have a duty officer assigned. More duty officer functions can be found in Chapter 3 of the *Interagency Redbook*. Primary responsibilities of the DNR, Division of Forestry Duty Officer are to coordinate and prioritize suppression actions and resource allocation.

Figure 4-4: Alaska Region Fire Program Organizational Chart.



4.9.3 General Budget Process

Suppression

Suppression costs for operations occurring within the park/preserve are the responsibility of the Alaska Fire Service as explained in Exhibit D of the Master Agreement. True authority is listed in DM 620, Chapter 2 (Alaska). Further, the Alaska Statewide Master Agreement explains use and reimbursement of fire interagency resources within Alaska under clauses 34-37 and in Exhibit D: Reimbursable Billings and Payment.

Fuels Management

All requests for national fuels funding must be made by February 1st of the preceding year in order to be considered. Requests should be brief (under two pages) and follow the format example at the National Interagency Fuels Management website. No blanket requests incorporating multiple projects will be accepted. Instead, separate requests must be submitted for individual activities/projects. All requests must indicate a schedule of product development and activity/project completion. Sporadically there is yearend funding available between August and September, but competition for these funds are high.

Cost Accountability and Budget Tracking

All fire management activities occurring within Katmai will meet fiscal accountability and tracking requirements as outlined in the, Interagency Fire Business Management Handbook Standards and Alaska Statewide Master Agreement. The recently implemented Wildland Fire Decision Support System (WFDSS) uses the USFS fire cost estimation model, Stratified Cost Index to help predict incident costs. This tool assists fire managers by ensuring decisions made on the incident will meet strategic objectives.

However all incident cost tracking is performed by the Protection Agency in Alaska requiring a collaborative accountability effort on the behalf of both Protection and Jurisdictional agencies to ensure that response efforts are commensurate with values at risk.

5.0 ADAPTIVE MANAGEMENT STRATEGY

Adaptive management has been embraced by Interior Department Bureau's and is being mandated throughout NPS Fire Management programs. Adaptive management ensures projects are well thought out, professionally planned, skillfully implemented, and appropriately monitored. The project data is then analyzed and ***communicated*** to all stakeholders involved in the project. Annual evaluations will ensure information learned from the project including data analysis, will be used to modify plans and objectives for the betterment of future projects in the park/preserve.

Katmai NPS managers will collaborate with regional fire staff to ensure adaptive management strategies are implemented on all fires and fire related projects throughout the park/preserve. Annual planning and evaluation meetings will be coordinated by the Regional Fire Management Officer for all coastal parks who have had fires or projects implemented during the summer season. Parks with current planning efforts for fire related projects may also be required to participate. The complexity of the incident or project that occurred or is planned will determine the required level of adaptive management necessary. Appropriate adaptive management may range from an organized conference call for small simple fires, to a meeting at the Anchorage Regional Office for larger more complex fires or projects. This meeting will be called the Coastal Park Adaptive Management Strategy Meeting and will be scheduled by the Regional FMO sometime after the Interagency Fall Fire Review. As complexity warrants, regional staff members may be called upon to participate and provide valuable input regarding fires or fire related projects in the applicable park units. These positions include but are not limited to; Fire Ecologist, Communication and Education Specialist, GIS Specialist.

The need for FMP updates may be initiated by the RFMO or Katmai park management and will be addressed at the Coastal Park Adaptive Management Strategy Meeting.

For details regarding all aspects of adaptive management, please visit the DOI Adaptive Management Initiative Website, RM 18-Chapter 7, Section 3.4 and Chapter 8-Fire Ecology & Monitoring Section 3.1.

5.1 Fire Management Objectives

Due to low historic fire occurrence coupled by suppression ineffectiveness in logistically difficult regions of Alaska, vegetation in Katmai National Park and Preserve has not been drastically altered by suppression actions. Therefore, it is fortunate that management acts are not required in order to "return" the system to its natural balance. At present the current management environment and its resources are healthy and within the normal range of natural variability. Therefore, fire will be encouraged to continue playing its natural role in landscape environmental change, alongside, volcanic events, floods, glaciations, insect infestations and various other climatic changes.

The paramount objective for Fire Management in Katmai is stated directly in the park/preserve's General Management Plan and states, "Let fires burn except where property or people would be threatened." (NPS, GMP, 1986) Fire management objectives are described in Section 3.1.1.

5.2 Monitoring

Within the NPS Wildland Fire Management Reference Manual 18 it states that: "Fuels management activities and treatments must be monitored in order to assess treatment effectiveness and to determine whether

management objectives were met. Moreover, monitoring is the basis of a successful adaptive management program." (RM-18, Ch. 7, section 3.4). The Alaska NPS fire ecology program is designed to determine whether fire and resource management objectives are being met, as well as to document any unexpected consequences of fire management activities. Fire and non-fire fuels treatment monitoring is an important part of adaptive management. Monitoring level requirements and recommendations for fire management activities are provided in Table 5-1.

Table 5-1. Monitoring Level Requirements and Recommendations for Fire Management Activities.

Management Activity	***Minimum Required* Monitoring Levels**	***Recommend* Monitoring Levels**
Wildfire	Levels 1 *Burn Severity	Levels 1, 2, 3, *Burn Severity
Prescribed Fire	Levels 1, 2, 3, *Burn Severity	Levels 1, 2, 3, *Burn Severity
Non-Fire Treatments	Level 1	Levels 1, 2, 3

*Burn Severity should be requested for all fires > 500 acres on NPS lands (RM 18, Chapter 8, 4.3)

Level 1, Surveillance Monitoring – This level provides a basic overview of the baseline data that is required to be collected for all wildland or prescribed fires, some variables are required for mechanical treatments. Information at this level includes such items as RAWS weather data, general description of the fire environment (i.e. topography and fuel types), and fire location or perimeter. Information collected at this level precludes the necessity for on the ground measurements and can be done from remote sensing or an aerial platform. This data is necessary to satisfactorily complete a Wildland Fire Report.

Level 2, Moderate Intensity Monitoring – This level of monitoring documents fire behavior observations (not addressed in this document), fuels, and general effects of wildland fires, prescribed fires or mechanical treatments on vegetation. Information at this level includes characteristics of the fire, such as rate of spread, fire behavior, and burn severity, as well as current weather conditions. Fuel conditions would be assessed by determining the fuels array, composition, and dominant vegetation within the burn area, in addition to using vegetation and fuels maps to predict potential fire spread. Information to assess pre and post fire or treatment effects would include duff depth and moisture measurements, photo points, vegetation cover, and tree parameters. This level of monitoring is recommended for the use of wildland fire and prescribed fires, but is dependent on the objectives of the burn and the resources of concern. Some of the variables monitored at this level would require on the ground measurements of specific sites.

Level 3, Comprehensive Monitoring (Short or Long-term Fire Effects) – This level would be used to monitor the effects of prescribed or wildland fires in greater depth, it may also be used for mechanical treatments. Level 3 monitoring requires collecting information on fuel reduction, vegetative changes, and soil parameter changes. This level of monitoring may also include wildlife utilization techniques. The number of variables monitored increases and the techniques are more rigorous. Information collected at this level is based upon management objectives and the resources of concern. Variables monitored at this level would require the establishment of ground based plots.

Fire and mechanical treatment monitoring should be designed to meet the objectives of each project and therefore the components of monitoring should be developed based on the project objectives. Suggested monitoring variables for Level 1 through 3 are provided in Table 5-2. Measurement of Level 1 variables is the recommended minimum for all wildland fires. The implementation of variables at Level 2 and Level 3 would depend on the objectives of the fire/treatment and the resources of concern, and would remain up to the discretion of the FMO, resource management staff, and fire ecologist. The difference between Level 2 and Level 3 monitoring will often be the nature of data gathered for the same variable (qualitative vs. quantitative) or the number of plots, which may determine the statistical significance of findings.

Table 5-2. Recommended Monitoring Variables for the Three Major Fire Management Activities.

Monitoring Level	Monitoring Variable	Wildland Fire	Prescribed Fire	Mechanical Treatment
1	Perimeter (> 100 acre fire) or Point Location	R	R	R
1	Fuel types	R	R	R
1	Site description	R	R	R
1	Weather (RAWS)	R	R	O
1	Fire Danger Indices	R	R	N/A
1	FRCC	R	R	R
1	Burn severity maps (> 500 acres)	R	R	N/A
2	Photos of burn or treatment area	O	O	O
2	Photo Points	O	R	O
2	Fire behavior	O	R	N/A
2	Smoke	O	R	N/A
2	Duff/fuel bed depths	O	O	O
2	Duff moisture	O	O	O
3	Duff consumption (pins)	O	O	N/A
2	Burn severity assessment	O	O	N/A
2	Vegetation class (pre & post)	O	O	O
2	Vegetation cover/ composition (Level	O	O	O

Monitoring Level	Monitoring Variable	Wildland Fire	Prescribed Fire	Mechanical Treatment
	2 - quantitative)			
2	Tree density by species and size class	O	O	O
2	Tree canopy cover	O	O	O
3	Tree heights, diameters	O	O	O
3	Tree damage (insect and disease)	O	O	O
3	Ladder fuel heights	O	O	O
3	Active layer depth	O	O	O
3	Soil parameters	O	O	O
3	Tree ring disks/cores	O	O	O
3	Shrub or species specific densities	O	O	O
3	Coarse woody debris (Brown's transects)	O	O	O
3	Herbivory	O	O	O

R = Required, O = Optional, and N/A = Not Applicable

Recommended and past fire and fuels monitoring protocols for Katmai National Park and Preserve are provided in Appendix F of this Fire Management Plan. Included are the Alaska NPS Regional Fire and Fuels Monitoring Protocols, Paired Plot Protocol, and Hazard Fuels Reduction Minimum Monitoring Protocol.

5.2.1 Wildfire Monitoring

The minimum required monitoring for wildfires on AK NPS lands includes the data necessary to fill out DOI required Wildland Fire Management Information (WFMI) fire reporting documentation (http://www.nifc.blm.gov/nsdu/fire_reporting/NPS/doc/NpsUserGuides.html). This includes documentation of information such as the fire origin, fire start and end dates, fuels, weather, final fire size (acres), and suppression actions. Currently, remotely sensed burn severity data using dNBR is required for all wildfires and prescribed fires exceeding 500 acres on National Park Service lands (RM-18, USDI NPS 2008 Chapter 8). A description of burn severity mapping and monitoring is provided in the Fire & Fuels Monitoring Plan in Appendix F. Fire effects plots may be established if Fire Management, Resource Management or other needs are identified for specific fires. The AK Regional NPS Fire and Fuels Monitoring Protocol is recommended for monitoring wildfire effects.

5.2.2 Prescribed Fire Monitoring

All prescribed fires that are implemented in KATM are required to have a monitoring plan that addresses the objectives of the prescribed fire. Not all prescribed fires need to be monitored, if representative fuel types are being monitored with similar prescription and fuels. All prescribed fires >500 acres are required to have a burn severity assessment map. The AK Regional NPS Fire and Fuels Monitoring Protocol is recommended for monitoring prescribed fire effects (Appendix F).

5.2.3 Non-Fire Fuels Treatment Monitoring

Mechanically treating fuels has recently become an important part of reducing fuel densities and reducing overall threats associated with wildland fires. A fuels treatment plan should be prepared for each project and include the following components. This plan includes a description or purpose of the project in an executive summary. A detailed description of the fuels to be treated is discussed. The area is identified with a project map listing the goals and objectives of the project. Project costs are calculated and summarized in the plan. The plan addresses the protection of sensitive features, safety of the personnel and the public, interagency coordination, public involvement, a monitoring plan, and post project rehabilitation issues. The main body of the plan addresses the statement of work to be done and specifications for treatments. These specifications address plant species by diameter and percent of stand for treatment. The monitoring section of the plan contains information on documenting and collecting photo point information and addresses other techniques or methods used to monitor the effectiveness of mechanically treating the vegetation.

Minimum Recommendations for Non-Fire Treatment Monitoring:

1. Describe treatment objectives and methods
2. Document location, size, and data of treatment
3. Photo points or video documentation

5.2.4 Katmai Fire Monitoring History

Alaska NPS Fire Effects Paired Plots (1982-Present)

Background: The only formal fire effects study that has been conducted in Katmai National Park/Preserve is the Alaska Region NPS Fire Paired Plot study. The project began in 1981 under the direction of Gary Ahlstrand, NPS Alaska Regional Research Ecologist. The purpose of the project was to assess vegetation change and succession as a result of fire and to determine fire history. Fire staff established paired vegetation 15-m x 30-m plots in burned and representative unburned habitat adjacent to the burned areas of varying ages. Between 1981 and 1988, at least 525 plots were installed across 9 different parks in Alaska. A total of 14 plots were established in KATM during the summers of 1982/83 (Table 5-3). Most of the plot locations were not permanently marked. The plots listed as “Core” plots had only tree cores taken and were not necessarily associated with a past fire.

Purpose: These plots provide valuable historic data on previous fires and forest health in Katmai, which can be used to compare vegetation succession in areas impacted by fire to those not impacted. The data is being used in other parks to develop fire succession models in order to update fuels and landcover vegetation maps for the fire management program.

Table 5-3. Fire Effects Paired Plots in Katmai National Park.

Plot ID	Site Name	Plot Type	Date Visited	Year Burned	Viereck Class at Time of Measurement	Latitude (NAD 83)	Longitude (NAD 83)
KATM-FCA-1	Fure's Cabin	Control	8/30/1984	NA	Open Spruce-Balsam Poplar Forest	58.668930	-155.4343496
KATM-FCB-1	Fure's Cabin	Burn	9/5/1983	1920	Closed Balsam Poplar Forest	58.669404	-155.4317899
KATM-FCC-1	Fure's Cabin Core	Core site	8/29/1984	UNK			
KATM-ILA-1	Iliamna Burn	Control	8/31/1983	N/A	White Spruce Woodland	58.984423	-155.9369191
KATM-ILB-1	Iliamna Burn	Burn	8/30/1983	1935	Open Low Willow Shrub	58.979903	-156.0514867
KATM-ILC	Iliamna Core	Core site	8/28/1984	UNK			
KATM-KSA-1	King Salmon Burn	Control	9/1/1983	N/A	White Spruce Woodland	58.697171	-156.4269873
KATM-KSB-1	King Salmon Burn	Burn	8/31/1983	1945	Open Low Mesic Shrub Birch-Ericaceous Shrub	58.686375	-156.4812277
KATM-KSC-1	King Salmon Core	Core site	8/28/1984	1945		58.712949	-156.4632704
KATM-NOA-1	Nonvianuk Burn	Control	9/3/1983	N/A	Spruce-Paper Birch Woodland	59.025187	-155.3729879
KATM-NOB-1	Nonvianuk Burn	Burn	9/4/1983	1983	Barren	59.0243822	-155.3739529
KATM-NRA-1	Naknek River	Control	8/29/1984	N/A	Open Paper Birch-Balsam Poplar-Spruce Forest	58.6389987	-156.5960496
KATM-NRB-1	Naknek River	Burn	8/29/1984	1958	Closed Low Ericaceous Shrub	58.6388758	-156.5985507
KATM-NRC-1	Naknek Core	Core site	8/29/1984	UNK			

Methods: Burned sites were identified and selected for the study from historic fire reports, 1:63,360 color infrared aerial photography, and aerial reconnaissance. Plot data that was collected included: photographic slides of plot, tree density by species and diameter size class on 15-m x 30-m quadrants, vegetation cover class for 30 Daubenmire frames (20 x 50 cm), tree cores/cookies, fuels and soils data (on some plots), and general plot site descriptions. Complete protocols and methodologies are described in Appendix F.

Data Management: Between 2003 and 2008, paired plot data for all the parks was entered into a Microsoft Access database, and plot locations were digitized off topographic maps and aerial photos. The Access database was converted to an interagency Fire Ecology sequel server database called FFI V1.02 through a contract with SEM in 2008. Original copies of data and photos are archived at the Alaska Regional Office. Scanned copies of data and photos are stored at the regional office and with the Regional Fire Ecologist in Fairbanks.

5.3 Evaluation

In the fall following each fire season an interagency review of the fire plan implementation and fire suppression operations is held with Protection Agency personnel and Jurisdictional Agency personnel. All involved parties are given the opportunity to identify plan implementation problems and operational concerns. The NPS will evaluate how the Protection Agencies responded to fires in the selected fire management options. Special considerations will be given to non-standard responses and opportunities will be available for each agency to comment. Consideration of fire management option selection is reevaluated annually and if deemed appropriate will follow the revision process and timeline specified in the AIWFMP. At minimum the Regional FMO and the Regional Fire Ecologist will be present to give voice to park units not already represented by NPS Area FMOs.

All wildland fire occurring within Katmai will be reviewed in accordance with Reference Manual 18, Chapter 17- Wildland Fire and Program Reviews and the Interagency Redbook-Chapter 18-Reviews and Investigations. If fires occur and the complexity necessitates a specific incident review, the Regional FMO, and KATM Fire Coordinator will coordinate with the Katmai management personnel to schedule a separate review for the incident.

Park specific standards and procedures for the evaluation of monitoring and research data from wildfire, prescribed fire and non-fire fuels treatments is discussed in section 5.0- Adaptive Management Strategy, of this FMP.

5.4 Fire Research

Implementation of this fire management plan is not contingent upon the completion of research. Information regarding primary and secondary fire effects in most ecosystems of KATM is incomplete. A limited body of scientific information exists regarding effects of fire for the plant associations within Alaska. Although most of this research was accomplished in other geographic areas, the results may be applied to Katmai National Park (taking care to identify site differences and any subtle differences in effects that those differences might cause). As new information becomes available fire-related resource management objectives can be refined in an adaptive management style.

Opportunities will be taken to coordinate and work with NPS staff, Fire Management Staff, and Southwest Network Inventory and Monitoring Program to identify and encourage fire related research within the park. As research needs are identified, funding will be sought so studies may be undertaken. Fire research has limited

funding within the NPS. If it is determined, however, that significant information is needed concerning the effects of fire, park managers may submit proposals through the NPS Fire Research Funding call. Opportunities exist for making requests for research funding through the Joint Fire Science Program. Other opportunities exist under the (CESU) Cooperative Ecosystem Study Units and National Park Service requests (Fee Demonstration Program, Project Management Information System, and Natural Resource Challenge).

Currently there are no known fire research studies completed within KATM, other than the Paired Plot work described in the monitoring section of this document. However the following research studies may be applicable to Katmai to understand fuels, climate/fire interactions, and burn severity.

Interactions of regionally widespread spruce beetle outbreaks and climate variability in south-central Alaska

The following project that is being conducted by the Southwest Inventory and Monitoring Network (SWAN) could be applicable to understanding fuels dynamics in KATM in relation to spruce beetle outbreaks and climate variability.

Disturbance is an important driver regulating landscape pattern and process in Katmai. High latitude forests have experienced widespread mortality and/or loss of canopy cover due to insect and disease outbreaks in the past. Spruce bark beetles (*Dendroctonus rufipennis*) and a variety of native and non-native defoliators (e.g., birch leaf roller, *Epinotia solandriana*, birch leaf miner, *Profensa thomsoni*, and the alder- and willow-defoliating noctuid, *Sunira verberata*) occur at various levels within the SWAN parks. Changing land use patterns and variation in climate may affect population dynamics of insects and forest pathogens, potentially altering forest structure and composition in the future. As of 2005, the current spruce bark beetle outbreak had killed approximately 35,000 ha (86,500 acres) on the Alaska Peninsula. A retrospective tree-ring study is currently being conducted in Lake Clark National Park and Preserve and Katmai National Park and Preserve will provide information regarding the frequency and extent of historic spruce bark beetle outbreaks, and whether the current outbreak is outside the historic range of variability.

Park contact: Amy Miller, Plant Ecologist, SWAN NPS

Future Fire Regime and Climate Modeling

Climate modeling predictions for KATM have been completed by the SNAP program (Scenarios Network for Alaska & Arctic Planning) and The Wilderness Society (The Wilderness Society 2008). Temperatures in the park are projected to increase over the next few decades, averaging 0.6°c per decade. This translates into a rise in average annual temperature of 2.6°c by 2040 and 4.5°c by 2080. Winter temperatures are predicted to increase the most. Precipitation is predicted to increase across the park, with most of the precipitation occurring as snow. These predicted changes could impact fire regimes.

The following study on predicting future fire regimes under climate change models was completed for other parks in the region, but similar modeling could be completed for KATM.

A CESU agreement was developed with Dr. Scott Rupp at the University of Alaska-Fairbanks to assess how different climate scenarios may impact the fire regimes and vegetation within several parks over the next 100 years. The landscape dynamics model, Boreal ALFRESCO, was used to simulate the potential response of vegetation and fire regimes to likely scenarios of future climate change using IPCC models. Results of this study were presented to Park Service personnel and a final report was prepared in 2010. The following parks were selected for analysis: Denali, Yukon-Charley Rivers, Gates of the Arctic, Bering Land Bridge, and Wrangell-St. Elias.

Publications and Reports:

SNAP modeling http://snap.uaf.edu/files/docs/Climate_Change_Sums/Katmai_ClimSum.pdf

Springsteen, A, and Rupp, T.S. 2009. Summary report for Alaska National Parks: Projected vegetation and fire regime response to future climate change in Alaska. CESU Final Report, NPS. (Contact: Jennifer Barnes, Regional Fire Ecologist, NPS AKRO, for copy of report)

Loya, Wendy, Springsteen, Anna L., Barnes, Jennifer L. and Rupp, Scott. 2011. Projected Vegetation and Fire Regime Response to Future Climate Change in National Parks in Interior Alaska. Alaska Park Science. Vol. 10-1: 22-25. http://www.nps.gov/akso/nature/science/ak_park_science/PDF/2011Vol10-1/projected-vegetation-and-fire-regime-Loya.pdf

Park contact: Jennifer Barnes, Regional Fire Ecologist, NPS AKRO

Assessing Remote Sensed Burn Severity Maps – Boreal and Tundra Fires NPS

A remote sensed burn severity map has been produced for the 2003 W. Kamishak Bay fire. The following work has been completed in other parks to assess the applicability of these maps.

In Alaska the level of burn severity strongly influences post-fire vegetation succession, soil erosion, and wildlife populations in the fire-adapted boreal forest and tundra ecosystems. Methods have been developed to map burn severity for landscape level fires using remote sensing. The process uses Landsat 30-meter data and a derived radiometric value called the Normalized Burn Ratio (NBR). The difference between pre-and post-fire NBR datasets is computed to determine the extent and degree of landscape change resulting from fire.

The NPS Alaska fire program has investigated the accuracy of the remote sensed burn severity maps in various fuel types. To do so satellite-derived estimates of burn severity (differenced Normalized Burn Ratio [dNBR] calculated from pre- and post-fire Landsat TM/ETM+ data) have been compared to ground-based burn severity measures in several of Alaska National Parks. The purpose of this project was to provide ground verification of remotely-sensed burn severity data in Alaskan ecosystems through the installation of burn severity plots - Composite Burn Index plots.

Burn severity assessment plots have been established in several park units, including Denali, Noatak, Yukon-Charley Rivers, and Wrangell-St. Elias. Some of this data has been included in a formal report and presented to land-managers.

Publications:

Allen, J.L. and Sorbel, B. 2008. Assessing the differenced Normalized Burn Ratio's ability to map burn severity
in the boreal forest and tundra ecosystems of Alaska's national parks. International Journal of Wildland Fire. 17: 463-475.

Sorbel, B. and Allen, J. 2005. Space-based burn severity mapping in Alaska's National Parks. Alaska Park Science. Vol 4(1): 4-11 (Link to article: http://www.nps.gov/akso/AKParkScience/Vol4-Issue1.html)

Park contacts: Brian Sorbel, Regional Fire GIS speciality or Jennifer Barnes, Regional Fire Ecologist, NPS AKRO

5.4.1 Fire Research Needs

Opportunities will be taken to coordinate and work with NPS staff, Fire Management Staff, and Southwest Alaska Inventory and Monitoring Network to identify and encourage fire related research within the park. As research needs are identified, funding will be sought so studies may be undertaken. Fire research has limited funding within the NPS. If it is determined, however, that significant information is needed concerning the effects of fire, park managers may submit proposals through the NPS Fire Research Funding call. Opportunities exist for making requests for research funding through the Joint Fire Science Program. Other opportunities exist under the Cooperative Education Studies Unit (CESU) and National Park Service requests (Fee Demonstration Program, Project Management Information System (PMIS), and Natural Resource Challenge). The following list are fire research and monitoring needs currently identified by the Regional Fire Ecologist for Katmai:

1. Determine fire effects at KATM through the establishment of vegetation and/or soils plots in past burned areas or during on-going fires.

2. Determine the impacts of potential climate change on fuels, fire risk, and impacts on insect outbreaks such as spruce bark beetle.

3. Assess the risk of fire and fire behavior in relation to insect outbreaks and climate change.

4. Determine historic fire regime in KATM, utilizing dendrochronology or lake core methods. Map and determine pre-1940 fire history.

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Appendix B: Definitions

Agency Administrator: An incident-specific position filled by any qualified KATM staff member as designated by the Superintendent. The Agency Administrator represents the KATM Superintendent and works with the incident command team to ensure the compliance of wildland fire operations with KATM and NPS resource management policy and AIWFMP.

BEHAVE: A system of interactive computer programs used for formulating fuel models based and predicting fire behavior.

Condition Class 1: Fire regimes are within an historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within an historical range.

Director's Order 18 (DO-18): A comprehensive statement of National Park Service wildland fire management policy.

Extended Attack: Any wildland fire suppression action lasting beyond one operational period.

Fire Management Officer (FMO): A permanent position with responsibility for the planning and coordination of fire management programs on NPS lands in western Alaska. A Western Area FMO based administratively in Denali provides fire management direction for WEAR as well as LACL, and DENA.

Fuel Loading: Amount of live and dead organic matter present at a particular site.

Fuel Model: A mathematically simulated fuel complex based on representative descriptors; used to estimate rate of spread and other fire behavior indices.

Initial Action: The actions taken by the first resources to arrive at a wildfire. Initial Action may include the full spectrum of responses from monitoring to aggressive containment.

Initial Attack: Initial action focused on aggressive containment of the fire perimeter.

Operational Period: The period of time scheduled for execution of a given set of tactical actions as specified in the Incident Action Plan. Operational Periods can be of various lengths, although usually not over 24 hours.

Prescribed Fire: Planned implementation of fire within a predetermined area and under predetermined conditions, for the accomplishment of resource management objectives and/or hazard fuel mitigation.

Reference Manual 18 (RM-18): A detailed set of guidelines for the operational implementation of the wildland fire management policies specified in DO-18. RM-18 consists of a continuously evolving on-line document.

Response to Wildland Fire: The mobilization of the necessary services and responders to a fire based on ecological, social, and legal consequences, 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.

Suppression: All the work of extinguishing a fire or confining fire spread.

Unplanned Ignition: The initiation of a wildland fire by lightning, volcanoes, unauthorized human-caused fires and escaped prescribed fires where the objective is to protect values at risk while meeting resource objectives specified in Land/Resource Management Plan

Unwanted Ignition: An ignition from any source that is unplanned and unwanted.

Use of Wildland Fire: Management of either wildfire or prescribed fire to meet objectives specified in Land/Resource Management Plans

Wildfire: Unplanned ignition of a wildland fire or escaped prescribed fire where the objective is to protect values at risk while meeting resource objectives specified in the Land/Resource Management Plan

Wildland Fire: Any non-structure fire that occurs in the wildland. Two distinct types of wildland fire have been defined and include wildfire (unplanned ignition) and prescribed fire (planned ignition).

Wildland Fire Decision Support System (WFDSS): A decision support system, utilized Nation-wide for the federal agencies after March 31, 2010.

Wildland Fire Suppression: Any management action based on protection goals rather than resource management concerns.

ACRONYMS

AAR	After Action Review
ADEC	Alaska Department Environmental Conservation
AICC	Alaska Interagency Coordination Center
AIWFMP	Alaska Interagency Wildland Fire Management Plan
AKRO	Alaska Regional Office
ANILCA	Alaska National Interest Lands Conservation Act
AOP	Annual Operating Plan
AWFCG	Alaska Wildland Fire Coordination Group
ATV	All-Terrain Vehicle
BAR	Burn Area Rehabilitation
BAER	Burned Area Emergency Response
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BUI	Buildup Index
CESU	Cooperative Ecosystem Study Units
CFFDRS	Canadian Forest Fire Danger Rating System
CISM	Critical Incident Stress Management
DC	Drought Code
DMC	Duff Moisture Code
DNR	State of Alaska, Department of Natural Resources
DO	Director's Orders
DOI	Department of Interior
EA	Environmental Assessment
ESF	Endangered Species Act
F	Fahrenheit
FFMC	Fine Fuel Moisture Content
FMO	Fire Management Officer
FMP	Fire Management Plan
FMU	Fire Management Units
FONSI	Finding Of No Significant Impact
GIS	Geographic Information System
GMP	General Management Plan
IC	Incident Commander
ICS	Incident Commander System
IRPG	Incident Response Pocket Guide
ISI	Initial Spread Index
JHA	Job Hazard Analysis
KATM	Katmai National Park and Reserve
LCES	Lookouts, Communication, Escape routes, Safety zones
MAC	Multi-Agency Coordinating
MIST	Minimum Impact Suppression Tactics
NBR	Normalized Burn Ratio
NEPA	National Environmental Planning Act
NFPORS	National Fire Plan Operations and Reporting System
NHPA	National Historic Preservation Act
NPS	National Park Service
NWCG	National Wildfire Coordinating Group
RAWS	Remote Automated Weather Station

RM-18	Reference Manual 18
RMP	Resource Management Plan
SHPO	State Historic Preservation Office
SWAN	Southwest Alaska Network
SWSC	Southwest Area Dispatch Center
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
WFDSS	Wildland Fire Decision Support System
WFLC	Wildland Fire Leadership Council
WFMI	Wildland Fire Management System

Appendix C: Current Species of Concern

Federal Threatened and Endangered Species

Brachyramphus brevirostris (Kittlitz's murrelets) – Candidate
Brachyramphus marmoratus (marbled murrelet) – Candidate
Contopus cooperi (olive-sided flycatcher) – Candidate
Enhydra lutris (northern sea otter) – Threatened
Eumetopias jubatus (Steller's sea lion) – Endangered
Gavia adamsii (yellow-billed loon) – Candidate
Polysticta stelleri (Steller's eider) – Threatened

The northern sea otter and the Steller's sea lion are two marine mammals listed on the federal threatened and endangered species list that reside in Katmai. Fortunately the Katmai coast experiences infrequent fire activity due to maritime weather patterns that dominate the region. These weather influences, coupled with few fire starts and the Limited Fire Management Options selected for the entire Coast (with the exception of the private land at Hallo Bay), result in little to no impact foreseen for these marine animal species. Steller's eiders occur in relatively high densities in Kamishak Bay (bordering KATM) in fall and winter. It is important to note that only breeding populations of Steller's eider are listed as federally threatened. These marine ducks have been observed in Katmai but no nesting sites have observed along the Katmai coast. Kittlitz's murrelets nest in unvegetated scree fields, coastal cliffs, on barren ground, rock ledges, and talas above timberline in coastal mountains. Nests have been confirmed at KATM. However, areas of fire management are vegetated and unsuitable for nesting murrelets.

National Heritage Program AK Rare Plant List

Aphragmus eschscholtzianus (Aleutian cress)
Primula tschuktschorum (Chukchi primrose)

These two plant species are categorized as rare and persist in the Mirror Lakes area northeast of Kukaklek Lake near the preserve boundary. These species occupy specific micro-sites. The Aleutian cress was found in a well-drained former snowmelt pond with large cobbles and the second in wet tundra and pond margins, often shallowly submerged. Because of site occupation, it is believed that fire in most years will not burn in these types of environments, thus posing little threat to these species except under the most severe drought circumstances when fire behavior supersedes normal activity.

Appendix D: Compliance for FMP

Consultation and Coordination

The following individuals were consulted in the preparation of this plan:

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Jim Gavin, Chief of Maintenance, Katmai National Park and Preserve
Chuck Gilbert, Chief, Land Resources Program Center, National Park Service, Alaska Region
Troy Hamon, Chief of Natural Resource Management and Research, Katmai National Park and Preserve
Neal Labrie, Chief Ranger, Katmai National Park and Preserve
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Whitney Rapp, Resource Management Specialist, Katmai National Park and Preserve
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See attached Environmental Assessment

Appendix F: Wildfire and Prescribed Fire/Fuels Treatment Monitoring Plan

I. INTRODUCTION / EXECUTIVE SUMMARY

1.1 Introduction

Katmai National Park (KATM) has established a program of fire management to achieve resource management objectives associated with the protection and stewardship of fire-adapted ecosystems. The purpose of fire and fuels monitoring program is to provide effective evaluation of the fire program management activities with respect to fuels, vegetation, wildlife habitat effects or additional identified objectives. The fire monitoring program is designed to determine whether fire and resource management objectives are being met, as well as to document any unexpected consequences of fire management activities. The monitoring program is intended to inform the staff about results of management activities so management can adapt to changing conditions using the best available information. In addition, the program strives to obtain baseline data on the natural variability of fire on the landscape and asses impacts of potential climate change on fire and fire effects.

The purpose of the Alaska NPS Fire Ecology program is to provide science based information to guide Alaska NPS fire and land management planning, decisions and practices in order to maintain and understand fire adapted ecosystems. The primary focus areas of the program are to:

1. Participates in planning activities for the Fire Management and Park Land Management Programs and develops strategies to accommodate fire management issues as a result of climate change

2. Provide effective evaluation of Alaska NPS fire management program activities and fire on the landscape through monitoring

3. Coordinate research and facilitate the use of scientific data, modeling and technology to enhance the fire management program

4. Provide fire ecology information and outreach to fire managers, other park staff, and the public

5. Collaborate with other NPS programs, interagency partners, and other entities.

One of the primary tasks of the Fire Ecology program is to develop and implement a comprehensive Fire and Fuels Monitoring program for Alaska's parks. The Regional Fire Ecologist is responsible for coordinating monitoring efforts and maintaining fire effects data. Currently the Alaska NPS Fire Ecology program does not have a funded fire effect monitoring crew. The fire monitoring work in other Alaska parks is usually accomplished by area program NPS Fire/Fuels seasonal technicians and staff, under the guidance of the Regional Fire Ecologist. There have been no recent fire effects or fuels monitoring completed in KATM by the NPS fire management staff.

This fire monitoring plan describes the framework that could be used to collect, manage, and evaluate fire effects information at KATM. As new information and research results are obtained, relevant changes to the monitoring program will be made. These changes may include new or alternative monitoring techniques, changes in treatment prescriptions, or refinement of management objectives.

1.2 Need for Monitoring and Study in Relation to Management

NPS Fire Ecology Program Policy is developed by the NPS Fire Ecology Steering Committee with approval from the NPS Fire Management Leadership Board. The information within this monitoring plan is consistent with information from RM-18 (USDI NPS 2008 http://www.nps.gov/fire/fire/fir_wil_planningandpolicy.cfm) and the NPS Fire Monitoring Handbook (USDI NPS 2003 http://www.nps.gov/fire/fire/fir_eco_mon_fmh.cfm).

Each Fire Management Area unit intending to either manage wildland fire for resource benefit or conduct prescribed fire must have an approved fire management plan. In order to evaluate resource management and fire management objectives, units must monitor the effects of fire. The Fire Monitoring Plan can be prepared independent of the Fire Management Plan and attached as an Appendix at a later time. Since Katmai manages wildland fires, may implement mechanical fuels reduction projects, and could potentially implement prescribed fire, this plan has been prepared.

1.3 History of Fire & Fuels Monitoring at Katmai National Park and Preserve

Prior to the 2002 establishment of the Alaska NPS Fire Ecology program, only one formal fire effects study has been completed in Katmai. This study is summarized below. The full protocol and complete methods are provided in Appendix F1.

Alaska NPS Fire Effects Paired Plots (1982-Present)

Background & Purpose: The only formal NPS fire effects study on Alaska parklands prior to 1999 was the Alaska Region NPS Fire Paired Plot study. The project began in 1981 under the direction of Gary Ahlstrand, NPS Alaska Regional Research Ecologist. The purpose of the project was to assess vegetation change and succession as a result of fire and to determine fire history. Fire staff established paired vegetation 15-m x 30-m plots in burned and representative unburned habitat adjacent to the burned areas of varying ages. Between 1981 and 1988, at least 525 plots were installed across 9 different parks in Alaska. Most of the plot locations were not permanently marked. A total of 14 plots were established in KATM during the summers of 1982/83. A complete list of the plots and coordinates are listed in Table 5-3 of Section 5.3 in the FMP. These plots provide valuable historic data on previous fires and fire effects in Katmai which can be used to compare vegetation succession in areas impacted by fire to those not impacted. The data is being used in other parks to develop fire succession models in order to update fuels and landcover vegetation maps for the fire management program.

Methods: Burned sites were identified and selected for the study from historic fire reports, 1:63,360 color infrared aerial photography, and aerial reconnaissance. Plot data that was collected included: photographic slides of plot, tree density by species and diameter size class on 15-m x 30-m quadrants, vegetation cover class for 30 Daubenmire frames (20 x 50 cm), tree cores/cookies, fuels and soils data (on some plots), and general plot site descriptions. Complete protocols and methodologies are described in Appendix F.3.

Data Management: Up until 2008 most of the data was only available in paper format, except for the vegetation cover data was in a TWINSPAN text format. Between 2003 and 2008, paired plot data for all the parks was entered into a Microsoft Access database, and plot locations were digitized off topographic maps and aerial photos. The Access database was converted to an interagency Fire Ecology sequel server database called FFI V1.02 through a contract with SEM in 2008. Original copies of data and photos are archived at the Alaska Regional Office. Scanned copies of data and photos are stored at the regional office and with the Regional Fire Ecologist in Fairbanks.

II. FIRE ECOLOGY AND FIRE HISTORY

2.1 Overview of Katmai National Park Fire Ecology

The boreal forests of Alaska are fire-adapted ecosystems, and are characterized by a mosaic of different aged landscapes that are maintained by fire. Within this system, burn severity strongly influences vegetation patterns and succession after fire. Since many of the plant species are rooted in the organic forest floor mat, the amount of consumption of the organic mat will determine whether vegetation regeneration occurs through seeding or re-sprouting post fire (Viereck 1983). For tree establishment, seed source and seedbed conditions at the microsite scale in the immediate post-disturbance period are major drivers of recruitment (Zasada et al. 1972, Johnstone and Chapin 2006). If fire severity is low to moderate, above-ground portions of plants may be top-killed, but minimal organic mat or duff is burned and regeneration can occur quickly through re-sprouting from roots and stems for species such as aspen, paper birch, Labrador tea, willow, resin birch, rose, fireweed, tussocks or northern blue joint grass (Viereck and Schandelmeier 1980; Foote 1983; Racine, Johnson, and Viereck 1987) . On the other hand, severe burns will consume most of the organic layer and may kill more of the underground root structure of shrubs and herbaceous plants, such that reproduction will occur more often by seed. As a result, severity will influence the plant species composition at a site.

Relatively few studies have documented the effects of fire and burn severity in shrubland ecosystems such as Alder and that are common in Katmai.

2.2 Historic Role of Fire

Climate, terrain, and vegetation strongly influence the occurrence and extent of fires within KATM. Fire plays a less significant role in coastal parks such as Katmai than it does in the Alaska Interior. Although the majority of the park does contain vegetation that is certainly capable of supporting fire, weather patterns on most years keep summers in the region wet and cool. This weather regime keeps convective storms infrequent and thus a low percentage of lightening ignitions occur (Figure 1). The lightning data shows an increase in lightning detected in the park in the last decade, but this may be attributed to improved lightning sensors that have been utilized since early 2000s. Fire occurrence, although rare, does exist as seen from historic fire data. In fact when weather parameters permit, the potential for large fire growth does exist within the park/preserve. The south-central boreal forests are subject to periodic fires.

Only 15 fires are reported in the NPS fire records for Katmai from 1950-2010, with a majority of these fires being human caused. A total of 1,337 acres have burned within and around the KATM park units over the last 60 years. From the current fire history the largest fire recorded in KATM was the 1284 acre W. Kamishak Bay fire in 2003. This fire was ignited in late April (human caused) and burned near the coast predominantly in Alder.

There is some evidence of large fires occurring in the early 1900s in the park and possibly some fires that may be missing in the last 60 year record of fires. In the mid-1980s the NPS FirePro crew worked on the fire history of KATM (part of the Paired Plot study) and developed a fire history map for the park. Figure 2 shows the legend of the map that indicates estimated years and acres for fires in Kamai. This map and fire documentation described a very large burn (~335,000 acre) located mostly north of Alagnak River and runs east to Iliamna Lake. They estimated the fire to have occurred around 1935 (Figure 2) and established paired burned and unburned plots in the portions that burned into the park in 1984. Lutz (1956) lists numerous old fires from Alaska and a 1935 “Iliamna Lake” fire that burned 1.9 million acres is recorded in this technical report. Additional research would be beneficial to determine the actual extent of this and other fires.

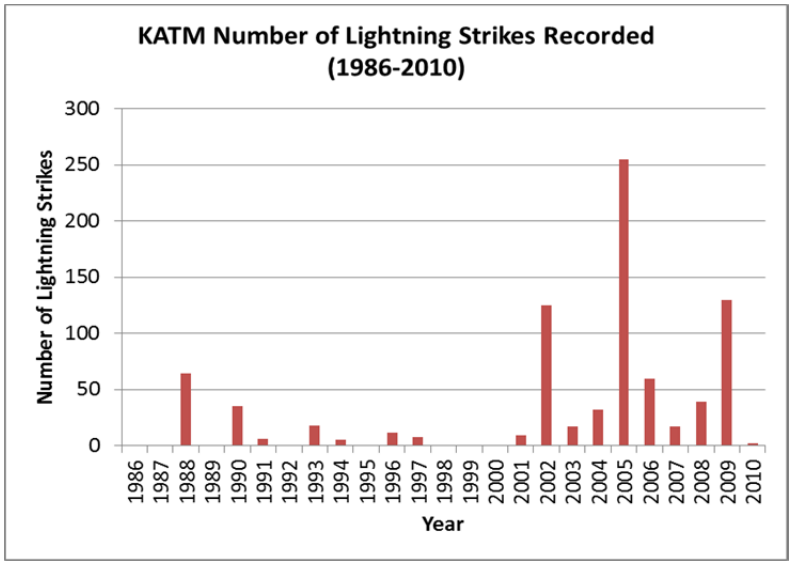

Figure 1: Number of lightning strikes detected in Katmai using AICC lightning data set.

KATMAI FIRE MAP

LACL FIRE PRO 1984

KATMAI FIRE NO.	FIRE NAME	APPROX. ACRES	YEAR	CAUSE	VEGETATION TYPE	PLOTS SAMPLED
1	FURES CABIN	9	~1920	MAN	closed white spruce-poplar-birch forest	1983 & 1984
2	ILIAMNA	335,000	~1935	?	white spruce-Ledum-Lichen woodland	1983
3	KING SALMON	23,500	~1945	?	wh. spruce woodland	1983
4	NONVIANUK	<½	1983	MAN	white spruce-birch forest	1983
5	KUKAKLEK	2	1957	LIGHTENING	ericaceous shrub-lichen tundra ?	NOT FOUND
6	KING SALMON	10	1958	MAN	ericaceous shrub-lichen tundra	1984
7	NAKNEK TOWER	0	1963	MAN	ericaceous shrub-lichen tundra ?	NOT FOUND
8	SUGARLOAF	5	1974	LIGHTENING	shrub lichen tundra or wh. spruce woodland ?	NOT FOUND
9	ILIAMNA	40,200	1957	LIGHTENING	white spruce woodland ?	NOT FOUND

Figure 2: Fire history legend from a map created by FirePro crew in 1984 for fires in KATM.

III. MANAGEMENT GOALS, OBJECTIVES, AND DESIRED CONDITIONS

3.1 Monitoring Program Goals and Objectives

The Fire Management program has developed comprehensive fire management plan for Katmai National Park. Within RM-18 it is stated that: “Fuels management activities and treatments must be monitored in order to assess

treatment effectiveness and to determine whether management objectives were met. Moreover, monitoring is the basis of a successful adaptive management program." Fire ecology program requirements are described in the Fire Ecology and Monitoring chapter in RM-18 (Ch. 8, USDI NPS 2008).

Fire Management Strategic Objectives

Whenever safely possible, Katmai National Park will utilize the role of fire in the natural environment in the fulfillment of NPS natural resource management directives. Accordingly, KATM will direct all fire management activities toward the accomplishment of the following strategic objectives (FMP Section 3.1.1):

1. Let fires burn except where property or people would be threatened. (GMP, 1986)

2. Maintain unimpaired the water habitat for all fish native to the Park/Preserve. (KATM, Foundation Statement)

3. Identify, protect, and perpetuate Katmai's outstanding wildlife, vegetation, water and volcanic features in their wilderness environments. (RMP, 1994)

4. Identify and afford protection to the Park and Preserve's fire-sensitive cultural resources. (RMP 1994)

5. Ensure that fire management activities conducted in designated or suitable Wilderness within Katmai conform to the basic purposes of wilderness. (DO-41)

Fire Ecology Monitoring Program Goals

The natural fire regime shapes many of these ecosystems on a landscape scale, therefore a better understanding of the effects of fire on the ecological community and its environment is necessary for detecting responses to environmental change and management decisions. In particular, an understanding of the ways in which plant systems are affected by fire should allow us to determine appropriate fire management options. This will allow us to more effectively and efficiently achieve our goals and hopefully add some understanding to the intricacies of these ecosystems, as a whole functioning unit in nature. Monitoring should help us answer the questions; How should management be executed? How should these systems be managed?

The overarching goals of the Fire Ecology Monitoring program are to:

1. Verify that fire management objectives are met.

2. Document long-term trends and natural level of variation in the frequency, extent, and severity of fires, monitor for impacts of climate change.

3. Monitor fire and mechanical fuels treatment effects including:

    a. effects of time since fire and burn severity or mechanical treatments on vegetation species composition, vegetation structure, and ground cover in varying vegetation types

    b. effects of time since fire and burn severity or mechanical treatment on soil parameters

    c. effects of time since fire on the abundance, distribution and composition of the wildlife populations (i.e. moose, caribou, small mammals, birds)?**

d. effects of time since fire on water quality and air quality? **

4. Document fire behavior information for wildfires or prescribed fires if feasible

5. Monitor fuel moisture of applicable fuel types

6. Facilitate the sharing of fire-related information with fire managers to promote science-based management decisions

**The effects on wildlife populations, water quality and air quality are factors that may not be directly monitored by the fire management program and could be shared responsibility with the Inventory & Monitoring Programs.

Objectives and desired conditions are continually being developed and redefined from knowledge of the past and present. The methodologies and objectives need to be updated periodically. Monitoring objectives and precision levels will vary depending on project objectives and vegetation type. Vegetation monitoring objectives are used to verify that objectives are met. Documenting post-fire effects will allow us to follow trends in plant communities, which will improve our knowledge and direct our future management actions.

3.2 Adaptive Management

As the monitoring results become available, they are used to determine if management objectives are achieved and to determine if management activities need to be adjusted. Also at this time, an assessment of whether the management objectives are still desired is warranted in light of ongoing monitoring results and any new information made available. In this adaptive way, we can be sure that the monitoring program will adequately assess the success of the fire management program. Any changes or additions will be included in future revisions of this fire monitoring plan.

3.3 Desired Conditions

In managing and restoring the ecological benefits of fire on the landscape, managers must understand the differences between current conditions and desired conditions. Managers must also understand the practices and environmental factors that contributed to the current conditions. Information used to develop the desired conditions includes research data (where available), historic photos and written documents, and expert opinion. Desired conditions must be periodically evaluated to determine whether they are still realistic and wanted in light of a changing environment. For example, desired conditions may be based on our knowledge of past long-term climate conditions; however, future climate changes may preclude achieving these targets.

It is important to recognize that further work is needed at KATM to better understand the interrelationships within natural systems. As this occurs, we may be able to refine these desired conditions – as part of adaptive management. This could be accomplished at the landscape or vegetation community scale and could be useful in developing ecological models and refining ecosystem priorities. Currently no Desired Conditions are developed for Katmai. The following interim fire and vegetation Desired Conditions are provided here as suggestions for KATM:

1. Fire processes in fire dependent/adapted vegetation communities will be managed to promote healthy and functional ecosystems. Vegetation succession reflects the natural range of variability under conditions that would occur under historical fire regimes.

2. The number of acres burned per year per Park Unit are within the range of natural variability (1950-2010)

3. The number of natural fire starts per year per Park Unit are within the range of natural variability (1950-2010)

4. Total duration (days) of fire incidents annually per Park Unit are within the range of natural variability (1950-2010). The count of days from the first fire discovered to the final fire declared out date.

IV. MONITORING DESIGN AND METHODOLOGY

The Katmai Fire Management Plan mandates that fuels treatments and management ignited prescribed fires must have measurable objectives. Consequently, pre- and post-fire and fuels treatment monitoring is necessary to determine if project objectives were met. The minimum required monitoring for wildfires on AK NPS lands includes the data necessary to fill out DOI required Wildland Fire Management Information (WFMI) fire reporting documentation (http://www.nifc.blm.gov/nsdu/fire_reporting/NPS/doc/NpsUserGuides.html). Currently there are no established fire monitoring projects in KATM or ALAG. In the event that either the park requests monitoring or begins fuels reduction projects the following section describes general sampling design, methods, frequency, and analysis for monitoring.

4.1 Design and Methodology

The national recommended standard for monitoring is the National Park Service, National Fire Monitoring Handbook (USDI 2003). However within the Fire Ecology and Monitoring chapter of RM-18 (USDI NPS 2008, Ch. 8), it is also stated that alternative monitoring protocols may be used to address local/regional needs and objectives. In addition, monitoring protocols can be developed at the park level, community level or project level. All alternative protocols need to be reviewed by the Regional Fire Ecologist.

In 2002, a Regional Fire Ecologist was hired for the Alaska Region parks. Since 2002, most of the fire effects monitoring project conducted in Alaska's parklands have been based on the Alaska NPS Fire Management Fire and Fuels Monitoring Program Field Method Protocol. The full protocol and methodologies recommended for fire and fuels monitoring plots in KATM are provided in Appendix F.2 of this document. The Paired Plot fire monitoring methods are also presented in Appendix F.3. The following is the general framework, timing and data management plan for monitoring.

4.2 Fire & Fuels Monitoring Framework

Fire and non-fire fuels treatment monitoring is an important part of adaptive management. Guidelines for monitoring wildland fires, prescribed fires and mechanical treatments within KATM were developed in consultation with the Interagency Alaska Fire Effects Task Group (FETG), NPS Fire Monitoring Handbook (FMH 2001), and the NPS Alaska Regional Fire Ecologist. These guidelines provide recommendations for minimum variables to monitor fire or treatment effects within a framework of three monitoring intensities (Level 1 – 3) and are shown in Table 1. Brief descriptions of the three monitoring levels are provided below:

Table 1: Monitoring level requirements and recommendations for Fire Management Activities

Management Activity	***Minimum Required* Monitoring Levels**	***Recommend* Monitoring Levels**
Wildfire	Levels 1 *Burn Severity	Levels 1, 2, 3, *Burn Severity
Prescribed Fire	Levels 1, 2, 3, *Burn Severity	Levels 1, 2, 3, *Burn Severity
Non-Fire Treatments	Level 1	Levels 1, 2, 3

*Burn Severity should be requested for all fires > 500 acres on NPS lands (RM 18, Chapter 8, 4.3)

Level 1, Surveillance Monitoring - This level provides a basic overview of the baseline data that is required to be collected for all wildland or prescribed fires, some variables are required for mechanical treatments. Information at this level includes such items as Remote Automatic Weather Station (RAWS) weather data, general description of the fire environment (i.e. topography and fuel types), and fire location or perimeter. Information collected at this level precludes the necessity for on the ground measurements and can be done from remote sensing or an aerial platform. This data is necessary to satisfactorily complete a Wildland Fire Report.

Level 2, Moderate Intensity Monitoring - This level of monitoring documents fire behavior observations (not addressed in this document), fuels, and general effects of wildland fires, prescribed fires or mechanical treatments on vegetation. Information at this level includes characteristics of the fire, such as rate of spread, fire behavior, and burn severity, as well as current weather conditions. Fuel conditions would be assessed by determining the fuels array, composition, and dominant vegetation within the burn area, in addition to using vegetation and fuels maps to predict potential fire spread. Information to assess pre and post fire or treatment effects would include duff depth and moisture measurements, photo points, vegetation cover, and tree parameters. This level of monitoring is recommended for the use of wildland fire and prescribed fires, but is dependent on the objectives of the burn and the resources of concern. Some of the variables monitored at this level would require on the ground measurements of specific sites.

Level 3, Comprehensive Monitoring (Short or Long-term Fire Effects) – This level would be used to monitor the effects of prescribed or wildland fires in greater depth, it may also be used for mechanical treatments. Level 3 monitoring requires collecting information on fuel reduction, vegetative changes, and soil parameter changes. This level of monitoring may also include wildlife utilization techniques. The number of variables monitored increases and the techniques are more rigorous. Information collected at this level is based upon management objectives and the resources of concern. Variables monitored at this level would require the establishment of ground based plots.

Fire and mechanical treatment monitoring should be designed to meet the objectives of each project and therefore the components of monitoring should be developed based on the project objectives.

Wildfire Monitoring

The minimum required monitoring for wildfires on AK NPS lands includes the data necessary to fill out DOI required Wildland Fire Management Information (WFMI) fire reporting documentation (http://www.nifc.blm.gov/nsdu/fire_reporting/NPS/doc/NpsUserGuides.html).

This includes documentation of information such as the fire origin, fire start and end dates, fuels, weather, final fire size (acres), and suppression actions. Currently, remotely sensed burn severity data using dNBR

(differenced Normalized Burn Ratio) is required for all wildfires and prescribed fires exceeding 500 acres on National Park Service lands (RM-18, USDI NPS 2008 Chapter 8). A description of burn severity mapping and monitoring is provided in the Fire & Fuels Monitoring Plan in Appendix F. Fire effects plots may be established if Fire Management, Resource Management or other needs are identified for specific fires. The AKR Fire and Fuels Monitoring Protocol is recommended for monitoring wildfire effects (Appendix F).

Prescribed Fire Monitoring

All prescribed fires that are implemented in KATM are required to have a monitoring plan that addresses the objectives of the prescribed fire. Not all prescribed fires need to be monitored, if representative fuel types are being monitored with similar prescription and fuels. All prescribed fires >500 acres are required to have a burn severity assessment map.

Non-Fire Fuels Treatment Monitoring

Mechanically treating fuels has recently become an important part of reducing fuel densities and reducing overall threats associated with wildland fires. A fuels treatment plan should be prepared for each project and include the following components. This plan includes a description or purpose of the project in an executive summary. A detailed description of the fuels to be treated is discussed. The area is identified with a project map listing the goals and objectives of the project. Project costs are calculated and summarized in the plan. The plan addresses the protection of sensitive features, safety of the personnel and the public, interagency coordination, public involvement, a monitoring plan, and post project rehabilitation issues. The main body of the plan addresses the statement of work to be done and specifications for treatments. These specifications address plant species by diameter and percent of stand for treatment. The monitoring section of the plan contains information on documenting and collecting photo point information and addresses other techniques or methods used to monitor the effectiveness of mechanically treating the vegetation.

Minimum Recommendations for Non-Fire Treatment Monitoring:

1. Describe treatment objectives and methods
2. Document location, size, and data of treatment
3. Photo points or video documentation

4.3 Monitoring Basics – Frequency, Timing, Locations (GPS/GIS)

Established plots will be re-measured following the protocols documented in Alaska NPS Fire Management Program Fuels Treatment Monitoring Program Field Method Protocol (Appendix F.3). It is recommended that variations on the Field Method Protocol are applied to meet specific project objectives.

Frequency of Monitoring - Plots will be sampled pre-treatment, post-treatment, and in subsequent years on a time schedule determined based on project objectives.

Timing - Monitoring will be done from June through August, with peak plant phenology occurring during these summer months. When possible the same month will be used each year for the sampling of the fire effects monitoring plots. For the sake of continuity and statistical validity, plot re-reads should follow the pre-treatment established monitoring protocol. New plot installations should precede treatment occurrence or application. Plot re-reads should be conducted within one year of treatment application and at time intervals deemed fit to

meet project objectives. For prescribed fires, immediate post fire reads will be done within one month of the completion of the burn or at the earliest possible time thereafter.

Location - Global Positioning System (GPS) will be used to record all plots. In the event a GPS reading cannot be sampled at the time the plot is sampled, attempts will be made in later years or sample periods to obtain this data. Data will be processed and archived by the Fire Ecology program. General GPS data will be maintained on computers in the Fire Management Office for use in making maps and in ArcGIS projects. Directions for plots will be recorded on forms. For detailed information on how to record plot location refer to Appendix F.3.

V. PROGRAM MANAGEMENT

5.1 Information Management

Data will be entered, checked for errors, and managed by the Fire Ecology Program staff and supervised by the Fire Ecologist. Original copies of all data will be kept by the Fire Ecology Program office and disseminated as requested. Reporting fire effects information serves a number of purposes. Program status and results will be recorded in an annual report and reported in the spring of the year for the previous fiscal year. The annual report is flexible and is geared towards the needs of the park. The annual report includes a summary of monitoring activities from the year, results from data analysis, and discussion on objectives. In addition to these written annual reports, presentations are to be made to park staff. These presentations allow for open discussions of the program and the results. In addition to the reports and staff presentations, articles may be submitted to the fire ecology and fire management newsletters, scientific journals, and "popular" publications. Communication is not limited to written reports and articles, but should include utilization of intranet and internet web sites, and oral presentations. Fire ecologists should work with NPS Fire Communication and Education staff to assist with communication results and success stories.

1. Communicating results to park resource staff for adaptive management
2. Presenting accountability to regional and national offices
3. Communicating results to scientific community
4. Presenting success stories to NPS staff, interagency community, NGO's and general public

5.2 Data Management and Analysis

The national database, FEAT-FIREMON Integrated (FFI) software provides the digital computer database tool where the fire effects monitoring data is entered, stored, and to some degree analyzed. These databases are maintained at the Fairbanks Administrative Center as part of the Alaska Regional Fire Ecology program.

Data collection will be directed by the fire ecologist and or assistant fire ecologist. Data collection will follow standard operating procedures of data collection following Alaska NPS Fire and Fuels Monitoring protocols. Other data management will include computer data entry, quality control checks, filing of raw data; development, labeling, and filing of slide film and/or digital copies on disc or compact disc. All data will be entered, corrected, and analyzed at the end of the year and will be formally reported with copies of the report and backed up data sent to the regional office.

Data entry and analysis will be done using the national database FFI, and ARC/INFO GIS mapping software. Database files will be stored in the Fire Ecology program office on the Fire Ecology computers and backed up on the NPS Fairbanks Administrative Center computer network and compact discs. These backups are zipped

database files for each area. Backups are done either daily or weekly depending on the work load, status of the crew, and crews assigned work. The NPS Fairbanks Administrative Center computer network backs up files. The master copy of all data files will be maintained in the Fire Management Office. Annual reports are reviewed with Resource Management staffs and each area receives a copy of the Alaska Regional Fire Ecology program annual report. Copies of all data and data summaries will be shared upon request. All plot locations will be geologically referenced using GPS receivers.

Through the collection and analysis of the data we will be able to compare our results with other fire effects studies in similar vegetation types that have been conducted. The data will initially be analyzed using the FFI software. Once the data has been analyzed a statistician may be consulted to assist with determining if the data is skewed and normally distributed. Other statistical programs will be used in analyzing the data.

5.3 Management Implications of Monitoring Results

Monitoring results will be reviewed by the Regional Fire Ecologist. Data collected in this program will be used to evaluate whether fire management program goals and objectives are being met. The Fire Ecologist, in consultation with the Regional Fire Management Officer and KATM Resource Management Staff, will determine if the results of fuels treatments or planned fire management activities are on target. Acceptable results include meeting the monitoring objectives stated within the specific prescribed fire, mechanical treatment or monitoring plans. If monitoring results show deviations from desired vegetation conditions, or if resource needs change, the group will determine changes necessary for future activities.

When data is collected for fire related studies, presentations or reports will presented to the park and fire management staff to inform staff of findings. Possible items would include evaluating program objectives to see if they were achieved, any observable trends, areas of concern, and needed assistance or further study and research. This presentation will be open to the entire park staff but its main audience will be the Fire and Resource Management staffs. Following each program evaluation, a summary will be prepared, including any changes that need to be made along with what procedures were successful and those that were not. If the data shows that objectives are not being met, alternatives will be considered, including modification of prescriptions or objectives, or to provide for research.

5.4 Responsible Party – Staffing Roles and Responsibilities

This plan will be prepared by the Alaska Regional Fire Ecologist. The Alaska Regional Fire Management Officer and the KATM Chief of Resource Management will provide review. This plan will be ready for approval by the KATM Superintendent after these reviews. Identified Fire and Resource Management Personnel will participate in projects, develop specific fire and resource objectives, and review projects and objectives following completion of the project. The Fire Monitoring Plan may be reviewed and updated annually, as part of the annual review of the Fire Management Plan.

VI. RESEARCH

Implementation of this fire management plan is not contingent upon the completion of research. A limited body of scientific information exists regarding effects of fire and fire regimes for the Western Arctic National Parklands. Information regarding primary and secondary fire effects in most ecosystems of KATM is incomplete. A summary of fire research and monitoring are listed below, as new information becomes available fire-related resource management objectives can be refined in an adaptive management style.

6.1 Fire Research Needs in KATM

Opportunities will be taken to coordinate and work with NPS staff, Fire Management Staff, and Southwest Alaska Network Inventory and Monitoring Program to identify and encourage fire related research within the park. As research needs are identified, funding will be sought so studies may be undertaken. Fire research has limited funding within the NPS. If it is determined, however, that significant information is needed concerning the effects of fire, park managers may submit proposals through the NPS Fire Research Funding call. Opportunities exist for making requests for research funding through the Joint Fire Science Program. Other opportunities exist under the (CESU) Cooperative Ecosystem Study Units (CESU 2004) and National Park Service requests (Fee Demonstration Program, Project Management Information System (PMIS), and Natural Resource Challenge). The following list provides fire research and monitoring needs currently identified for Katmai National Park by the regional fire ecologist:

1. Determine fire effects at KATM through the establishment of vegetation and/or soils plots in past burned areas or during on-going fires.

2. Determine the impacts of potential climate change on fuels, fire risk, and impacts on insect outbreaks such as spruce bark beetle.

3. Assess the risk of fire and fire behavior in relation to insect outbreaks and climate change.

4. Determine historic fire regime in KATM, utilizing dendrochronology or lake core methods. Map and determine pre-1940 fire history.

Appendix F.1. Fire and Fuels Circular Plot Monitoring Protocol

Alaska NPS

Fire Management Program

Fire Ecology Program

Fire and Fuels Circular Plot Monitoring Protocol

Jennifer L. Barnes & Jennifer S. McMillan
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(Version December 2011)

Overview

The Alaska NPS Fire and Fuels Monitoring Protocol was established as a guideline for establishing fire and fuels treatment (i.e. hazard fuels reduction treatments) monitoring projects within Alaska National Park Service lands. The purpose of the Fire and Fuels Monitoring Protocol is to provide a standardized approach to monitor the effects of wildfire and prescribed fire as well as fuels thinning projects implemented by NPS fire management. The overarching purpose of the NPS studies which employ the Fire and Fuels Protocol is to provide scientific based information to guide Alaska NPS fire and land management planning, decisions and practices to maintain and understand fire adapted ecosystems. Monitoring can be used to document changes as a result of fire, implementation of treatments, or effects associated with long-term climate change or fire management activities. This protocol is a NPS specific modification of the field-tested methods created by the Alaska Interagency Fire Effects Task Group (FETG) and compiled in the Fire Effects Monitoring Protocol (Alaska FETG 2007). All or any combination of the protocol methods (i.e. point intercept, tree density, tree measurements etc.) maybe be used, depending on the objectives of the project.

This document provides instruction and datasheets for utilizing a circular plot layout. A separate set of instructions have been developed for belt transect plot shape and can be found in the following document: AKR Fire and Fuels Monitoring Protocol Belt Transect 2011 Final.docx.

Instructions for Project-Level Application of Fire Ecology Monitoring Plan

This document provides protocol methods, instructions and data sheets for fuels and vegetation sampling in fire and fuels treatment areas. For specific project level monitoring plans, a document should be prepared that provides the following descriptions of the planned project and monitoring:

1. Project Background & Purpose
2. Project Area Description (general vegetation, treatment area)
3. Treatment Goals & Objectives
4. Monitoring Objectives
5. Plot Selection Methods
6. Map and/or table of plot location coordinates
7. Sampling Schedule
8. List of protocols selected for monitoring, with reference to this document for methodologies. Note any alterations to standard methodologies.
9. Data entry and data management

Descriptions and recommended methods for the above listed sections for a project level monitoring plan are provided below. Overview of methods and detailed methodology instructions for individual monitoring protocols are provided in Section 2 and 3 of this document.

Monitoring Goals & Objectives

Studies which utilize the Fire and Fuels Protocol may be implemented to meet one or more of the following goals:

1. Verify that fire management objectives are met.

2. Document long-term trends and natural level of variation in the frequency, extent, and severity of fires, monitor for impacts of climate change.

3. Monitor fire and mechanical fuels treatment effects including:

    a. effects of time since fire and burn severity or mechanical treatments on vegetation species composition, vegetation structure, and ground cover in varying vegetation types
    b. effects of time since fire and burn severity or mechanical treatment on soil parameters
    c. effects of time since fire on wildlife habitat

4. Document fuels information for fire behavior modeling

5. Monitor fuel moisture of applicable fuel types

Purpose

This protocol may be used in full. Alternatively a subset of individual methods may be selected in order to meet the specific monitoring objectives of a project. The protocol may be used for the following purposes:

Wildfire effects protocol application: The Fire and Fuels Monitoring Circular Plot Protocol may be utilized to monitor wildfire effects. Project objectives may be met by establishing vegetation/soil plots in front of active fires and evaluating them prior to, during and after fire treatments.

Hazard fuels reduction protocol application: The Fire and Fuels Monitoring Circular Plot Protocol may be utilized to monitor hazard fuels reduction treatment effects. Project objectives may be met by establishing vegetation/soil plots prior to hazard fuels reduction treatments and evaluating them before and after hazard fuels treatments.

Prescribed fire effects protocol application: The Fire and Fuels Monitoring Circular Plot Protocol may be utilized to monitor prescribed fire treatment effects.

Plot Selection/Location

Wildland Fire Plots

Locations of pre- and post-fire plots are usually randomly established but a number of plot selection methods are utilized. Two examples of methods used for wildfire pre- and post-fire plot location selection are:

Transect Method - Using the fire perimeter map draw transects parallel to the head of the fire, flank of the fire, and rear of the fire. Mark 6 points that fit equally along the project transect. For instance, if the transect is 1-mile long, put a point every 1/6th of a mile. Fly or walk the transect and determine if the points are in a vegetation type that should be sampled, if not fly or walk to the next point.

GIS Method - In Arc Map use the buffer tool to create a buffer around the current fire perimeter of a distance safe for sampling based on the fire rate of spread. Use the Arc Toolbox random point generator (also available in Alaska Pak tools) to create points within the buffered polygon; select a minimum spacing of 500 m between points.

Hazard Fuels Plots

Monitoring plots will be usually be randomly established within the treatment zones as well as control areas immediately adjacent to the treatment areas in stands representative of the pre-treatment forest. GIS layers of the treatment and control areas are utilized to select plot locations. For the control area, a 200-m buffer around the thinning unit is created using ArcGIS. A GIS random point generator and manual manipulation to spread plot distribution is used to establish plots in the treated areas and control area. Plots that fall within parking areas or other built features are not utilized.

Plot Naming Convention:

The plot names should follow this naming convention: PARK- PPP-LOCATION-###, where the first four letters (PARK) is the park identifier (i.e. DENA, YUCH), the next letters (PPP) are the project identifier, and the third letters (LOCATION) are the location of the plots, such as the fire number or treatment site (e.g. A503 or Headquarters HQ), and the last three are plot identifiers. For wildland fire plots the project could be: WF (wildfire) or a project identifier such as VDM (video-moose). For hazard fuels treatment plots the project identifier will be: HZF (hazard fuels). For prescribed fires the project type should be RX. The plot identifiers are numerical as established. Examples of plot identifiers: DENA-WF-A503-003 and WRST-HZF-HQ-C-03.

Method Overview:

The following section is a quick reference of methods for each protocol. Full methods are described in the following sections. A complete plot with all protocols can be laid out and read by an experienced crew in less than 2 hours. All or any combination of the protocol methods (i.e. point intercept, tree density, tree measurements etc.) maybe be used, depending on the objectives of the monitoring project.

For simplicity, the myriad of options for modifying and customizing monitoring protocols or plot sizes, levels of monitoring intensity, deciding on the number of plots to use, placement of plots, other variables to include, etc. are not discussed here. It is recommended the user consult many other excellent references on setting up a monitoring study, including Measuring and Monitoring Plant Populations (Elzinga et al. 1998) or the NPS Fire Monitoring Handbook (NPS 2003). Data can be entered into the National Fire Effects Database program FFI (FEAT FIREMON Integrated). Refer to the "FFI Data Entry Instructions for NPS Alaska Manual" (Mitchell and Barnes 2009) for specific data entry protocols.
The following section provides an overview of the AK Fire and Fuels Monitoring Program Method Protocol.

A. PLOT LAYOUT (See Figure 1.)

1. Set up an 8-m radius (16-m diameter) circular plot based on a center-point coordinate.

2. Plot azimuth will North-up so 16-m end of transect is due north of plot center and 0-m end of transect is due south of center-point.

3. Lay out a 16-m transect (for point intercept and location of seedling and shrub density subplots). Pull the 0-m end of measuring tape due south 8-m, the center point should be at 8-m on the tape. Then pull the end of the tape in a 16-m straight line to the North (record declination used) and use a chaining pin to stake the 16-m end of the transect. Keep the tape as low to the ground as possible.

4. If a permanent plot, mark the center-point of the circular plot with non-burnable marker (e.g. rebar, conduit, metal monument). If re-visits planned then recommend staking both the 0-m and 16-m transect ends and the 8-m center point of the transect with wooden lathe.

5. Mark each end with flagging and GPS a point at the plot center-point.

B. SITE DESCRIPTION (*SITE DESCRIPTION* datasheet)

1. General plot description, direction to plots
2. Lat/Long, datum, error
3. General vegetation class for 8-m radius area
4. Take horizontal and vertical photographs of each cardinal direction (N, S, E, W) from the circular plot center-point.

C. GENERAL VEGETATION (*GENERAL VEGETATION* datasheet)

1. Record estimates of vegetation and substrate % cover for 8-m radius plot area (regardless of tree density circular plot size).
2. Record height estimates for tree, tall shrub and low shrub species.

D. VEGETATION COVER (*VEGETATION POINT INTERCEPT* Datasheet)

1. Point intercept along 16-m transects (32 points, every 0.5-m along 16-m baseline). Use a bike flag or other narrow pole for recording point intercepts "hits". Take points on right side of tape while walking on the left side of tape.
2. Record all trees, shrubs, herbaceous species, include substrate or groundcover that are located at each point along the transect ("hits").

E. TREE DENSITIES (*TREE DENSITY TALLY* Datasheet)

1. In less densely forested stands, tally all trees > 4.5' (1.37 m) tall located within 8-m radius plot area if there are <15 trees within a 4-m radius subplot area. In more dense forested stands (if there are >15 trees in the 4-m radius subplot area) tally all trees located within a 4-m radius subplot.
2. Within 8-m or 4-m radius circular plots tally trees >4.5' (1.37 m) tall by species and diameter size class: (< 5 cm, 5.1-10 cm, 10.1-15 cm, 15.1-23 cm, >23 cm), status (Live/Dead).
3. Tally small trees (<4.5' tall) in 3 1-m radius subplots centered at 4-m, 8-m and 12-m marks along center-line (total "seedling" area of 9.42 m2 or .0048 ac).

F. TREE MEASUREMENTS (*TREE MEASUREMENT* Datasheet)

1. For two trees of each species and diameter size class record diameter (DBH), height, crown base height (CBH), ladder fuel heights, and crown radius.

2. Choose trees located closest to plot center-point and within 4- or 8-m radius plot.

3. For needleleaf trees record all tree measurements. For deciduous trees record only DBH and height measurements.

G. ACTIVE LAYER & SOILS (*ACTIVE LAYER/SOILS* Datasheet)

1. Every 2-m beginning at 2-m mark (8 total points) record:

    a. Active layer depth to active layer boundary (rock, ice or seasonal frost).

    b. Surface fuel code for the top layer of ground cover (live moss, dead moss, upper duff, lower duff, mineral soil)

2. Record soil moisture (%), soil temperature (°C) and pH of soils at the 4-m, 8-m and 12-m points along transect.

H. BURN SEVERITY & DUFF CONSUMPTION (*BURN SEVERITY/DUFF CONSUMPTION* Datasheet)

1. Post-burn: Record micro-site (point) burn severity, using the FMH method which identifies 5 levels of severity provides corresponding codes for substrate and vegetation. Record severity every 2-m beginning at 2-m mark, for 8 total points.

2. If plots are established pre-fire, duff consumption pins (pre-burn) can be placed every 2-m, for a total of 8 points (co-located with FMH burn severity index points).

3. Assess CBI (Composite Burn Index) for overall burn severity score of plots, and for comparison to remote-sensed burn severity (dNBR differenced normalized burn ratio) using methodology described in FIREMON (Key and Benson 2006).

I. DUFF THICKNESS & FUEL MOISTURE (*DOWN WOODY DEBRIS & DUFF THICKNESS* and *FUEL MOISTURE* Datasheets*)*

1. Record forest floor surface material (live moss, dead moss, upper and lower duff layers) depths at two places offset ~1-m from the transect in locations representative of the forest floor along the transect.

2. Collect duff plugs for determination of fuel moisture.

J. DOWN WOODY FUEL LOADING (*DOWN WOODY DEBRIS & DUFF THICKNESS* Datasheet)

1. Brown's transect extends length of 16-m transect: 0-ft to 6-ft for 1-hr and 10-hr fuels; 0-ft to 12-ft for 100-hr fuels, and 0-ft to 52.5-ft for 1000-hr fuels (1.8-m, 3.66-m, and 16-m).

2. Record litter and duff layer thickness at each end of the 16-m transect (off-set 1-m)

3. If quantitative fuel loading is needed, place additional Brown's transects at 120° and 240° from origin and mark ends with pin flag.

K. SHRUBS (*SHRUB DENSITY* and *MOOSE BROWSE ARCHITECTURE* Datasheets)

1. Measure shrub density by tallying all shrubs within 8-m radius circular plot. If shrub density is greater than 15 individuals (defined as clusters of stems within 10-cm of one another) then tally shrubs in three 1-m radius subplots located at 4-m, 8-m and 12-m along 16-m transect. Record individuals by species and life status. Record average height by species.

2. Record evidence and degree of moose browse for two shrub individuals of each browse species located within the 8-radius circular plot. Select individuals located closest to the circular plot center-point.

L. INVASIVE PLANTS *(ALASKA EXOTIC PLANT MANAGEMENT TEAM [EPMT]* Datasheet)

1. Record observations of invasive plants in monitoring project areas to get a rough idea of presence, location, cover, phenology, and how long it would take to remove invasive plant species from given area.

2. Copies of datasheets should be brought on monitoring projects so that any observed invasive species can be recorded and reported to the NPS Alaska EPMT team.

Method Detailed:

Plot Layout

Standard plot configuration is depicted in Figure 1. An 8-m radius circular plot will be laid out based on a center-point coordinate. If any of the following methodologies (shrub density, seedling density, point intercept, fuel loading, active layer depth, or soil measurements) are utilized in the monitoring project then lay out a 16-m transect. Lay out transect by staking the center point of the plot. Setup a 16-m transect by pulling the 0-m end of a 30-m measuring tape with a chaining pin due south 8-m, the center point should be at 8-m on the tape. Then pull the end of the tape in a 16-m straight line to the North (record declination used) and use a chaining pin to stake the 16-m end of the transect. For permanent plots, drive markers (e.g. spray-painted 2.5-ft conduit or rebar, metal monuments) into the ground at the plot center-point. If re-visits are planned then it is recommended that both the 0-m and 16-m transect ends and the 8-m center point of the transect are staked with wooden lathe for easy re-location. Mark plots with flagging for easy spotting in aerial photo or where needed. When laying out plot avoid walking or trampling on the right side of the transect where vegetation data is collected. For all plots record the coordinates of the transect center-point. Set the GPS to take an average of 20 or more points and record the accuracy in the "Error" field on the SITE DESCRIPTION datasheet. Also record waypoint numbers or names. NAD-83 Datum will be used in the GPS receivers (standard for DOI agencies).

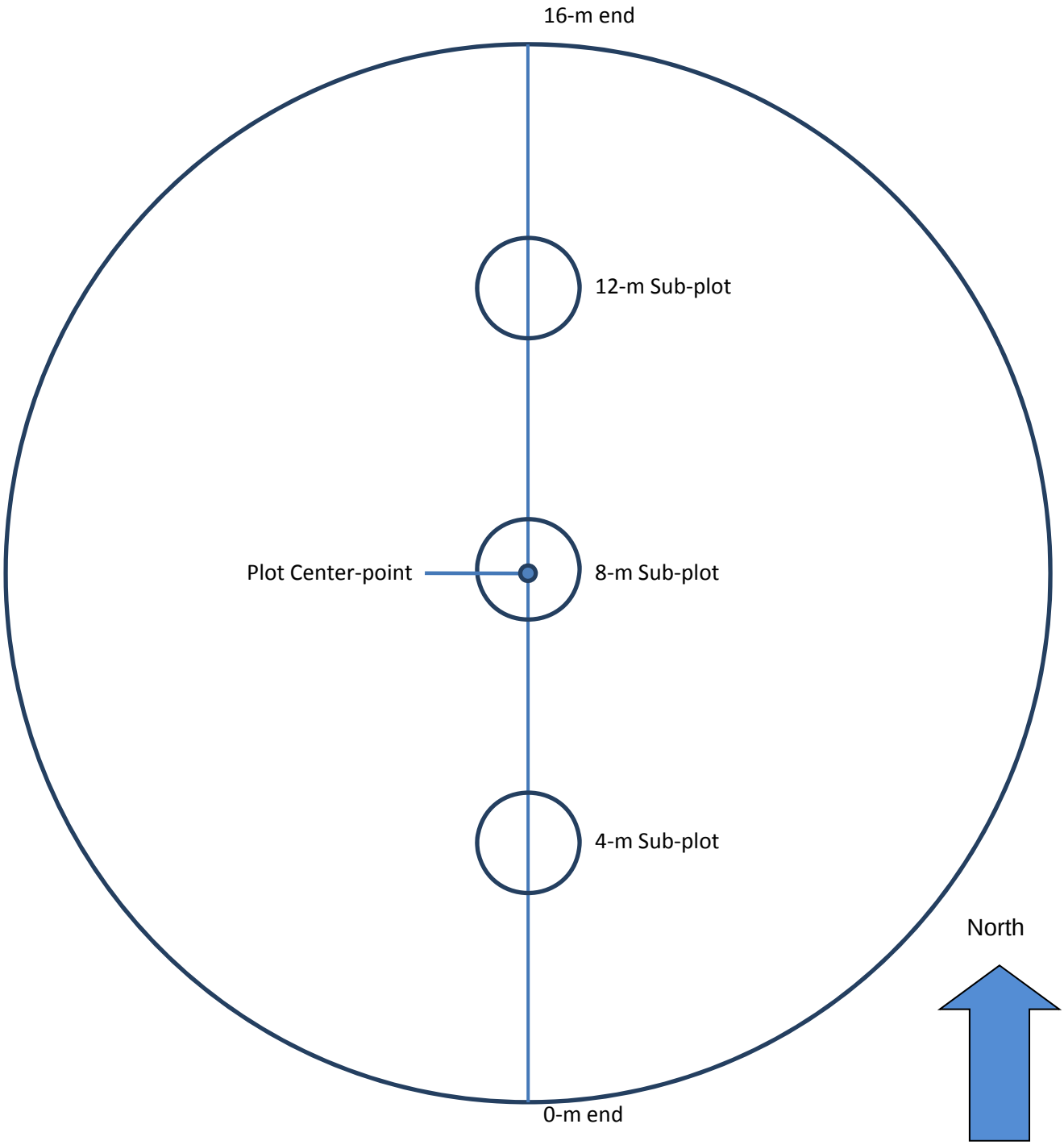

Figure 1. 8-m radius circular plot layout.

Photographs

A minimum of nine photos are taken for each plot. Two photos (one horizontal and one vertical) in each cardinal direction (N, E, S, W) are taken from the center-point of the circular plot. An additional photo is taken of the ground at the circular plot center-point. The ground photo should include the plot marker but does not require a photo board. For all photos except ground photos, label a dry-erase board with the park-project-location-plot ID (i.e. YUCH-PPF-A324-02), sample date, transect azimuth (direction facing) and designate as CP (center point) to N, CP to S, etc. Hold the board to the edge of the photo view within the 1.5 - 2 m of the photographer. Hold the camera at a fixed height of 5 ft above the ground. Record photo times on the Plot Description datasheet. Aerial photos should be taken of the plot where possible and applicable.

Site Description

General site information is recorded for each plot on the *SITE DESCRIPTION* Datasheet. Additional plot location descriptions, diagrams of plots, and additional notes are written on the back of the *SITE DESCRIPTION* datasheet. More detailed information on the datasheet fields is provided below:

Section: General Site Description

1. **Unit** – land unit identifier (NPS - four letter park acronym, e.g. Yukon-Charley NPPr is YUCH) or land unit name (i.e. Steese White Mountains)

2. **Project** – description of project: PPF (pre/post fire), CBI (burn severity), HZF (for hazard fuels), PP (paired plots). Also include an identifier for the area, such as a fire name or cabin name.

3. **Plot ID** – identifier for the plot within the project. Best to name plot with descriptor which includes park unit, project name, plot unique identifier. For pre/post wildfire monitoring plots, use the park unit name, fire number and sequential numbering 01 through x.

4. **Date** – sample date

5. **Field Crew** – names of all crew members

6. **Plot Markers** – type of marker used to mark plot (wooden lathe, metal monument, flagging etc)

7. **Transect Azimuth** – record the azimuth of the transect facing from the zero end to the 16-m end, recorded in True North (declination set).

8. **Plot dimensions**- plot radius, record units

9. **Slope** –% slope of the site, use clinometer

10. **Aspect** – slope aspect (facing downhill). Record azimuth (degrees) based on true north compass setting.

11. **Declination used** – record declination setting (degrees) on your compass. For initial plot visit, base declination on declination information provided in GPS. For future reading use the declination used in previous visits.

12. **Elevation** – record elevation at center-point of circular plot (in feet or meters, record units) from GPS.

13. **Soil** – record estimate of soil drainage (wet, moist, or dry). Wet soils must have some visible evidence of water, dry soils must be without moisture entirely (e.g. dry sand). The vast majority of soils will be categorized as moist.

14. **Disturbance** – general note of disturbance to plot and general area (provide more detail including estimated disturbance date in notes where applicable).

15. **Fire Indicators** – record visible evidence of fire (provide more detail in notes where applicable).

16. **Estimated time since fire** – where fire indicators are noted provide rough estimate of years since plot area burned.

Section: Treatment/Fire Description

1. **Plot Type** – indicate whether a plot is a wildfire, hazard fuels (thinning), prescribed fire (RX) or control plot.

2. **Thinning Treatment Phase** – pre-thinning, post-thinning and time since thinning date. Maintenance thinning if second thinning treatment has been implemented.

3. **Treatment Year** – record the year of the thinning or hazard fuels reduction occurred

4. **Fire Number and Fire Name** – prescribed or wildfire fire name and number

5. **Fire Year -** date of prescribed or wildfire fire (year)

6. **Pre or Post yrs** – time since wildfire or prescribed fire (years or months). Indicate if pre-fire.

Section: Latitude/Longitude

1. **GPS Type** – type of GPS used to collect location information (e.g. Garmin 76CSx Map)

2. **GPS Identification** –GPS unit identifier (person's name or unit number

3. **GPS Datum** – GPS datum used; NAD-83 (essentially same as WGS-84)

4. **Description** – description of where coordinates recorded (e.g. center-point of circular plot, LZ for the plot or other pertinent coordinates).

5. **Waypoint number/name**– waypoint identifier recorded in GPS. Best to re-name the points to indicate plot and where recorded (usually transect centerpoint). Example of waypoint name: 362-03-CP (fire number: 362, plot number: 03, location: CP (center-point) taken at the circular plot center-point).

6. **Latitude/Longitude** – use GPS (recommended: Garmin 76CSx Map or Trimble) to record coordinates in decimal degrees (e.g. Latitude: N65.634891°, Longitude: W142.982340°)

7. **GPS Error** – before saving the coordinate allow the GPS to average for a minimum of 20 points. Record the error and units (m or ft).

8. **Photo number, time and camera** – description of photos taken, photo time (from camera) and camera used.

Section: Vegetation Class

1. **Vegetation Class** - for the 8-m radius circular plot area use the Alaska Vegetation Classification (Viereck 1992), determine the current vegetation class and pre-disturbance vegetation class (if possible). Describe to Viereck Level IV of V (where possible).

2. **Vegetation Dominant Species** - record the dominant species in the 8-m radius circular plot area (particularly if not using the Point Intercept or General Vegetation datasheets). Skip if General Vegetation datasheet used at plot.

3. **Plot Layout and General Notes** – use back of page to describe how to get to site, landing zones, disturbance, habitat use and any other pertinent observations. Draw maps, diagrams and sketches where applicable.

General Vegetation and Ground Cover

Ocular Vegetation Cover Estimation – on the *GENERAL VEGETATION* datasheet record ocular estimates of vegetation and substrate % cover for vegetation and ground cover within the 8-m radius plot area (regardless of tree density circular plot size). The cover classes are defined in 10% increments (e.g. 1-10%, 10-20%....90-100%). Estimate the cover of each species or substrate and check the appropriate box on the datasheet. Due to overlapping components of the canopy cover, total cover can equal more than 100%. Use species scientific names where possible, use first two letters of the genus and the species (see *Species Codes* section below) (USDA NRCS 2011, http://plants.usda.gov/). Additional species can be added on the second page or by crossing out pre-written species. Estimate average plant heights in meters for all trees, tall shrubs and low shrubs. On the datasheet, species are listed by forest canopy layer as described below:

Tree Layer – estimate the percent cover of each tree species. At all plots indicate average tree height (m). If Tree Density and Tree Measurement datasheets not used then also estimate average tree diameter and ladder fuel height. If a single species forms two or more distinct sub-layers, list it on separate rows (e.g. PIGL-sapling, PIGL-overstory, PIGL-dead). Shrubs, such as willows or alders of tree size, are not considered trees.

1. *Shrub Layer* – shrubs are defined as woody plants with multiple stems. Estimate the % cover of tall (e.g. alder), low (e.g. dwarf birch) and dwarf (e.g. low-bush cranberry) shrubs. Provide estimates of tall and low shrub heights (in centimeters). If there are newly established shrubs, identify if plants are new seedlings or re-sprouts, if not leave the column blank to indicate mature plant.

2. *Herb and Graminoid* Layer – this layer is inclusive of all non-woody species observed including graminoids (grasses, sedges, and rushes), herbs/forbs, ferns, horsetails, and club mosses. Estimate the % cover of non-woody species. If there are newly established shrubs or herbs, identify if plants are new seedlings or re-sprouts, otherwise leave the column blank.

3. *Non-vascular Layer* – estimate the percent ground cover of mosses, lichens and liverworts.

4. *Surface Layer* – estimate the percent ground cover of litter, down woody fuels, bare ground, water or duff.

Point-Intercept Vegetation Cover Measurement - Use the VEGETATION POINT INTERCEPT datasheet. Along the 16-m transect, the point intercept method will be used to determine plant and ground cover. Every 50 cm along the 16-m transect, record all plant species and types of surface cover (e.g. mosses, lichens, substrate) intercepted at that point. Start at the 0.5 m mark and record along the right-han side of the transect.

Using a ¼" diameter pole (6 ft fiberglass bike flag), gently lower the pole so that the rod is plumb to the ground (on slopes this will not be perpendicular to the ground). At each point intercept record the species that touch one side of the pole from top to bottom, for example if black spruce was the tallest vegetation "hit" (touching the pole) at that point black spruce would be recorded first. Similarly, ground cover will always be recorded last.

1. *Species Codes*: Record species "hit" using the NRCS four letter plant species codes. Generally, the NRCS codes are the first two letters are the genus (i.e. *Salix*) and the last two are the species (i.e. *glauca*); for *Salix glauca* the NRCS code is SAGL. Refer to the USDA plants database for the most current species codes (USDA NRCS 2011, http://plants.usda.gov/). Also, numbers are frequently used to differentiate species with alphabetical similar codes (e.g. *Calamagrostis canadensis* code is CACA4), but if exact code is not known then write the species' full name and the code used on the datasheet.

2. *Unknown Species*: If common but unknown species are encountered, then collect for later identification, record on the datasheet as an identifiable acronym, note a description of the species, and whether it was collected.

3. *Dead trees*: For dead standing trees, record species and indicate that it is dead by adding a D after the species code as a superscript. For dead branches on a live tree, record the as live.

Tree Density and Measurements

Tree Density - on the TREE DENSITY TALLY datasheet record the total number of trees taller than 1.37-m (4.5 ft) that occur within an the 8-m radius circular plot by species and diameter size class (< 5 cm, 5.1 - 10 cm, 10.1 - 15 cm, 15.1 – 23 cm, > 22.5 cm DBH). *In dense stands of trees* with greater than

15 trees in a 4-m radius subplot, tally only trees within the 4-m radius subplot and indicate on datasheet which plot dimensions used (e.g. 4-m radius plot). Use a Hagloff DME to determine if trees are rooted within the 8-m or 4-m radius circular plot. All live "seedling" trees less than 4.5 ft tall will be tallied by species in three 1-m radius circular subplots located at the 4-m, 8-m, and 12-m marks along the transect (total "seedling" area of 9.42 m^2 or .0048 ac).

Tree Measurements - on the TREE MEASUREMENT Datasheet record detailed tree measurements for two live trees (> 4.5 feet tall) of each species and each size class located. Select trees for measurement which are located; 1) within the 8-m or 4-m radius circular tree density plot and 2) closest to the center point of the plot. If re-visiting the plot is planned then mark the trees with metal tags and unique identifiers. For each tree the following measurements are recorded: DBH (diameter at breast height), tree height, height to live crown, height to live and dead ladder fuels, and crown radius. This information will be used to calculate tree density, tree basal area, crown bulk density, and stand height. For deciduous trees record tree height and DBH only. Diagrams illustrating how to record tree measurements are provided in the QUICK REFERENCE section of this document. Definitions of the parameters measured are as follows:

1. **Tree Number** – assign a number to the tree. If it is the first visit to the plot and the tree needs to be marked for plot revisits, then record the designated number on the tree marker or the unique identifier provided on the tree marker as the tree number. If revisiting a plot with marked trees record the unique identifier on the tree marker.

2. **Species** – record the species of the tree using the NRCS species codes (see Species Code section above) (USDA NRCS 2011, http://plants.usda.gov/). Shrubs, such as willows or alders of tree size, are not considered trees.

3. **Diameter at Breast Height (DBH)** – measure the diameter of the tree trunk in centimeters at 4.5 ft (1.37 m) from the ground using the metric diameter tape measure.

4. **Tree height** – measure the tree height in meters using a clinometer. Record measurement from 10 to 30 m away from the tree; the taller the tree the further from the tree the measurement is taken. Use the percent side of the clinometers to calculate tree height. Tree Height (meters)= (distance from tree in meters) x (% to top of tree - % to base of tree). Note: if the base % is negative this will be added to the total height (math: minus a negative is positive).

5. **Crown radius** –measure the crown radius in centimeters to the average widest branch or drip-line of the crown.

6. **Crown base height (main live crown)** – measure the height in centimeters from the forest floor to the obvious main live crown. Use a clinometer to measure from a distance or measure directly with a tape measure or ruler.

7. **Height to live ladder fuel** – measure the height in centimeters from the forest floor to the lowest point of a live branch with a tape measure or ruler.

8. **Height to dead ladder fuel** – measure the height in centimeters from the forest floor to the lowest point of a dead branch.

9. **Comments** – use this field to describe notable aspects of the tree including location along transect and damage (use damage codes where possible).

Permafrost & Soils

On the *ACTIVE LAYER/SOILS* datasheet record active layer depth at 8 points located at 2-m intervals along the transect (except the last point is placed at 15-m) (Figure 1). At each point measure the depth of the active layer by inserting the bike flag rod or permafrost probe into the ground. Record the depth (cm) to resistance (active layer boundary). If possible record whether active layer depth is limited by rock, permafrost, or seasonal frost and note on datasheet. Record the surface fuel codes for each point: LC = lichen, FM = feather moss, SM = sphagnum moss, DM = dead moss, UD = upper duff, LD = lower duff, MIN = mineral, LTRH = Litter (leaf or herbaceous), LTRNDL = Litter (needle). Record soil moisture (%), soil temperature (°C) and pH at 4-m, 8-m and 12-m points on transect.

Burn Severity & Duff Consumption

Burn Severity (Point) – on the BURN SEVERITY/DUFF CONSUMPTION datasheet (located on the same datasheet as the ACTIVE LAYER/SOILS data) record assessments of burn severity using the burn severity codes (BSC) for both substrate and vegetation. The BSC used are described in Table 1. Burn severity is assessed at points located every 2-m along the 16-m transect (except for last point is located at 15-m mark on transect).

Duff Consumption To quantify duff consumption by fire use the following methodology. First, prior to the fire, insert 8 non-flammable burn pins (recommend 15-30" long welding rods) firmly in the ground at 2-m intervals along the transect. Ensure that the burn pins are pushed into the ground so that the top of the burn pin is flush with the ground surface. If it is not possible to fully insert the burn pin, then either; 1) cut the burn pin so that is flush with the ground using small bolt cutters or 2) record the length (cm) of the segment which remains above the ground on the *BURN SEVERITY/DUFF CONSUMPTION* datasheet. Revisit burned plots to record duff consumption as soon as possible or within 1 year of the fire event. Record the length of burn pin segment exposed as a result of the fire.

Composite Burn Index- Full Plot Burn Severity Assessment

The *COMPOSITE BURN INDEX (CBI)* datasheet is used to assess full plot burn severity. Composite Burn Index (CBI) is a ground-based plot methodology utilized to field-verify remotely-sensed burn severity measures such as the differenced Normalized Burn Ratio (dNBR). CBI plots are used throughout the National Park Service as a tool for validating the satellite-derived estimates of burn severity delivered by the U.S. Geological Survey. CBI ratings can be taken to assess the overall plot burn severity.

Plots are usually 20-m (non-forested sites) or 30-m (forested sites) diameter circular areas. Plot locations are usually pre-determined prior to field-visits to insure that the full range of likely burn severity levels and vegetation types within the fire perimeter are represented in the final dataset. Usually plots are clustered in groups of 8-10 plots within hiking distance of one another and a single group of 8-10 plots may be assessed in a day. CBI plots are usually not permanent and plot markers are usually not installed (unless desired by the park for future monitoring).

Table 1. Burn severity code matrix (modified from NPS Fire Monitoring Handbook [2003])

	Forest and Shrub Types	
	Substrate (S)	Vegetation (V)
(5) Unburned	Not burned	Not burned
(4) Scorched	Litter/moss partially blackened; duff nearly unchanged; wood/leaf structures unchanged	Foliage scorched and attached to supporting twigs
(3) Lightly Burned	Litter/moss charred to partially consumed; upper duff layer may be charred but the duff layer is not altered over the entire depth; surface appears black; small woody debris is partially burned.	Foliage and smaller twigs partially to completely consumed; branches mostly intact; less than 40% of the shrub canopy is commonly consumed
(2) Moderately Burned	Litter entirely consumed, leaving coarse, light colored ash; duff deeply charred to lower duff or upper /lower duff interface, but underlying mineral soil is not exposed; woody debris is mostly consumed; logs are deeply charred, burned-out stump holes are common	Foliage, twigs, and small stems consumed; some branches (>0.5 – 2.5 cm) still present. 40-80% of the shrub canopy is commonly consumed
(1) Heavily Burned	Litter and duff completely consumed, or within 1 cm of mineral soil; mineral soil may be visibly altered, sometimes reddish; if present, sound logs are deeply charred, and rotten logs are completely consumed. *Marcantia* and fire mosses may be present.	All plant parts less than 2.5 cm in diameter are consumed, leaving some or no major stems or trunks; any left are deeply charred
(NA) Not applicable	Inorganic pre-burn	None present pre-burn

The Composite Burn Index is based on ocular (visual) estimates of the degree of environmental change caused by fire to surface features and vegetation layers (strata). The most current data sheet and instruction are provided and more recent versions can be obtained from: http://frames.nbii.gov/ffi/docs/Composite_Burn_Index.pdf and a brief overview of major components is provided here. Strata are based on height above ground and include:

1. **Substrates -** inert surface materials (soil, duff, litter, and downed woody fuels)

2. **Herbs, low shrubs and trees < 3 ft (1m) -** grasses and forbs, as well as shrubs and small trees <3 ft (<1m) tall.

3. **Tall shrubs and trees 3-16 ft (1-5 m) -** tall shrubs and trees

4. **Intermediate trees (subcanopy and pole-sized trees) -** trees canopy layer situated between "tall shrubs and trees" and "big trees" layers, ~ 4–10 inches (10–25 cm) DBH. Trees may be of stratified heights and extend to upper canopy, but crowns receive little direct sunlight.

5. **Big trees (upper canopy, dominant, and codominant trees) -** Tree layer taller than intermediate canopy layer which occupies the upper canopy and receives direct sunlight.

6. **Total Plot, or Overall** - All strata of the plot combined for assessment of total burn severity.

Within each stratum, there are 5 or more burn severity variables assessed; each is scored from 0-3 (0 = unburned, 3 = high severity). An overall CBI score is calculated for each plot by averaging the individual severity scores from each of the individual measures. This overall CBI score is then cross-referenced with the satellite measure of severity to determine the degree of correlation.

Alaska Specific Modifications to CBI ranking: The CBI datasheet includes optional fields which provide an opportunity to score additional fields to more accurately represent a specific region. These optional fields are provided for each strata and are called "CBI_1". For Alaska it is recommended to add the following user-defined fields to the "CBI_1" fields on the datasheet:

Medium Fuel, 3-8": If medium down woody fuel **(**3-8" diameter [7.6-20.3 cm]) are present in plot then rate the consumption of down woody fuel as usual. If medium woody fuels are not present and tussocks are present; rate consumption of tussock (*Eriophorum vaginatum)* basal stock. Do not score if no medium fuels or tussocks pre-fire.

Substrate CBI_1: For the user-defined substrate CBI_1, score the consumption of moss and/or lichen species. The scale is the same as used for "Duff" (see below example).

CBI_1: Moss/Lichen Cover	Unchanged	--	Light Char	--	50% Loss deep char	-	Consumed

Forest Floor Duff Layer Thickness and Moisture

Measurement of litter and duff layer thickness is standard for many fire ecology monitoring projects. In some cases duff moisture measurements may also be needed for a project. Both "duff and litter thickness" and "duff moisture" measurements are conducted using duff plugs (removable sections of forest floor).

Duff plug removal: When removing duff plugs do not disturb the forest floor or the vegetation in the 8-m radius circular plot area. If permafrost or other obstructions limit the depth of the duff plug then measure the layers available and indicate the type and depth of obstruction. To extract a duff plug carefully cut down through the forest floor (using a compass saw, trowel and/or shovel) to either mineral soil or permafrost. For duff thickness measurements plug size is not crucial, but for fuel moisture measurements extract ~ 4-inch-square plugs.

Duff thickness: Duff thicknesses are recorded on the *DOWN WOODY DEBRIS & DUFF THICKNESS* datasheet or if measured in combination with fuel moisture measurements on the *FUEL MOISTURE DATA SHEET/DUFF PLUG* datasheet. Remove duff plugs from at least two sites located at least 1-m

away from the belt transect. Choose duff plug collection sites that appear to be representative of the forest floor in the larger plot area. Examine the duff plugs removed and record the thickness of forest floor layers (live moss, dead moss, upper and lower duff layers). Measure the thickness of each layer down to mineral soil (live moss, lichen, dead moss, upper duff and lower duff) with a ruler to the nearest 0.5 cm. Refer to Wilmore (2001) for detailed duff moisture methods.

Fuel moisture measurements: Duff moisture measurements are recorded on the *FUEL MOISTURE DATA SHEET/DUFF PLUG* datasheet. If measuring duff moisture, then first record the duff layerthicknesses as described above and then remove duff samples from each layer. Place the samples in nalgene plastic sampling bottles, and record the number on the bottle selected in the Bottle # field. More detailed information on distinguishing duff layers, duff moisture sampling and specialized data sheets for destructive fuel sampling reference Wilmore (2001) and Jandt et al (2005).

Down Woody Fuels

Use the *DOWN WOODY DEBRIS & DUFF THICKNESS* datasheet to tally the number of woody debris particles along the 16-m transect using the planar intersect method outlined by Brown (1974) and the National Park Service Fire Monitoring Handbook (National Park Service 2003). Down woody fuel loads are measured in standard units. Table 2 is a summary of the woody debris size classes and the sample distance segments along the transect. By size class tally the number of times down woody debris intercepts (crosses) the transect line. Size classes are summarized in Table 2. 1-hour and 10-hour fuels are tallied along the first 6 feet of the transect. 100 hour fuels are tallied along the first 12 feet of the transect. 1000 hour fuels are tallied along the whole 52.49 ft (16-m) transect. *For 1000 hr fuels, measure and record the diameter of the 1000 hr fuels (at the line crossing) and record as solid or rotten and also record tree species.* A go-no-go gauge with openings 0.25, 1 and 3 inches is useful for determining size classes. Tally dead and down woody materials only; do not include 1) cones, needle litter, leaf litter, and bark, or 2) stems and branches that are attached to standing trees or shrubs. **Record as "NONE" if there are no woody fuels intersecting the transect.**

Table 2. Woody fuel types, diameter size classes, and distance segment in which each fuel type is tallied along 16-m transect.

Diameter size	**Fuel Type**	**Distance to tally along transect**
0 to 0.25 inch	1 hour fuels	From 0 to 6 foot (1.82 m)
0.25 to 1 inch	10 hour fuels	From 0 to 6 foot (1.82 m)
1 to 3 inches	100 hour fuels	From 0 to 12 foot (3.66 m)
> 3 inches	1000 hour fuels Record species, diameter and solid/rotten	From 0 to 52.49 foot (16 m)

Shrub Density

Shrub density is recorded on the *SHRUB DENSITY* datasheet. To quantify tall shrub (alder and tall willow species) density, tally the number of individual shrubs greater than 1-m tall located in the 4-m radius circular plot. Individuals are defined by clusters of stems separated by >10 cm. Where not possible to

distinguish between individual shrubs, record the number of *stems above* ground counted at the ground surface level. Tally shrubs by species and life stage (resprout, mature, decadent and dead). *Mature* shrubs have <50% of the shrub biomass dead compared to *decadent* shrubs which have >50% of the shrub biomass dead. Dead shrubs must have no sign of living material on the plant. Record the average height of each shrub species found within the 8-m circular plot (skip height record if GENERAL VEGETATION datasheet is used).

Moose Browse Architecture

Evidence of browse by moose is recorded on the MOOSE BROWSE ARCHITECTURE datasheet. Moose select certain shrub and tree species for consumption; these species are referred to as preferred species. Preferred browse species includes all common Alaskan deciduous tree species (paper birch, aspen, and balsam poplar) as well as tall (and some low) willow species. Other tall and low shrub species including alder, rose, soapberry, and dwarf birch are not preferred browse species. To measure habitat-use based on browse evidence employ the following modification of the general methodology outlined by Seaton (2002).

Select 2 individuals of <u>each</u> preferred species located closest to the circular plot center point and within the 8-m radius plot. For each individual identify the species and record the estimated plant height. Also record the mature class (whether more or less than 50% of the individual is taller than 3-m), the dead class (whether more or less than 50% of the individual is dead) and assign one of the following architectural classifications:

1. **Broomed** – has been extensively affected by browsing activity:

    a. sapling type plants- the main apical stem has been broken by moose. It is important to look at the history of the plant to ensure that; this may have happened 2–10 years before you measured it;
    b. (bushy type plants) more than half of the current annual growth (CAG) stems arise from lateral stems that were produced as a result of browsing. Look back through stems that are many years old.

2. **Browsed** - has been browsed some in the past, but browsing has not significantly affected its growth. Less than half of CAG twigs between 0.0 and 3.0 m arise from lateral stems that were produced from browsing.

3. **Unbrowsed** - There is no visible evidence that moose have ever browsed this plant.

Additionally, record whether browsing activity by moose has resulted in one or more broken stems; moose often break taller stems to reach new growth and leaves. Record whether there is evidence of hare browsing. Hare browse evidence can be distinguished from moose browse in the following ways: hare browse is usually located lower on the plant than moose browse (at the level of winter snow depth or below) and is indicated by a clean diagonal cut in the stem. Moose browse usually has a more horizontal and jagged appearance. Use comments to note evidence of bark stripping by moose and porcupine, lichen utilization by caribou, and any other evidence of habitat utilization by wildlife (ptarmigan, small mammal, squirrel etc.)

Invasive Plant Infestation

To record observations of invasive plants during monitoring projects use the *ALASKA EXOTIC PLANT MANAGEMENT TEAM (EPMT)* Datasheet (modified for the NPS Alaska Fire Ecology program). Invasive plant infestation are often associated with disturbed areas, including burned and thinned areas. In order to get an idea of what's coming back in areas affected by fire management decisions carry several copies of the Alaska Exotic Plant Management Team (EPMT) datasheets for the purpose of recording observations of invasive species. Where invasive species are observed record a rough estimate of the area infested (buffer), the % cover of the species in the buffer, the current life cycle stage (phenology), the amount of time it would take to remove all individuals from the buffer area, the GPS co-ordinates indicating where to find the infestation and any comments which might lend insight to infestation (e.g. type of disturbance(s), health of species individuals). Recommend carrying copy of Invasive Plants of Alaska (AKEPIC 2005) and/or list of probable invasive species in area visited and reviewing probable invasive species in a given area prior to field visits.

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Field Gear List

General	Item	Per Plot
Plot	30 meter tape	1
Plot	Bike flag	1
Plot	Hagloff DME	1
Plot	Chaining pins	2
Plot	Clinometer	1
Plot	Clipboard	2
Plot	Compass	2
Plot	Diameter calipers	1
Plot	Diameter logger's tape, metric	1
Plot	Diameter tape (small), metric	2
Plot	Fuel Diameter measure (go-nogo)	1
Plot	Field vest	1/person
Plot	Folding ruler 1 meter	2
Plot	Handlens	2
Plot	Paintsticks	2
Plot	Rebar, wooden lathe, other plot markers	2 per plot
Plot	Steel tags w/wire	2 per plot
Plot	Welding rods (duff consumption)	10 per plot
Plot	White board/dry erase pen	1
Duff	4" quilting square	1
Duff	Compass saw	1
Duff	Duff containers	40
Duff	Green duff mat	1
Duff	Pruners	1
Duff	Ruler, centimeter	1
Duff	Special duff plug shovel	1
Tech	Digital Camera	1
Tech	GPS w/appropriate map coverage downloaded	1
Logistic	BK Radio w/appropriate freqs	1
Logistic	Copies of original Datasheets for each paired plot.	1 set for each year
Logistic	Datasheet organizer for plot project w/ data sheets	1
Logistic	Maps of plot locations	1
Logistic	Satellite Phone	1
Logistic	Shotgun w/ammo	1
Personal	Food, Clothing, Shelter	Yes

Plot Data Collection Check List

Unit: _____ Project: _____ Plot ID: _____ Date (M/D/Y): ___/___/_____

Protocol/Data Sheet	Check if Data Form Used	Modifications/Comments
Site Description		
General Vegetation Information		
Vegetation Point Intercept		
Tree Density Tally		
Tree Measurement		
Active Layer/Soils		
Burn Severity/Duff Consumption		
Down Woody Debris & Duff Thickness		
Burn Severity- Composite Burn Index		
Fuel Moisture Data Sheet/Duff Plug		
Shrub Density		
Moose Browse Architecture		
Invasive Plant Survey		

Site Description

Unit: _____ **Project**: _____ **Plot ID**: _____ **Date (M/D/Y):** ___/___/____

Field Crew: _____ **Plot Markers**: _____

☐ Used same Site and Lat-Long Information as recorded on: **____/____/_____**

Transect Azimuth: _____ Deg (0m to 16m) **Plot Dimensions**:_____

Slope: _____% **Aspect**: _____Deg **Declination used**: _____ **Elevation** (0m end): _____ ft/m

Soil (circle): Wet Moist Dry **Disturbance** (circle): Fire Wind Insect Other: _____

Fire Indicators: Burned Snags Burned Stumps Fire Scars Burned Plants Charcoal

Est. Time since fire: _____yrs

Treatment/Fire Description:

Plot Type (circle): Wildfire Hazard Fuels RX Control

Treatment phase (circle): Pre-thinning Post-thinning _____ Maintenance thinning: _____

Treatment Year: _____ (Time since treatment, yrs) (Time since treatment, yrs)

OR

Fire Number: _____ Fire Name:_____ Fire Year: _____ Pre or Post: _____ yrs

Latitude/Longitude: GPS Type: _____ GPS Ident: _____ GPS Datum:_____

Description	**Waypoint**	**Latitude (DD.DDDD)**	**Longitude(DD.DDDD)**	**GPS Error**
		N	W	m/ft
		N	W	m/ft
		N	W	m/ft
		N	W	m/ft

Photos: Camera used: _____

Description	**Azimuth**	**Photo Time (military)**

Vegetation Class: *List two or more dominant species of each lifeform and their % cover within the plot area.*
Current Viereck class: _____

Pre-Disturbance Viereck Class: _____

Plot Dimensions: _____

Lifeform	Species 1	% Cover	Species 2	% Cover	Species 3	% Cover	Species 4	% Cover
Tree Sp. (list all spp)								
Tall Shrub Sp.								
Low Shrub Sp.								
Dwarf Shrub Sp.								
Graminoid/Herbaceous Sp.								
Moss/Lichen/Ground Cover								

Notes on Back of

Plot Layout and General Notes: Provide notes and map on relocating or LZ, burn information and other plot notes as needed below.

General Vegetation Information

Park Unit: _____ Project: _____ Plot ID: _____ Pre or Post ____ yrs

Field Date: _____ Field Crew: _____ Plot Dimensions: 8 m radius

Record plant status (superscript): **D** (dead), **C** (charred), **S** (scorched). Also record if collected (***** next to spp. code) or trace (**t** = trace) <1% cover. If tree density and tree measurements not recorded at plot, then record average ladder fuel height and DBH for tree species. If a single species forms two or more distinct sub-layers or a substantial proportion of species is burned or damaged then, list on separate rows (e.g. PIGL-sapling, PIGL-overstory, PIGL-scorched).

Species	**Common Name**			**Cover Class**											
Tree Layer		**Avg. DBH (cm)**	**Avg. Ladder Fuel Hgt (cm)**	**1-10%**	**10-20%**	**20-30%**	**30-40%**	**40-50%**	**50-60%**	**60-70%**	**70-80%**	**80-90%**	**90-100%**	**Dead?**	**Avg. Height (m)**
PIGL	White spruce														
PIMA	Black spruce														

Shrub Layer	**Common Name**	**Seedling**	**Resprout**	**1-10%**	**10-20%**	**20-30%**	**30-40%**	**40-50%**	**50-60%**	**60-70%**	**70-80%**	**80-90%**	**90-100%**	**Dead?**	**Avg. Height (m)**
ALVIC	Green alder														
SALIX	Unknown willow														
SAGL	Glaucous willow														
SAPU15	Diamond Leaf willow														
SABE2	Bebb willow														
BENA	Dwarf birch														

BEGL	Tall shrub birch														
DAFL3	Shrubby cinquefoil														
LEDUM	Labrador tea														
CHCA2	Leatherleaf														
SHCA	Soapberry														
ROAC	Prickly Rose														
VAUL	Blueberry														
VAVI	Lowbush cranberry														
EMNI	Crowberry														
ARRU	Bearberry														
RUCH	Cloudberry														
COCA13	Dwarf dogwood														
LIBO3	Twinflower														
RUCH	Cloudberry														
Plot ID:_____ Date:_____															
Herbs & Graminoids	**Common Name**	**Seedling**	**Resprout**	**1-10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**90-100%**	**Dead?**	
EQUIS	Unknown Horsetail														
EPAN2	Fireweed														
GELI2	Pumpkinberry														
CABI5	Bigelow's sedge														
CAREX	Unknown carex														
CACA4	Bluejoint grass														

GRASS	Unknown Grass														
ERVA	Tussock grass														
Non-vascular	**Common Name**	**1-10%**	**10-20%**	**20-30%**	**30-40%**	**40-50%**	**50-60%**	**60-70%**	**70-80%**	**80-90%**	**90-100%**	**Dead?**			
MOSS*	Unidentified moss														
SPHAG2	Sphagnum moss														
FMOSS	Unknown feather moss														
HYSP70	Stair-step moss														
PLSC70	Big red stem moss														
CEPU12	Ceratadon moss														
POJU70	Common juniper moss														
AULAC2	Unk. Aulacomnium moss														
MAPO12	Marchantia liverwort														
CLADI3	Cladina unknown														
CLADO3	Cladonia unknown														
LICHEN*	Unknown lichen														
PEAP60	Freckle pelt lichen														
Ground Cover	**Common Name**	**1-10%**	**20%**	**30%**	**40%**	**50%**	**60%**	**70%**	**80%**	**90%**	**90-100%**	**Dead?**			
LTRNDL	Needle Litter														

LTRH	Leaf Litter												
DUFF	Duff												
1Hr	0 to 0.25 inch												
10Hr	0.25 to 1 inch												
100Hr	1 to 3 inches												
1000Hr	> 3 inches												
DM	Dead Moss												
UD	Upper Duff												
LD	Lower Duff												
MIN	Mineral Soil												
W	Water												
ROCK	Rocks												

Vegetation Point Intercept

Park Unit: _____ Project: _____ Plot ID: _____ Pre or Post ______ yrs

Field Date: _____ Field Crew: _____

Record substrate and species codes of trees, shrubs, forbs and groundcover intercepted at each 50 cm interval, record plants tallest to lowest. **Record status** (superscript): **D** (dead), **C** (charred), **S** (scorched). *****=collected

PNT	Meters	*Tallest* SPP 1	SPP 2	SPP 3	SPP 4	SPP 5	SPP 6	SPP 7
1	0.5							
2	1							
3	1.5							
4	2							
5	2.5							
6	3							
7	3.5							
8	4							
9	4.5							
10	5							
11	5.5							

PNT	Meters	*Tallest* SPP 1	SPP 2	SPP 3	SPP 4	SPP 5	SPP 6	SPP 7
12	6							
13	6.5							
14	7							
15	7.5							
16	8							
17	8.5							
18	9							
19	9.5							
20	10							
21	10.5							
22	11							
23	11.5							
24	12							
25	12.5							
26	13							
27	13.5							
28	14							
29	14.5							
30	15							
31	15.5							
32	16							

Tree Density Tally

Park Unit: _____ Project: _____ Plot ID: _____ Field Date: _____Field Crew: _____ Plot Dimensions: _____

Tally the number of trees taller than 4.5' (1.37-m) by diameter size class, species and status within the 8-m circular plot area. In densely forested stands (with > 15 trees in 4-m radius circular subplot) tally only trees in 4-m radius subplot. Tally trees by live, dead, or if disease or insects are prevalent (record damage code). Dead trees with < 45° angle to ground are not tallied. For small "layering" trees, pull trees upright to determine if height is > 4.5'. Tally seedlings"/saplings (*live* trees less than 4.5' tall) by species and life status in three 1-m radius circular plots at 4-m, 8-m and 12-m on transect. **Resprouts:** new growth from older root stock, **Seedlings:** new plants from seeds < 10cm high, **Mature** >10cm.

		Tree Counts by DBH (cm)					Seedling <4.5ft	Seedling <4.5ft	Seedling <4.5ft
Tree Species	**Status**	**< 5cm**	**5.1-10 cm**	**10.1-15 cm**	**15.1-23 cm**	**>23 cm**	3 M	15M	27M
Black Spruce (*Picea mariana*)	LIVE						R	R	R
	Dmg____						S	S	S
	DEAD								
	Dmg____						M	M	M
White spruce	LIVE						R	R	R
(*Picea glauca)*	Dmg____								
	DEAD						S	S	S
	Dmg____						M	M	M
Aspen	LIVE						R	R	R
(Populus tremuloides)	Dmg____						S	S	S

	DEAD								
	Dmg____						M	M	M
Paper birch ***(Betula papyrifera)***	LIVE						R	R	R
	Dmg____						S	S	S
	DEAD								
	Dmg____						M	M	M
Balsam poplar ***(Populus balsamifera)***	LIVE						R	R	R
	Dmg____						S	S	S
	DEAD								
	Dmg____						M	M	M
Larch **Tamarack (*Larix laricina*)**	LIVE						R	R	R
	Dmg____						S	S	S
	DEAD								
	Dmg____						M	M	M

Tree Measurements

Park Unit: _____ Project: _____ Plot ID: _____ Pre or Post _____ yrs

Field Date: _____ Field Crew: _____ Plot Dimensions: _____

Record the following for two live trees (> 4.5 feet tall) of each species and size class observed within the tree density plot. Select trees located within the tree density plot and closest to the plot center point. Record measurements to 1 decimal place (e.g. 4.3 m, 2.2 cm). Note observed tree damage (including fire damage), insects or disease using damage codes where possible. *For deciduous tree species record tree height and DBH only*.

Tree No.	Tree Species	DBH (cm)	Height (m)	Crown Radius (cm)	Ht to Dead Ladder Fuel (cm)	Ht to Live Ladder Fuel (cm)	Main Crown Base Ht (cm)	Location	Comments

Active Layer/Soils

Park Unit: _____ Project: _____ Plot ID: _____ Field Date: _____ Field Crew: _____ Plot Dimensions: _____

Point	Distance	Active Layer Depth (cm)	Surface Layer Fuel Code	Comment (Permafrost/ Rock)	Soil Moisture (%) Depth:	pH	Soil Temp (°C) Depth:	Notes
1	2-m							
2	4-m							
3	6-m							
4	8-m							
5	10-m							
6	12-m							
7	14-m							
8	15-m							

Fuel Codes: LC = lichen, FM = feather moss, SM = sphagnum moss, DM = dead moss, UD = upper duff, LD = lower duff, MIN = mineral, LTRH = Litter herbaceous, LTRNDL = Litter needle litter

Burn Severity/Duff Consumption

		Post-Fire		**Pre-fire**	**Post-fire**	
Point	**Distance**	**Burn Severity Code (Substrate)**	**Burn Severity Code (Vegetation)**	**Burn Pin above surface (cm)** **(A)**	**Burn Pin Exposed (cm)** **(B)**	**Burn Depth cm** **(=B-A)**
1	2-m					
2	4-m					
3	6-m					
4	8-m					
5	10-m					
6	12-m					
7	14-m					
8	15-m					

Down Woody Debris & Duff Thickness

Park Unit: _____ Project: _____ Plot ID: _____ Pre or Post _____ yrs

Field Date: _____ Field Crew: _____ Transect Length: _____

Record the number of intercepts of woody fuels by diameter size class along the transect. Record 1hr (0 - 1/4") and 10 hr (1/4"- 1") from 0 to 6 ft along transect, 100 hr (1" - 3") from 0 to 12 ft along transect, and 1000hr (> 3") from 0 to 52.49 ft. Or use meters to define segments: 1.82-m (6 –ft), 3.66-m (12-ft), and 16-m (52.49 ft). Record the species and diameter of fuels >3". Record litter and duff layerthickness at each end of the transect in location off-set by at least 1-m from transect.

	# of intercepts			**>3" Diam:** **Record Diameter (in) and Species** (0-53 ft)		**Litter and Duff Thickness (cm)**			
Transect	**0 – 0.25"** **1 hr** (0-6 ft)	**0.25 - 1"** **10 hr** (0-6 ft)	**1 - 3"** **100 hr** (0-12 ft)	**3"+ solid 1000 hr S**	**3"+ rotten 1000 hr R**	**Sample site 1**	**Thickness cm**	**Sample site 2**	**Thickness cm**
Dir. ____ Slope ___						Litter		Litter	
						Lichen		Lichen	
						Live Moss		Live Moss	
						Dead Moss		Dead Moss	
						Upper Duff		Upper Duff	
	Total:	Total:	Total:			Lower Duff		Lower Duff	

Transect	0 – 0.25" 1 hr	0.25 - 1" 10 hr	1 - 3" 100 hr	3"+ solid 1000 hr S	3"+ rotten 1000 hr R	Sample site 3	Thickness cm	Sample site 4	Thickness cm
Dir. ____ Slope ___						Litter		Litter	
						Lichen		Lichen	
						Live Moss		Live Moss	
						Dead Moss		Dead Moss	
						Upper Duff		Upper Duff	
	Total:	Total:	Total:			Lower Duff		Lower Duff	

Definitions & Tally Rules

>Downed woody material are dead twigs, branches, stems and boles of trees and shrubs that have fallen and lie on or above the ground.

>Measure woody material first to avoid disturbing it and biasing your estimates.

>Do not count dead woody stems and branches still attached to standing shrubs and trees (see below)

>If more than 45 degrees and dead, but still attached at the bole it is still counted

>Do not tally any particle having a central axi that coincides perfectly with the sampling plane.

>If the sampling plane intersects a curved piece more than once tally each intersection

>For rotten logs that have fallen apart try to estimate its original diameter

>Tally uprooted stumps and roots not encased in dirt. Do not tally undisturbed stumps.

FFI -- BURN SEVERITY -- COMPOSITE BURN INDEX

PD - Abridged	Examiners:			Fire Name:		
Administrative Unit		Project Unit		Macro Plot		
Field Date mmddyyyy	/ /	Fire Date mmyyyy	/			
Plot Aspect		Plot % Slope		UTM Zone		
Plot Diameter Overstory		UTM E plot center		GPS Datum		
Plot Diameter Understory		UTM N plot center		GPS Error (m)		
Number of Plot Photos		Plot Photo IDs				

BI – Long Form	% Burned 100 feet (30 m) diameter from center of plot =					Fuel Photo Series =		
STRATA RATING FACTORS	BURN SEVERITY SCALE							FACTOR SCORES
	No Effect	Low		Moderate		High		
	0.0	0.5	1.0	1.5	2.0	2.5	3.0	
A. SUBSTRATES								
% Pre-Fire Cover: Litter = Duff = Soil/Rock = Pre-Fire Depth (inches): Litter = Duff = Fuel Bed =								∑ = N = $\bar{X}$ =
Litter/Light Fuel Consumed	Unchanged	--	50% litter	--	100% litter	>80% light fuel	98% Light Fuel	
Duff	Unchanged	--	Light char	--	50% loss deep char	--	Consumed	
Medium Fuel, 3-8 in.	Unchanged	--	20% consumed	--	40% consumed	--	>60% loss, deep ch	
Heavy Fuel, > 8 in.	Unchanged	--	10% loss	--	25% loss, deep char	--	>40% loss, deep ch	
Soil & Rock Cover/Color	Unchanged	--	10% change	--	40% change	--	>80% change	
CBI_1								
B. HERBS, LOW SHRUBS AND TREES LESS THAN 3 FEET (1 METER):								
% Pre-Fire Cover = % Enhanced Growth =								∑ = N = $\bar{X}$ =
% Foliage Altered (blk-brn)	Unchanged	--	30%	--	80%	95%	100% + branch loss	
Frequency % Living	100%	--	90%	--	50%	< 20%	None	
Colonizers	Unchanged	--	Low	--	Moderate	High-Low	Low to None	
Spp. Comp. - Rel. Abund.	Unchanged	--	Little change	--	Moderate change	--	High change	
CBI_1								
C. TALL SHRUBS AND TREES 3 to 16 FEET (1 TO 5 METERS):								
% Pre-Fire Cover = % Enhanced Growth =								∑ = N = $\bar{X}$ =
% Foliage Altered (blk-brn)	0%	--	20%	--	60-90%	> 95%	Signifcnt branch loss	
Frequency % Living	100%	--	90%	--	30%	< 15%	< 1%	
% Change in Cover	Unchanged	--	15%	--	70%	90%	100%	
Spp. Comp. - Rel. Abund.	Unchanged	--	Little change	--	Moderate change	--	High Change	
CBI_1								
D. INTERMEDIATE TREES (SUBCANOPY, POLE-SIZED TREES)								
% Pre-Fire Cover = Pre-Fire Number Living = Pre-Fire Number Dead =								∑ = N = $\bar{X}$ =
% Green (Unaltered)	100%	--	80%	--	40%	< 10%	None	
% Black (Torch)	None	--	5-20%	--	60%	> 85%	100% + branch loss	
% Brown (Scorch/Girdle)	None	--	5-20%	--	40-80%	< 40 or > 80%	None due to torch	
% Canopy Mortality	None	--	15%	--	60%	80%	%100	
Char Height	None	--	1.5 m	--	2.8 m	--	> 5 m	
CBI_1								
Post Fire: %Girdled = %Felled = %Tree Mortality =								
E. BIG TREES (UPPER CANOPY, DOMINANT, CODOMNANT TREES)								
% Pre-Fire Cover = Pre-Fire Number Living = Pre-Fire Number Dead =								∑ = N = $\bar{X}$ =
% Green (Unaltered)	100%	--	95%	--	50%	< 10%	None	
% Black (Torch)	None	--	5-10%	--	50%	> 80%	100% + branch loss	
% Brown (Scorch/Girdle)	None	--	5-10%	--	30-70%	< 30 or > 70%	None due to torch	
% Canopy Mortality	None	--	10%	--	50%	70%	%100	
Char Height	None	--	1.8 m	--	4 m	--	> 7 m	
CBI_1								
Post Fire: %Girdled = %Felled = %Tree Mortality =								

Community Notes/Comments:	CBI = Sum of Scores / N Rated:	Sum of Scores	N Rated	CBI
	Understory (A+B+C)			
	Overstory (D+E)			
	Total Plot (A+B+C+D+E)			

% Estimators: **20 m Plot:** 314 m^2 1% = 1x3 m 5% = 3x5 m 10% = 5x6 m
30 m Plot: 707 m^2 1% = 1x7 m (<2x4 m) 5% = 5x7 m 10% = 7x10 m

After, Key and Benson 1999, USGS NRMSC, Glacier Field Station.
Version 4.0 8 27, 2004 (updated 11/26/07 for FFI)

Strata and Factors are defined on the reverse side of this form. See the FIREMON Landscape Assessment, Chapter 2, available at http://frames.nbii.gov/firemon, for more information.

CBI Instruction (FFI 2007)

STRATA

Substrates—Inert surface materials of soil, duff, litter, and downed woody fuels. **Herbs, Low Shrubs and Trees**—All grasses + forbs, and shrubs + small trees <3 ft (<1 m). **Tall Shrub and Trees**—Shrubs and trees 3–16 ft (1–5 m) tall. **Intermediate Trees (pole-size, subcanopy)**—Trees between tall shrubs/trees and upper canopy, approximately 4–10 inches (10–25 cm) diameter, and 25–65 ft (8–20 m) tall. May be stratified heights and extend to upper canopy, but crowns receive little direct sunlight. Size is relative to upper canopy and varies by community. If this size is upper canopy, count as intermediate trees. **Big Trees (mature, dominant and co-dominant, upper canopy)**—Larger than intermediate trees, occupy upper canopy, receive direct sunlight; tallest may extend above average big-tree level. **Understory**—Substrates, herbs/low shrubs+trees, tall shrubs+trees. **Overstory—**Intermediate and big trees. **Total Plot, or Overall**—All strata of the plot combined.

GENERAL

Pre-fire exposed soil/rock is considered unburned if there is no sign of overlying substrates or vegetation that burned. Avoid sites with >50% exposed pre-fire soil/rock, see guidelines. **Rehab Site**—Mulch or other does not count, estimate as if that was not present. Planted, growing vegetation can be tallied where appropriate, but not as new colonizers. A specific factor may not be rated if is not relevant, shows inconsequential presence or insignificant indication of severity (write in N/A for not applicable), or when effects are unclear and cannot be reasonably judged (write in UC for uncertain). **Percent Plot Area Burned**—Record the percent surface area (burned substrates and low-growing plants) showing any impact from fire for the 98-ft (30-m) diameter plot, and for the nested 66-ft (20-m) plot, if that is used for the understory. **Prefire Variables**—Report cover (percent area), depth (inches) and density (number of trees) plot-wide as if before fire. Consider burned evidence + unburned areas within plot or nearby; reasonable approximation of prefire conditions. If too difficult to estimate, write in UC for uncertain. **Enhanced Growth Factors**—100 percent + percent productivity above that, judged to be fire-enhanced; regard amount of green biomass in terms of cover, volume and density. If plots show about the same or less productivity than before fire, then enter as not applicable (N/A). If plot shows enhanced growth, then enter the percent productivity that is augmented by fire, with 100 percent being the same postfire productivity as prefire (for example, 200 percent represents double the estimated prefire productivity); write in UC if uncertain.

SUBSTRATE RATING FACTORS (Do not count litter or fuels built up after fire.)

Litter/Light Fuel—Relative amount consumed of leaves, needles, and < 3-inches (<7.6-cm) diameter wood on the ground at time of fire. Not new litter-fall. Count litter/light fuel even if it occurs under living plants. **Duff condition**—Relative amount consumed and charring of decomposed organic material lying below the litter. Not fine root mass. Count duff even if it occurs under living plants. **Medium Fuel**—Consumption of down woody fuel between 3–8 inches (7.6–20.3 cm). **Large Fuel**—Loss and charcoal from down woody fuel >8-inch diameter (20.3 cm). Base both classes on change to fuel load. Omit or join as one if either fuel class < 5 percent plot cover, see text. Include stumps in appropriate size class, if relevant. **Soil Cover/Color**—New exposed soil and color change; lightening at moderate to high, ~10 percent red at high severity— overlook ash. Consider soil or rock surface *not* covered by litter, duff or low herbaceous cover less than about 30 cm. If such occurs under taller shrubs and trees, count it.

HERBS, LOW SHRUBS AND TREES LESS THAN 3 FEET (1 METER) RATING FACTORS

Percent Foliage Altered—Only low shrubs and trees (<3 ft), prefire live or dead cover that are newly brown, black or consumed. Ignore resprout. **Frequency Percent Living—**Percent of prefire vegetation that is still alive after fire, based on number plot-wide; survivorship, not cover, not new seedlings. Include unburned as well as burned, resprouting perennial herbs, low shrubs and trees (<3 ft) pot-wide. Include all green vegetation as well as burned plants that have not had enough time to resprout but remain viable. Burned plants may need to be examined for viable growth points. Do not include new plants from seed or suckers. **Colonizers**—Potential dominance 2–3 years postfire of new (native or exotic) plants from seed; includes herbs and tree seedlings, plus aspen or other tree-to-shrub suckers, and nonvascular plants (for example, thistle, fireweed, pokeweed, ferns, moss, fungi, seedlings of lodgepole pine, slash pine, western larch, many weedy spp.). Rate only if spp. response to fire is known. **Species Composition/Relative Abundance**—Change in spp. and/or relative abundance of spp. anticipated 2–3 years postfire. How much does postfire spp. composition resemble prefire stratum? Consider presence of new or absence of old spp., plus how dominance is spread across spp.

TALL SHRUBS AND TREES 3 TO 16 FEET (1 TO 5 METERS) RATING FACTORS

Percent Foliage Altered—Percent prefire live-or-dead crown volume (leaves, stems) newly brown, black or consumed. Ignore new resprout; it does *not* lessen the amount of prefire foliage altered. **Frequency Percent Living**—Percent of prefire tall shrubs/trees that are still alive after fire. This is a measure of survivorship based on numbers of individuals. Include unburned as well as burned but viable tall shrubs/trees 3–6 ft (1–5 m) tall plot wide; examine growth points for viability if needed. Do not include new plants from seed or suckers. Account for potential mortality that could occur up to 2 years postfire. **Percent Change in Cover—**Overall *decrease* in cover of tall shrubs/trees between 3 and 16 ft tall (1 and 5 m), relative to the area occupied by those plants before fire. Count resprouting from plants that burned, plus the unburned plants as cover that lessens the amount of decrease in cover. Do not include suckers or plants newly germinating from seeds. **Species Composition/Relative Abundance** Change in spp. composition and/or relative abundance of spp. Anticipated 2 to 3 years postfire.

INTERMEDIATE AND BIG TREE RATING FACTORS (COMBINED)

Percent Unaltered (green)—Percent prefire live-or-dead crown volume unaltered by fire. Include new resprout from burned mcrowns, not from bases. **Percent Black (torch)**—Percent prefire live-or-dead crown volume that actually caught fire (black or consumed stems, leaves). May or may not be viable postfire; resprout from black crowns does not lessen percent black. At high severity, consumption of fine branching is evident. Include deciduous blackened crowns. **Percent Brown (scorch)**—Percent prefire live crown volume affected by scorch or girdle without direct flame contact. Brown is due to proximal heating, where foliage did not catch fire. Includes delayed mortality, insect damage, and brown foliage that has fallen to ground. **Percent Canopy Mortality** —Percent prefire live canopy volume made up by trees killed directly or indirectly by fire within 1–2 years. Proportion of a plot's total once-living canopy lost to dead trees (include insect/disease kill) in relation to total prefire canopy volume. **Char Height**—Mean char height from ground flames averaged over all trees. The mean is halfway between upper and lower heights on a tree. Include unburned (char height = 0) and burned trees ***only*** when char height is discernable. Do ***not*** include black from crown fire; enter N/A for most crown fire burns.

RECORD FOR EACH OVERSTORY STRATUM, BUT DO NOT COUNT IN CBI SCORES

Percent Girdled (at root or lower bole)—Percent of trees effectively killed by heat through the lower bark, sufficient to kill cambium around lower boles or buttress roots. Include trees either dead or likely to die within 1–2 years. Do not include trees killed by torch or scorch to crown. May or may not char through bark and into the wood; may have loose sloughing bark in 1–2 years. **Percent Felled (downed)—**Percent live-or-dead trees, that were standing before fire but now are on the ground. Usually from wind throw after fire, they exhibit fresh up-turned root masses, and different charring patterns than trees that were down when fire occurred. **Percent Tree Mortality**—Percent of once living trees on the plot that were killed by the fire, based on number of trees. Suspected insect and disease effects also may be included, if such contributed to killing whole trees relatively soon after fire (for example, within 1–2 years).

RATING ADVICE

Factors that are not applicable or cannot be resolved in a plot are not rated; they are omitted from that plot's composite ratings. Moreover, if there is much uncertainty about how a specific factor should be rated, or whether it is even relevant to the plot, then that factor should be left unranked. Only the number of rated factors is used to compute averages. If a factor is not rated, enter not applicable (N/A) or uncertain (UC) on the CBI data form. Do not just leave the field blank; such factors are not part of the CBI average, but one wants to know whether these factors were actually assessed and it was decided not to rate them, or just accidentally overlooked and skipped. Zeros, on the other hand, are valid entries and do get averaged into composite scores. Zeros should be used when a rating factor is applicable and exhibits an unburned condition. A zero represents no detected change in an observable factor.

Fuel Moisture Data Sheet/Duff Plug

Project name: _____ Recorders: _____ Date:_____/_____/_____
Plot ID:_____ Fuel Type Sampling:_____ Phenology: _____
Time: _____ Location:_____ Lat (DD):_____ Long (DD):_____
Datum:_____ Avg slope:_____% Elevation:_____(ft/m) Aspect:_____deg

Sample #	Type	Fuel Codes	Sample Depth (cm)*	Thickness (cm)**	V/G*	Bottle #	Wet Wt	Dry Wt	Tarre Wt	Comments
1-example	Duff	lm	0-3cm	3	V	23	75.3	58.7	52.9	
1-example	Duff	dm	3-7cm	4	V	22	80.5	58.7	52.9	

Fuel Codes: lm=live moss (feather), dm = dead moss, ud = upper duff, ld = lower duff

pima = black spruce, pigl = white spruce, lepa = labrador tea, vavi = cranberry, spha = sphagnum

Shrub Density

Park Unit: _____ Project: _____ Plot ID: _____ Pre or Post _____ yrs

Field Date: _____ Field Crew: _____ Plot Dimensions: _____

Tally all individuals for each tall shrub (alder and tall willow) species within the 4-m radius circular plot by life status. Individuals are defined by >10 cm gaps between stems. If individuals are indistinguishable then record the number of tall shrub stems at ground level. Record average shrub height by species. Mature (more live than dead) and decadent (more dead than live).

Shrub Species	Avg. Hgt. (m)	Life Status			
		# Resprout	# Mature	# Decadent	# Dead

Moose Browse Architecture Data Sheet

Park Unit: _____ Project: _____ Plot ID: _____ Pre or Post ____ yrs

Field Date: _____Field Crew: _____ Plot Dimensions: _____

For each preferred species individual within the 8-m radius circular plot (if shrub tally in 8-m radius plot > 15, then use three 1-m radius sub-plots at 4-m, 8-m and 12-m), identify species, record height, mature class, dead class, whether broken by moose, evidence of browse by hares as well as architecture classification based on moose browse evidence. Architecture classes are defined as:

Broomed - 1) *sapling type plants*: the main apical stem has been broken by moose. Look back through the history of the plant, this may have happened 2–10 years before you measured it; 2) *bushy type plants*: more than half of the CAG stems arise from lateral stems that were produced as a result of browsing.

Browsed - Has been browsed some in the past, but browsing has not significantly affected its growth. Less than half of CAG twigs between 0.0 and 3.0 m arise from lateral stems that were produced from browsing.

Unbrowsed - There is no visible evidence that moose have ever browsed this plant.

Note in comments evidence of bark stripping and other evidence of moose or other wildlife use in the area.

Plant #	Species	Ht (m)	Mature Class (taller than 3m)	Dead Class (% dead)	Architecture (extent of moose utilization)	Broken	Hare Browse	Comments
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	

			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	
			>50% <50%	>50% <50%	Brmd Brwd Unbrw	Y N	Y N	

Alaska Exotic Plant Management Team (EPMT) Datasheet (Modified for NPS Alaska Fire Ecology)

Park Unit:				**Date:**		
Site/Location Description:				**Disturbance Type:**		
Taxon	**Buffer (m)**	**% Cover (circle one)**	**Phenology (circle one)**	**Control Estimate (circle one)**	**Coordinates**	**Comments**
		1-5% 6-25% 26-50% 51-75% 76-95% 96-100%	Rosette No flower Full flower In seed Senesced	<1 person hour between 1 and 8 person hours > 8 person hours	X: Y:	
		1-5% 6-25% 26-50% 51-75% 76-95% 96-100%	Rosette No flower Full flower In seed Senesced	<1 person hour between 1 and 8 person hours > 8 person hours	X: Y:	
		1-5% 6-25%	Rosette No flower	<1 person hour between 1 and 8	X:	

		26-50% 51-75% 76-95% 96-100%	Full flower In seed Senesced	person hours > 8 person hours	Y:	
		1-5% 6-25% 26-50% 51-75% 76-95% 96-100%	Rosette No flower Full flower In seed Senesced	<1 person hour between 1 and 8 person hours > 8 person hours	X: Y:	
		1-5% 6-25% 26-50% 51-75% 76-95% 96-100%	Rosette No flower Full flower In seed Senesced	<1 person hour between 1 and 8 person hours > 8 person hours	X: Y:	

Record instances and coverage of invasive plant species where observed. Record ***taxon*** (species 4-letter code), ***phenology*** (life cycle stage), ***buffer***(ocular estimate of area of species infestation; defined as the radius of a circle which would encompass all plants), and ***control estimate*** (hours required to hand-pull all individuals in buffer

Quick Reference

Common codes:

Trees

Code	*Name*
PIGL	Picea glauca – White spruce
PIMA	Picea mariana – Black spruce
BEPA	Betula papyrifera – Paper birch
POTR	Populus tremuloides – Aspen
POBA	Populus balsamifera – Balsam poplar

Shrubs

Code	*Name*
BENA	Betula nana- Dwarf birch
ALNUS	Alnus spp – Alder ,
LEPA11	Ledum palustre – Labrador tea
VAUL	Vaccinium uluginosum – blue berry
VAVI	Vaccinium vitis-idaea – lowbush cranberry
SALIX	Willow

Ground

Code	*Name*
FMOSS	Feather moss
HYSP70	Hylocomium splendens – Stair step moss
SPHAG2	Sphagnum spp (moss)
LTRH	Leaf Litter
LTNDL	Needle Litter
DUFF	Organic duff
MIN	Bare Mineral soil
1 HR, 10HR…	Woody debris by size class

Code	*Name*
CHAN	Chamerion angustifolium – Tall Fireweed (EPAN2)
POAL	Polygonum alpinum – Wild rhubarb
MEPA	Mertensia paniculata - Tall blue bells
LIBO3	Linnaea borealis – Twin flower
EQUIS	Equisetum spp – Horsetail
CACA4	Calamagrostis canadensis – blue joint grass

Tree Crown Measurements

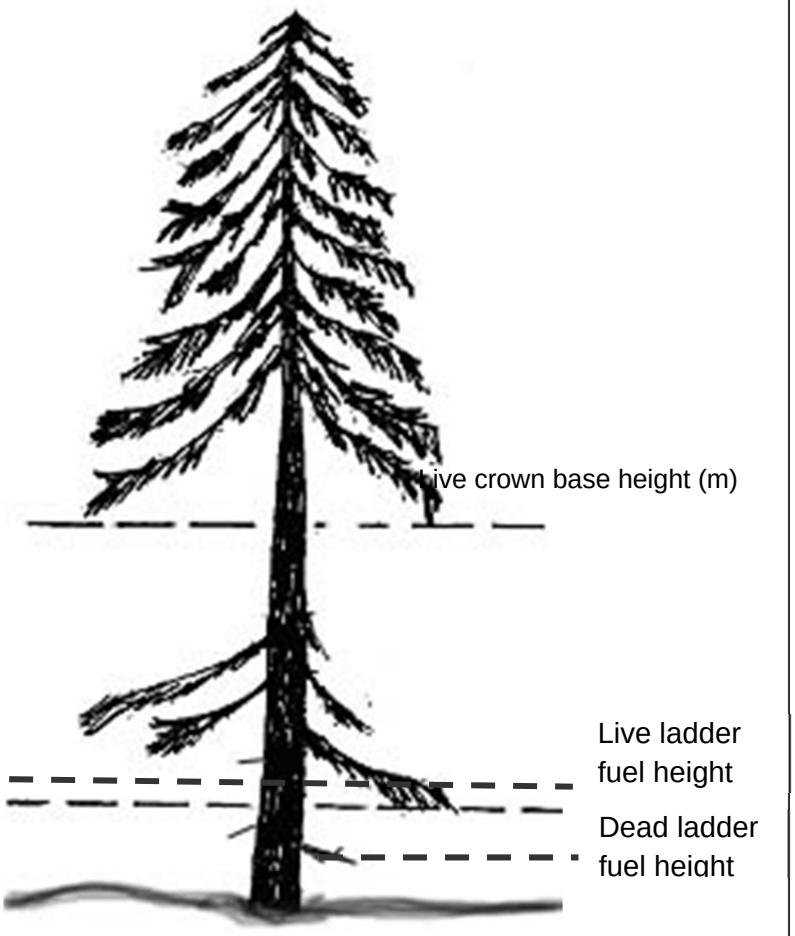


Fig. B.2 Tree crown and ladder fuel measurements. Figure modified from USFS FMH Manual, 2002.

Tree Height Measurements

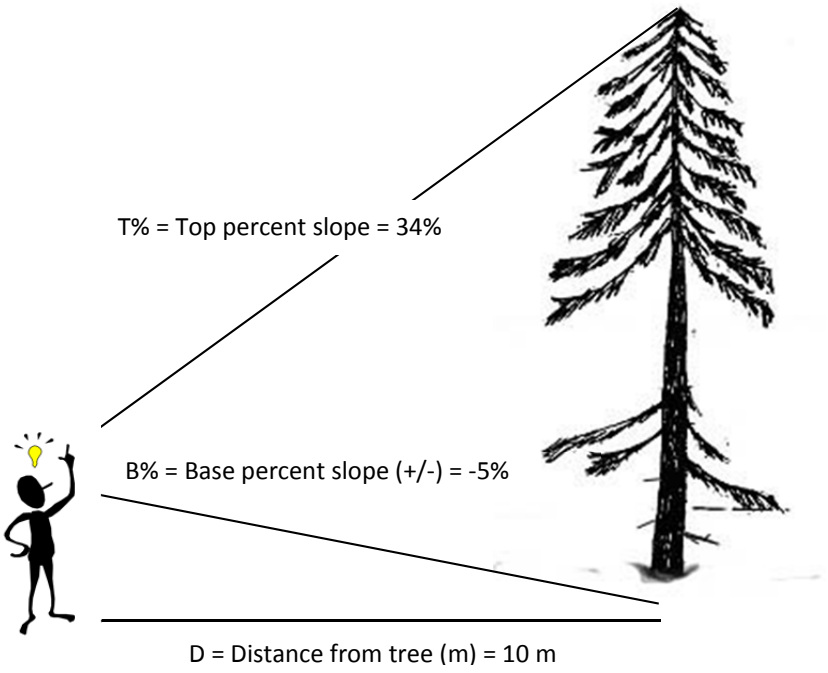


Figure B.3 Tree height equals: Height (m) = D x (T% - B%). If the base percent is negative (reading eye-level to tree or on slope above tree DBH), then add B%, if base percent is positive (on slope below tree DBH) then subtract B%. Ht = 20m x (0.34 + 0.05) = 7.8 m

Remember to use percent side of clinometer (right side scale or look for percentage sign at top or bottom of scale) and to move the clinometer up and down, not your head if possible. *Hint:* 10-m and 20-m distances makes easier math, but you must go back far enough to accommodate tree heights.

Damage Codes for Trees

Damage Code	Brief Description
FORK	Forked top of a tree, multiple primary leaders in a tree crown.
BROK	Broken tree top.
DTOP	Upper portion of tree is dead
BURL	A hard, woody and often rounded outgrowth on a tree.
DAMG	Mechanical damage to tree
FIRE	Evidence of fire damage or death.
LEAN	Tree is leaning.
MAMM	Damage caused by mammals, such as bear claw marks, porcupine, rabbit or beaver chewing.
REDB	Red belt, winter desiccation. Foliage and buds killed or faded. May be worse on windward side of tree. New growth is green & normal. Pg. **202** AK I &D
RUST	Spruce needle rust. Current year spruce needles are infected leaving the trees with a distinct orange tinge when the rust is fruiting on the needles. Pg.**129**AK I & D
BRM	Spruce broom rust. Branches or twig swelling, large burls on main bole or witches' broom (branch proliferation in tree crown). Rust tints needles in the broom yellow/orange. Pg.**146** AK I & D
HRT	Heart rots. *Phellinus pini* conks are hard and woody, upper surface dark brown, hairy (when young), with concentric ridges and a narrow velvety, light brown margin. Lower surfaces dark brown with pores. Coring shows discoloration of the heartwood, light purplish to gray and later changing to reddish brown. Decay pockets may be empty or filled with a mass of white fibers. Other heart rots would be brown cubicle rots, cores will show brown, yellow crumbly rot. Rots described Pg. **162-193** AK I & D.
ROOTRT	Tomentosa root rot (*Inontus tomentosus*) and Armillaria. Both may have chloritic thin crown, reduced growth, distressed cone crop, resin flow or saturation near root collar. Wind thrown trees lacking major roots. Lose needles oldest to youngest. In Tomentosa roots honeycombed and filled with white mycelium, pink staining. Armillaria has white mycelium and black stringy rhizomorphs under the bark. Rhizomorphs may also be on roots or in soil. Decay in root produces yellow stringy rot w/ fine black lines. Pg. **160** AK I & D
ROT	Unknown cause of rot, try to record if brown or white rot (Br or W).
BUDW	Spruce bud worm, brown head, with a lighter body and ivory spots. Web new foliage together and feed in web. Pg. **24** AK I & D
GALL	Spruce gall aphids, cause the tree to form conspicuous cone shaped galls on spruce twigs. Dark purple to green initially and then turning brown. Pg. **58** AK I&D

BB	Unknown bark beetles, not identifiable as either spruce bark beetle or *Ips* spp. Describe galleries or collect insects.
IPS	*Ips* spp., engraving beetle. Easily confused with spruce bark beetle. They are smaller (1/8 to 1/4 in) with concave wing covers with projections at the rear. Y, H or star shape galleries. Differences from spruce bark beetle; forked egg galleries, lighter (yellow brown to red orange), and finer boring dust, little boring dust in galleries. Pg. **79** AK I & D
SPB	Spruce bark beetle damage. Spruce trees. Pg. **71-77** AK I & D.
BORE	Other boring insect damage – e.g.Carpenter ants, Long-horn beetles, wood wasps, ambrosia beetles
BRNZ	Bronze birch bore damage. Stem swelling on birch or aspen due to larval galleries are winding – 6mm wide filled with boring dust. Adult may feed on foliage. Pg. **94** in AK I &D.
UNKN	Tree is damaged or dead, but cannot determine cause.

Appendix F.2. Fire Effects Paired Plot Protocol

Alaska NPS Fire Ecology Program
Fire Effects Paired Plot
Field Method Protocol 2005

Background: Fire Effects Paired Plots

The fire effects paired plot project began in 1981 under the direction of Gary Ahlstrand, NPS Alaska Regional Research Ecologist. The purpose of the project was to assess vegetation change and succession as a result of fire and to determine fire history. Fire staff established paired vegetation 15-m x 30-m plots in burned and representative unburned habitat adjacent to the burned areas of varying ages. Burned sites were identified and selected for the study from historic fire reports, 1:63,360 color infrared aerial photography, and aerial reconnaissance. Some plots were established in front of active wildfires and control plots were not established. Between 1981 and 1988, at least 525 plots were installed across 9 different parks in Alaska. Plot data that was collected included: photographic slides of plot, tree density by species and diameter size class on 15-m x 30-m quadrats, vegetation cover class for 30 Daubenmire frames (20 x 50 cm), tree cores/cookies, fuels and soils data (on some plots), and general plot site descriptions.

Up until 2008 most of the data were only available in paper format, except for the vegetation cover data was in a TWINSPAN text format. Between 2003 and 2008, paired plot data for all the parks was entered into an Access database and plot locations were digitized off topographic maps and aerial photos. The Access database was converted to Interagency Fire Ecology sequel server database called FFI V1.02 through a contract in 2008. Original copies of data and photos are archived at the Alaska Regional Office. Scanned copies of data and photos are stored at the regional office and with the Regional Fire Ecologist in Fairbanks.

Data from this project can be used to determine the vegetative and structural components that have changed over time since fire. Currently the data is being utilized to develop fire successional models to update landcover vegetation maps and fuels maps utilized by the fire management program. This information is being used to understand the potential impacts of shortened fire return intervals and future climate warming.

Plot Locations and Layout: Fire Effects Paired Plots

Plot Locations

Plots were located in an area of the stand free of ecotonal effects in which environment, overstory and understory were as homogenous as possible. Originally the plot locations were pin pricked on 1:63,000 aerial photography and marked on 1:63,360 topographic maps. Some of the plots have since been digitized, although they are not precise locations. For most of the permanently marked plots, there are written instructions with marker trees and azimuths to re-locate the plots. Plots that were permanently marked appear to have 4 corner markers of rebar or welding rod with aluminum cans. Use the photos, maps and written instructions to locate the plots. For all plots that are re-visited, GPS locations will be collected and recorded, corners will be re-established with re-bar.

Plot Layout
A 15-m x 30-m rectangle plot was laid out so that the long axis paralleled the contour of the slope. Use a 100-m tape to outline the 15-m x 30-m plot. Two 30-m vegetation transects are established within the 15 x 30-m rectangle, at 5-m and 10-m along the 15-m end of the rectangle (see plot layout Figure C.4.1). To measure vegetation cover, thirty 20 x 50 cm microplots (Daubenmire frames) were placed every 2-m along the inside edges of the two vegetation transects (A and B). The central transects will be used for point intercept measurements, active layer depths and burn severity code scores if recently burned.

Plot Naming Convention

The plots were named with a three letter acronym based on a physical feature or the fire name. In general plots ending in a "B" were burned plots and plots ending in an "A" were control plots. For example: plots were established near Trout Creek in Yukon-Charley Rivers. The burn plot was named TCB-1 and the control plot was TCA-1. However over the different years that plots were established and among the different parks the plot names often got duplicated. For example, YUCH also had plots established at Todd Cr and were also named TCA-1/TCB-1. Therefore it is recommended that the original plot designators utilize the park code first, and if repetitive names occur within the parks that an "a", "b" or "c" be added to the end of the plot name to distinguish between different plots.

Data Collection: Fire Effects Paired Plots

Site and Photo Points

General site information will be collected and recorded for each plot on the *SITE AND GENERAL DESCRIPTION* Datasheet. It is recommended that additional site location descriptions, diagrams of plots, and additional notes on the plot be written up on separate sheet. The definitions of the fields for the *SITE AND PLOT DESCRIPTION* Datasheet are given below:

1. **Land Unit** – land unit identifier or write out land unit name - (i.e. Steese White Mtns, Yukon-Charley NP) (NPS - four letter park acronym)

2. **Project** – Description of project: PPF (pre/post fire), CBI (burn severity), HZF (for hazard fuels), PP (paired plots).

3. **Plot ID** – Identifier for the plot within the project, i.e. ECA-1, TCB-1 etc

4. **Fire Name and Fire Date** – Fire name/number or project location or cabin name and thinning date if hazard fuels

5. **Fire Date -** Date of fire or fuels treatment (pre-treatment will be blank).

6. **Field Date** – Sample date

7. **Field Crew** – Names of crew members

8. **WP number and GPS number** – record the WP number of the collected point and the name or number of the GPS used.

9. **Lat/Long** – Using a GPS (Garmin V recommended), collect a lat/long averaging the time of collection for 20 points. Record in Decimal Degrees - i.e. Lat: N 65.634891° Long: W 142.982340°

10. **GPS Error** – Record the error EPE and units, this needs to be recorded before you save the waypoint in Garmin handhelds.

11. **Datum** – GPS datum used for collecting and navigating to plots, use NAD-83 (this is the same as WGS-84).

12. **Transect Azimuth** – record the azimuth of the transect facing from the zero end to the 30-m end.

13. **Declination used** – record the declination setting used on your compass, for the initial reading, base your declination on the most recent topographic map. For future reading use the declination used in the original setup.

14. **Transect slope** – record the slope looking down the transect

15. **Slope** – Percent slope, use clinometer

16. **Aspect** – Slope aspect (facing downhill) azimuth in degrees

17. **Elevation** – Taken from GPS or maps in feet or meters (record units)

18. **Viereck Class** – Using Viereck's (1992) Alaska Vegetation Classification, determine the vegetation class to level IV, or if possible level V for the plot area. Either write it out: Open PICMAR/LEDGRO/HYSPLE or use numeric: I.A.2.f with Labrador tea.

19. **Soil** – Estimate of soil drainage: wet, moist, dry.

20. **Disturbance** – General note of disturbances, record date estimate if known. This is for the plot and general vicinity.

21. Evidence of fire

22. **Photo number, time and camera** – record the photo number in the digital camera or keep a photo log if standard camera, record the time of the photos (for digital cameras) and the camera used.

23. At least four photos will be taken for each plot. The photos will be taken from each end of the vegetation sampling transect looking towards the plot center. Label a dry-erase board with the date, park, plot ID, transect letter (A or B), transect azimuth (direction facing) and designate as 0-m ---> 30-m and vice-versa. Hold the board to the edge of the photo view within the first 1.5 - 2 m of the transect. In addition, original photos that were taken at the plot will be duplicated as closely as possible.

Map of Plot Layout

Record the latitude/longitude for all four corner markers. If corners cannot be relocated estimate using tapes and azimuths. Draw corner plot identification and direction of daubenmire frame readings or any other plot information pertinent to the plot.

Vegetation and Ground Cover

Point-Intercept Vegetation Sampling - Two 30-m point intercept transects will be established along the two transects A and B within the macroplot (see Figure 1). The zero end of the transect will be the start of the transect. Every 1-m along the 30-m transect, all plant species and forest floor surface cover (mosses, lichens, litter) that are intercepted at that point will be recorded. Using a ¼" diameter pole (6 ft fiberglass bike flag), gently lower the pole so that the rod is plumb to the ground (on slopes this will not be perpendicular to the ground). At each point intercept record the species that touch the pole from top to bottom, for example if black spruce was the tallest vegetation at that point hit it would be recorded first, similarly ground cover will always be last. Record the

species code on the *POINT INTERCEPT* Data Sheet. This data was not originally collected at the Paired Plots – added in 2005.

Daubenmire Vegetation Cover Class - To estimate vegetation cover, thirty 20 x 50 cm microplots (Daubenmire frames) are placed every 2-m along two transects A and B, starting at the 1-m point and continuing with every odd meter. The long edge of the frame parallels the transect. Estimate canopy cover for each species of live shrub, herb, bryophyte, lichen and for tree species less than 1-m tall, that is rooted in the plot frame. The following cover classes are used: **0 = 0-5%; 1 = 5-25%; 2 = 25-50%; 4 = 50-75%; 5 = 75-95% ; 6 = 95-100%**

Record the cover estimate of each species for each frame, number 1 through 30. Frame 1 begins at the 1-m point on transect A, continuing to frame 16 -30 on transect B. (Note: the exact sequence of frames was not recorded in any of the plot methodologies written up for the plots in the 1980's, the sequence shown was drawn for a plot in YUCH CCPB-1.)

Active Layer Depths and Burn Severity

Active Layer Depths - Ten active layer points are located along the two transects (A & B) at 3-m intervals, except last point is placed at 29-m. At each point measure the depth of the active layer with the bike flag rod and tape measure. Measure the depth in cm to the point of permafrost or bedrock. If it is possible to determine that depth is to rock, note this on the datasheet.

Burn Severity (1 yr post fire) - Up to 1 yr postfire, at each active layer depth point determine burn severity code (BSC) as described in FMH 2003 for the substrate and vegetation at each active layer point, see Appendix for codes. Burn severity for the plot can be determined using the Composite Burn Index methodology (See FIREMON 2004).

Forest Density

All live trees taller than 1 meter within the 15 x 30-m macroplot will be tallied by species and diameter size classes (< 5 cm, 5.1-10 cm, 10.1-15 cm, 15.1-20 cm, 20.1-25 cm, 25-30 cm, and > 30 cm DBH). To facilitate the counting of trees, tally each 5 x 30-m sub-plot separately – either use one data sheet for each sub-plot or label on the datasheet within each size class columns with 1, 2, and 3. This is also being done so that we can reduce the plot size to the central 5 x 30-m subplot for subsequent measurements. Label the subplot number on the plot map. Count all trees less than 1.4 m tall along two 1-m wide strips along the inner side of the central subplot (Note: it's unclear in original documentation if the whole plot was tallied for seedlings/saplings or a sub-sample).

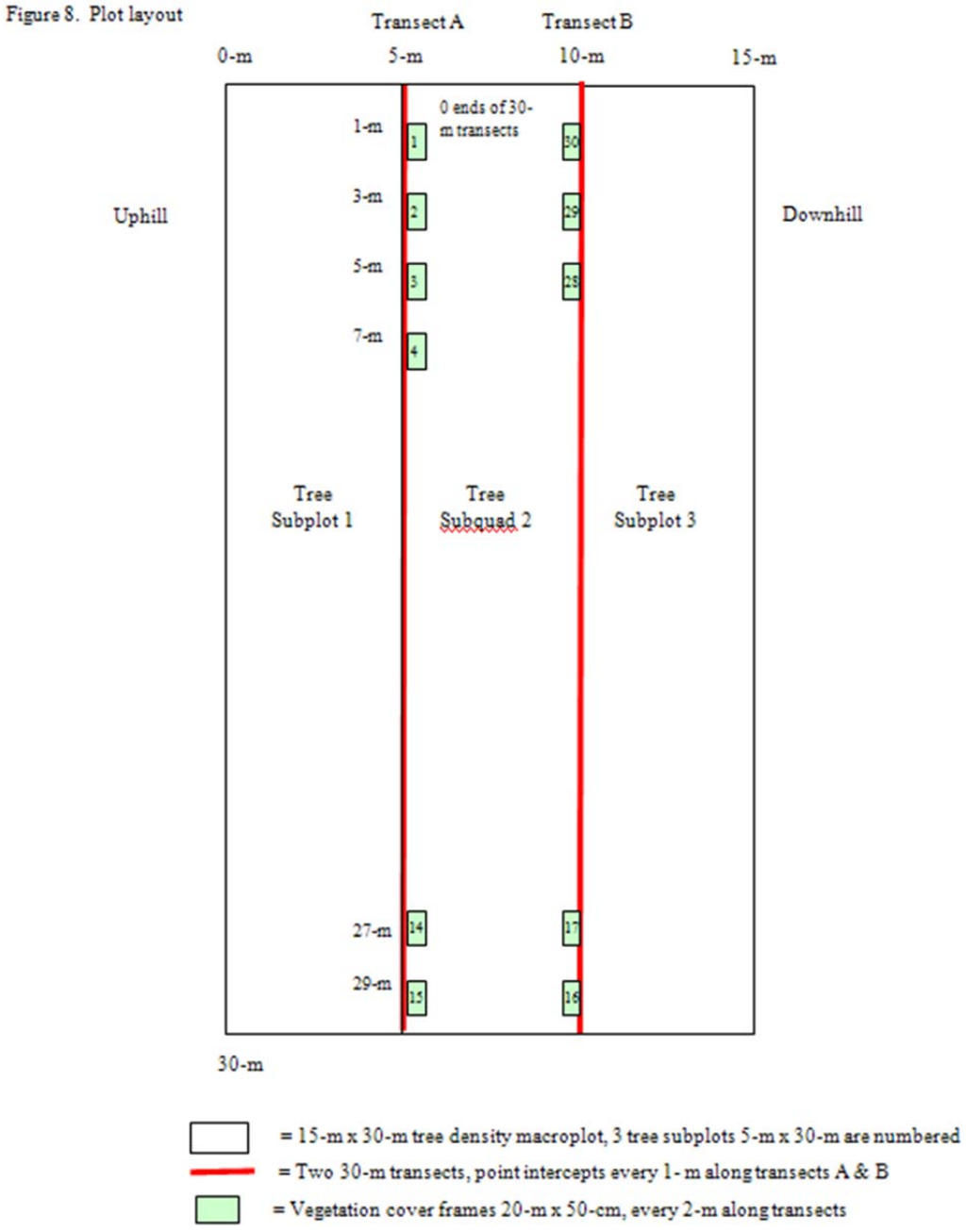


Figure C.4.1 Plot diagram for Paired Plots.

Unit: _____ Project: _____ Plot ID: _____ Pre or Post ___ yrs
Field Date: _____ Field Crew: _____
Fire Number _____ Fire Date: _____ Fire Name:_____
Transect Azimuth: _____ Transect Slope: _____ Declination used: _____
Slope: _____% Aspect: _____ Elevation: _____ ft Viereck class: _____
Soil (circle): Wet Moist Dry **Disturbance** (circle): Fire Wind InsectOther: _____
Evidence of Fire/ Fire Indicators: Burn Snags Burned Stumps Fire Scars Charcoal (circle all that apply)
Photo numbers: _____ **Time of photos**: _____ **Camera used**: _____

Mark all four corners of the 30-m x 15-m plot and record corner directions (N, S, E, W or NE, SW, SE etc.)
GPS Type: _____ GPS Identification: _____ GPS Datum: _____

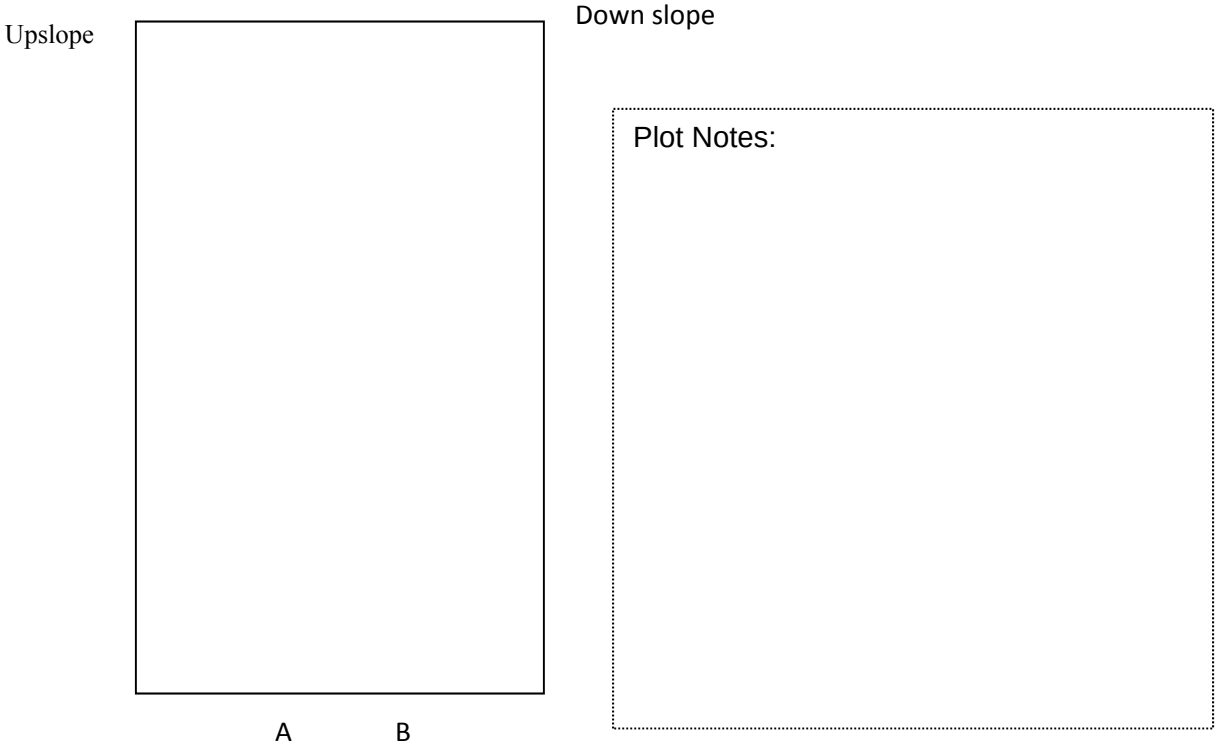
Corner Direction:_____ WP No: _____ Latitude: N_____ Longitude: W_____ GPS Error: ___(m/ft)

Corner Direction: _____ WP No: _____ Latitude: N_____ Longitude: W_____ GPS Error: ___(m/ft)

Corner Direction: _____ WP No: _____ Latitude: N_____ Longitude: W_____ GPS Error: ___(m/ft)

Corner Direction: _____ WP No: _____ Latitude: N_____ Longitude: W_____ GPS Error: ___(m/ft)

Map of Plot Layout: Label direction of daubenmire frames read, tree subplot #, and corner marker directions or numbers. Provide notes on relocating or LZ, burn information and other plot notes as needed below.



Vegetation Point Intercept: Fire Effects Paired Plots

Park Unit: _____ Project: _____ Plot ID: _____ Pre or Post ____ yrs

Field Date: _____ Field Crew: _____ Control or Burn Plot

Record substrate and species codes of trees, shrubs, forbs and groundcover intercepted at each 1-m interval along the two 15-m transects (A and B), for a total of 60 pts. Record plants from tallest to lowest.

PNT	Meters	SPP	SPP	SPP	SPP	SPP	SPP
A 1	1						
2	2						
3	3						
4	4						
5	5						
6	6						
7	7						
8	8						
9	9						
10	10						
11	11						
12	12						
13	13						
14	14						
15	15						
16	16						
17	17						

Plot ID: _____ Field Date: _____

PNT	Meters	SPP	SPP	SPP	SPP	SPP	SPP
18	18						
19	19						
20	20						
21	21						
22	22						
23	23						
24	24						
25	25						
26	26						
27	27						
28	28						
29	29						
30	30						
B 31	1b						
32	2b						
33	3b						
34	4b						
35	5b						
36	6b						
37	7b						
38	8b						
39	9b						
40	10b						

PNT	Meters	SPP	SPP	SPP	SPP	SPP	SPP
41	11b						
42	12b						
43	13b						
44	14b						
45	15b						
46	16b						
47	17b						
48	18b						
49	19b						
50	20b						
51	21b						
52	22b						
53	23b						
54	24b						
55	25b						
56	26b						
57	27b						
58	28b						
59	29b						
60	30b						

0 - 5 % = 1	50 - 75 % = 4
5 - 25 % = 2	**75 - 95 % = 5**

Vegetation Cover – Daubenmire Frames: Fire Effects Paired Plots

Park Unit: _____ Project: _____ Plot ID: _____ Field Crew: _____ Field Date: _____

To estimate vegetation cover, thirty 20 x 50 cm microplots (Daubenmire frames) are placed every 2-m along the inner edges of the central 5 x 30-m subplot, starting at the 1-m point. Canopy cover estimates are made for each species of shrub, herb, bryophyte, lichen and for tree species less than 1-m tall. The following class coverages are used: 0-5 %, 5-25 %, 25-50 %, 50-75 %, 75-95 %, 95-100 % using the numbers above.

SPECIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

Tree Density – Paired Plots

Park Unit: _____ **Project:** _____ **Plot ID:** _____ **Field Date:** _____

Field Crew: _____ **Subplot #:** _____ **Plot Dimensions:** _____

All trees taller than 1.4 meter within the15 x 30-m macroplot will be tallied by species, diameter size classes (< 5 cm, 5.1-10 cm, 10.1-15 cm, 15.1-20 cm, 20.1-25 cm, 25-30 cm, and > 30 cm DBH) and type of damage (insect, fire etc). Tally and record for each of the 3 subplots (5-m x 30-m) within the macroplot. Count all trees <1.4 m (4.5') tall along the two 1-m wide strips along the inner side of the central subplot. **Resprouts:** new growth from older root stock < 1.37 m tall, **Seedlings:** new plants from seeds < 10cm high, **Mature** >10cm

		Tree Counts by DBH (cm)							"Seedlings" 1-m strip A	"Seedling" 1-m strip B
Tree Species	**Status**	**< 5cm**	**5.1-10 cm**	**10.1-15 cm**	**15.1-20 cm**	**20.1 -25 cm**	**25-30 cm**	**> 30 cm**		
Black Spruce (*Picea mariana*)	LIVE								R	R
	Dmg____								S	S
	DEAD									
	Dmg____								M	M
White spruce	LIVE								R	R
(Picea glauca)	Dmg____									
	DEAD								S	S
	Dmg____									

									M	M
Aspen ***(Populus tremuloides)***	LIVE								R	R
	Dmg____								S	S
	DEAD									
	Dmg____								M	M
Paper birch ***(Betula papyrifera)***	LIVE								R	R
	Dmg____								S	S
	DEAD									
	Dmg____								M	M
Balsam poplar ***(Populus balsamifera)***	LIVE								R	R
	Dmg____								S	S
	DEAD									
	Dmg____									

									M	M
Larch **Tamarack (*Larix laricina*)**	LIVE								R	R
	Dmg____									
	DEAD								S	S
	Dmg____								M	M

Active Layer/Burn Severity: Fire Effects Paired Plots

Park Unit: _____ Project: _____ Plot ID: _____

Pre or Post ____ yrs Fire Name/Number: _____ Fire Date: _____

Field Date: _____Field Crew: _____

Record depth of active layer every 3-m along the transects A & B, for each point record if you hit permafrost (pf) or rock (r). If plot has burned within the last year record the burn severity code for the substrate and vegetation using the descriptions following this data sheet.

Transect A:

Point	Distance	Active Layer Depth (cm)	Burn Severity Code (Substrate)	Burn Severity Code (Vegetation)
1	3-m			
2	6-m			
3	9-m			
4	12-m			
5	15-m			
6	18-m			
7	21-m			
8	24-m			
9	27-m			
10	29-m			

Transect B:

Point	Distance	Active Layer Depth (cm)	Burn Severity Code (Substrate)	Burn Severity Code (Vegetation)
1	3-m			
2	6-m			
3	9-m			
4	12-m			
5	15-m			
6	18-m			
7	21-m			
8	24-m			
9	27-m			
10	29-m			

Appendix G: Preparedness Activity Elements

Appendix G.1: Annual Delegation of authority from Park Superintendent

Delegation of Authority for Fire Management Officer, Katmai National Park and Preserve and Alagnak Wild River: Maintained on file in the Fire Management office at the National Park Service Regional Office in Anchorage, AK.

Appendix G.2: Fire Management Staff Roles – Park Superintendent

Need to get this

Appendix G.3: Response Plan

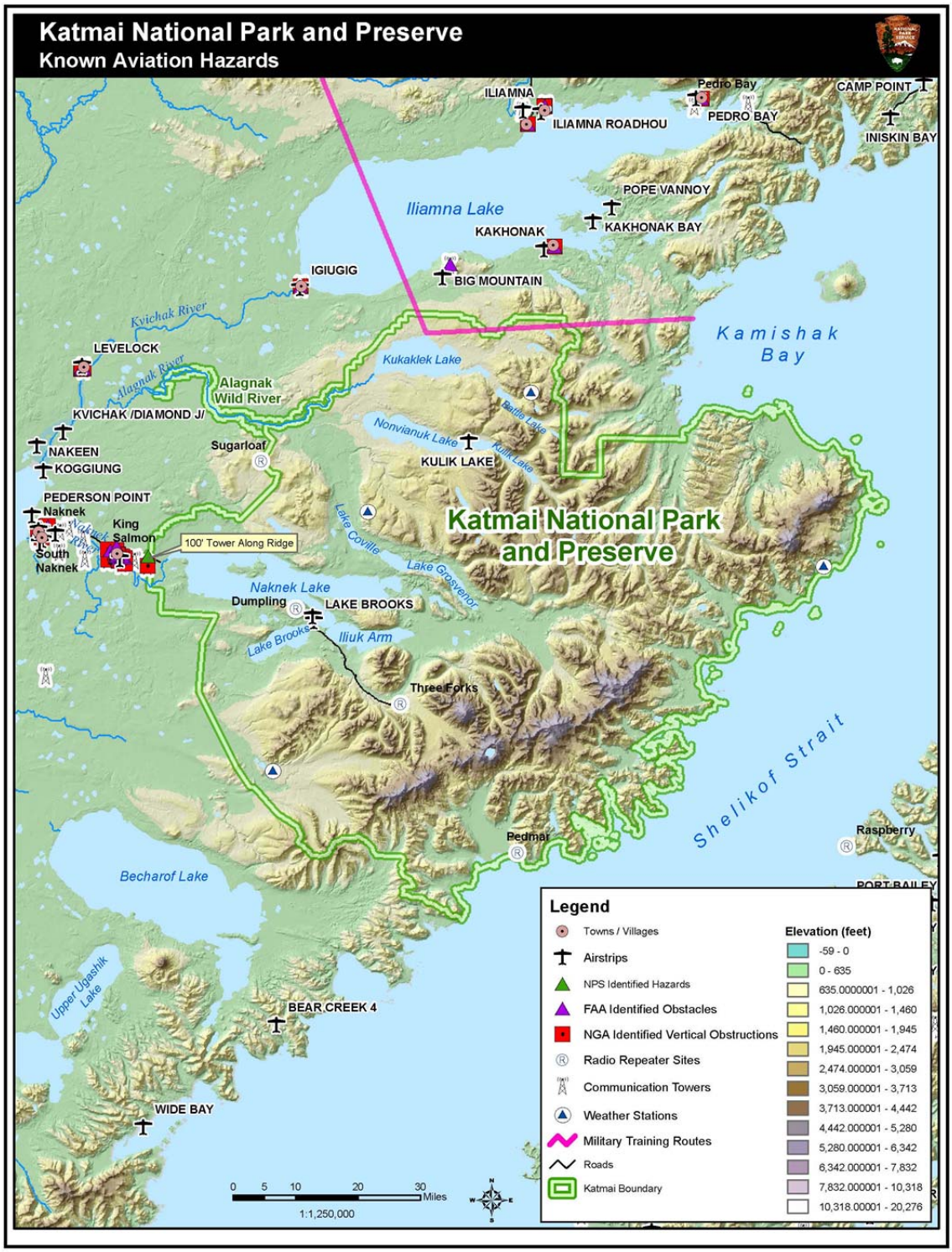
Appendix G.3.1: Alaska Statewide Annual Operating Plan

See Attached

Appendix G.3.2: Southwest Area Orientation Guide

See Attached

Appendix G.4 Aviation Hazards



Appendix G.5: Risk Management Process – from IRPG

Situation Awareness
Gather Information
Objective(s) Previous Fire Behavior
Communication Weather Forecast
Who's in Charge Local Factors
Scout the Fire

Hazard Assessment
Estimate Potential Fire Behavior Hazards
Look Up/Down/Around Indicators
Identify Tactical Hazards
Watch Outs
What other safety hazards exist?
Consider severity vs. probability?

Hazard Control
Firefighting Orders LCES
Anchor Point
Downhill Checklist (if applicable)
What other controls are necessary?

Decision Point
Are controls in place for identified hazards?
NO - Reassess situation YES - Next question
Are selected tactics based on expected fire behavior?
NO - Reassess situation YES - Next question
Have instructions been given and understood?
NO - Reassess situation YES - Initiate action

Evaluate
Human Factors: Low experience level?
Distracted from primary tasks?
Fatigue or stress reaction?
Hazardous attitude?
The Situation: What is changing?
Are strategy and tactics working?

Appendix G.6: Job Hazard Analysis

Job Hazard Analysis (JHA)/Risk Assessment (RA)

A completed Job Hazard Analysis is required for:

1. Jobs or work practices that have potential hazards.
2. New, non-routine, or hazardous tasks to be performed where potential hazards exist.
3. Jobs that may require the employee to use non-standard personal protective equipment (PPE).
4. Changes in equipment, work environment, conditions, policies, or materials.
5. Supervisors and appropriate line managers must ensure that established JHAs are reviewed and signed prior to any non-routine task or at the beginning of the fire season.

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Appendix G.7: After Action Review – from IRPG

After Action Review

The climate surrounding an AAR must be one in which the participants openly and honestly discuss what transpired, in sufficient detail and clarity, so everyone understands what did and did not occur and why.

Most importantly, participants should leave with a strong desire to improve their proficiency.

1. An AAR is performed as immediately after the event as possible by the personnel involved.

2. The leader's role is to ensure skilled facilitation of the AAR.

3. Reinforce that respectful disagreement is OK. Keep focused on the what, not the who.

4. Make sure everyone participates.

5. End the AAR on a positive note.

What was planned?

What actually happened?

Why did it happen?

What can we do next time?

(Correct weaknesses/sustain strengths)

Appendix G.8: Critical Incident Stress Management (CISM) – Red Book

Critical Incident Stress Management (CISM)

A critical incident may be defined as a fatality or other event that can have serious long term affects on the agency, its employees and their families or the community. Such an event may warrant stress management assistance. The local agency administrator may choose to provide CISM for personnel having been exposed to a traumatic event.

The availability of CISM teams and related resources (e.g. defusing teams) varies constantly - it is imperative that local units pre-identify CISM resources that can support local unit needs. Some incident management teams include personnel trained in CISM who can provide assistance. Further information is provided in appendix Q.

Appendix G.9: Sample Delegation/Agency Administrator to IMT

Sample Delegation of Authority
Katmai National Park and Preserve
Alagnak Wild River

As of (time), (date), (year), I have delegated authority to manage the (insert incident name), to Incident Commander (insert name) and his Incident Management Team. The fire, which originated (location). My considerations for management of this fire are:

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. The fire borders are:
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, 2005, issued to Incident Commander (insert name) for the management of the (insert indent name), number (insert fire number), is hereby amended as follows. This will be effective at (insert date).

1. Key cultural features requiring priority protection are:
2. Use of tracked vehicles authorized to protect (insert description of assets to be protected)

(Signature and Title of Agency Administrator) (Date)

Appendix G.10: Modification of Federal Wildland Fire Policy Guidance

See Attached

Appendix H: Communication and Education Plan

Fire Communication Plan

Katmai National Park and Preserve is committed to providing high-quality, proactive, and coordinated fire communication and education to target audiences (listed below). Park staff, the Regional Fire Communication and Education Program (RFC&E) and the Regional Fire Management Program, in concert will fulfill the plan outlined below as appropriate in order to increase internal and external awareness and support. Fire management spans a broad spectrum of programmatic areas including operations, ecology, prevention, GIS, predictive services, fuels, leadership, etc. Based on evolving programs and situations, the park can determine the focus area as appropriate.

Vision

Recognition, acceptance and support of the role of fire in ecosystems and the management of fire and fuels in the National Park Service (NPS)

Mission

To proactively support the Alaska NPS Wildland Fire Management Program through a comprehensive communication and education program that emphasizes wildland fire management and the role of fire in ecosystems.

Goals

1. Internal and external audiences understand and support the role of fire in ecosystems and the management of fuels and fire.

2. As an integral part of the NPS, the Alaska Fire Management Program collaborates with all disciplines.

3. Provide accurate and timely fire information for local, regional, and national fire operations as needed.

4. Coordinate and collaborate with stakeholders, partners and peers for maximum efficiency and effect.

5. Facilitate an effective, two-way dialogue about fire in national parks in order to build trust and understanding with internal and external audiences.

Staffing

The RFC&E Specialist steers the Alaska NPS Fire Communication and Education Program and serves as a resource to parks by coordinating all matters related to the program. The specialist assists parks in using ongoing communication and education strategies, consultation and collaboration to enhance fire management programs. When a fire incident occurs, regardless of the different scenarios that might unfold, the Regional Fire Management Officer will contact the designated park Public Information Officer (PIO) and the RFC&E Specialist. The RFC&E Specialist then collaborates with the park's PIO through the duration of the incident. If the need arises and pending approval by the superintendent or delegate, the PIO and/or the RFC&E Specialist will recruit personnel for specific duties or outside resources will be requested through dispatch procedures. For further information, review the Information Officer Step-Up Plan at http://bit.ly/wMlLWu. Park staff and Alaska NPS Regional staff actively participates in and supports the FC&E program.

If an incident management team deploys to manage a fire that affects KATM, park staff will interact with and support the team's PIO. Park staff and/or the RFC&E Specialist will share NPS messages with the IMT team for inclusion into information dissemination. The Interagency Master Agreement and Interagency Operating Plan http://fire.ak.blm.gov/administration/asma.php and subsequent delegation of authority address specific protection agency and IMT team procedures.

Key Messages

The cornerstone of any communication effort is a set of consistent, compelling messages for use in all proactive and reactive communication. Messages should be actionable where appropriate so that, in addition to educating, they will motivate the audiences to act on what they have learned. They help the communicator move beyond the facts and tell the fire story. Refer to the NPS wildland fire key messages tip card for tips on how to tell the story (what, why, and how); contact the RFC&E Specialist for hard copies.

Key messages are general concepts that can be incorporated into discussions, print materials, and other resources used in communication, education, information, and prevention efforts. Key messages are umbrella statements that require additional supporting points and examples for context. These messages are not meant as a script; however they are intended to provide a foundation for crafting comments in response to inquiries from the public and media. It may also be helpful to review the National Interagency Fire Center (NIFC) themes, as these messages are updated on an annual basis to include pertinent, emerging topics. These themes are part of the PIO toolkit and can be located at http://www.nifc.gov/PIO_bb/pio_main.html.

The NPS Wildland Fire Management Program key messages are listed below. Details on the messages can be found in the NPS Wildland Fire Management Communication Plan. These messages and the Alaska wildland fire key messages are designed to meet the following criteria:

1. **Coincide with and not contradict interagency messages.** It is critical that the wildland fire community speak with one voice to the public. The NPS wildland fire messages are designed to complement the interagency messages listed below. The NPS wildland fire messages also are designed to be fluid. These messages do not address specific policy issues. NPS staff will rely on policy-related messages as they are revised.

2. **Allow for customization.** These messages are a guide, not a script. Users are encouraged to provide additional, local detail to ensure the messages touch audiences in a relevant, credible way.

3. **Include a call to action.** In addition to educating, messages should motivate the audiences to act on what they have learned.

4. **Answer the questions what, why, and how.** Categorizing messages in this way will help users recall the messages during appropriate situations.

NPS Wildland Fire Key Messages

What
1. The NPS is a leader in the wildland fire community.
2. The NPS Wildland Fire Management Program is committed to safety, science, and stewardship.

Why
3. Wildland fire is an essential, natural process.
4. *Science tells the story:* Today's environment includes hotter, drier, and longer fire seasons. Research also indicates poor ecosystem health and an increasing number of homes in fire prone areas.

How
5. The NPS works with our neighbors and other partners to preserve and protect park resources and mitigate wildfire risk in the wildland-urban interface (WUI).

The Alaska Wildland Fire Coordinating Group, Wildland Fire Education and Prevention Committee developed Alaska interagency key messages and can be viewed at http://fire.ak.blm.gov/administration/awfcg.php

Alaska Key Messages

1. Public and firefighter safety is our first priority.
2. Wildland fire happens, be ready.
3. Wildland fire is an essential, natural process.
4. Alaskans work together to manage wildland fire.
5. Managing wildland fire in Alaska balances risks and benefits in an ever changing environment.

Katmai National Park and Preserve will provide supporting points and highlight pertinent key messages on an incident-specific basis depending on the details of the fire and the communities affected.

Target Audiences

The park has identified target audiences for fire education and key messages.

1. **Park Visitors** – In-park visitors and special groups
2. **Virtual Visitors** – Website visitors and those who utilize social web such as Twitter for information sharing
3. **Park Employees** - NPS, Alaska Geographic, concessions, and volunteers
4. **Local Communities** – Residents and property owners, local and tribal government, businesses near the park, and special interests such as city councils or advocacy groups
5. **Student/Teachers** – K-12 students and teachers, college/graduate school students, and elder hostel groups

6. **Professional Peers/Partners** – Federal, state and local agencies, professional associations, and academics

7. **Special Interest and Tourism Related Groups**.

8. **Commercial Use Authorizations** – Businesses that operate in the park such as flight services, guide services, and boat charters

9. **Elected Officials** – Federal, state, and local

10. **Media** – Print, television, radio, film, and web-based news publications

11. **Incident Management Teams (IMT)** – Type 1, 2, and 3 IMT teams that may be from Alaska or the Lower 48

Communication Methods

The following methods will be used as appropriate to communicate with the target audiences listed above. There are both personal and non-personal methods which will facilitate reaching the largest number of people. The park will continue to improve and expand this list.

Personal

1. **Interpretive Programs** – Park staff will integrate fire messages into the variety of programs offered by the interpretative division.

2. **Education Programs** – Park staff and Regional Fire Management staff will incorporate fire ecology, fire behavior, fire management and Firewise concepts into curriculum-based education programs, student field research experiences and in-class programs.

3. **Employee Training** – Regional Fire Management Program and park staff will coordinate employee training sessions to improve staff understanding of the fire management program.

4. **Presentations** – Regional Fire Management staff will give peer presentations at conferences about current fire research, planning, or operations.

5. **Special Events** – Park staff and Regional Fire Management staff will participate in local events (festivals, July 4th celebrations) to promote the fire management program.

6. **Public Meetings** – As needed, Regional Fire Management staff will conduct special public meetings related to a specific fire event, planning effort or to share general program information.

7. **Workshops** – With help from interagency and educational partners, RFC&E Specialist and the park staff will offer in teacher workshops that incorporate fire ecology and management issues. Regional Fire Management staff and park staff will participate as needed.

8. **Interagency Meetings** – Park staff, Regional Fire Management and RFC&E Specialist will participate in interagency work groups to collaborate with statewide and national partners to share information and complete special projects. One example is the pre-season meeting to discuss the Annual Operating Plan. This document can be reviewed in the spring to help inform park staff of expected fire management operations. It will help define the role of information during the fire season and the collaboration between land managers and the service providers.

9. **Media Interviews** – Park PIO and/or RFC&E Specialist will facilitate or complete in-person or phone interviews for print, radio, and television outlets. When necessary the RFC&E Specialist will facilitate special media projects (books, documentaries etc.) by guiding research, scheduling interviews with appropriate staff, and coordinating filming schedules.

10. **Fire Interest List** – RFC&E Specialist maintains a listserv of individuals interested in receiving e-mails on all aspects of wildland fire.

11. **Recorded Phone Message** – Park PIO and/or RFC&E Specialist will maintain a recorded "Fire Information" message. RFC&E specialist will provide a script when requested.

12. **Social Web** – Currently, Twitter and Facebook are the main social web tools utilized by parks in Alaska. Park PIO (or designee) will update the KATM Twitter page as necessary and the RFC&E Specialist will update the Alaska NPS Twitter and Facebook pages. Maintained year-round, these posts will serve as brief updates on park information including fire. The RFC&E will coordinate with the park designee to disseminate information as necessary. This method of communication is two-way. It allows both the park and the public to make comments on the park pages and provides the opportunity for the parks to respond.

Non-Personal

1. **Webpage** – Park staff will create and maintain a fire management webpage that is linked to the main park webpage. RFC&E Specialist can assist as needed.

2. **Fire News, Inciweb** – Regional Fire Management staff, park PIO, and/or park staff with support from RFC&E Specialist will update Fire News throughout the duration of an incident. Update InciWeb as an incident warrants.

3. **AK2day and Inside NPS** – Park PIO and/or RFC&E Specialist will submit information regarding fire management activities on these internal websites.

4. **Press Releases/ Updates** – Park PIO and/or RFC&E Specialist will use email, fax, and bulletin boards to distribute press releases/updates, photos and public fire maps for all target audiences as needed.

5. **Public Fire Maps** – Regional Fire Management staff will produce internal and external fire incident maps. Area fire management programs may provide some assistance.

6. **Press Kit** – RFC&E Specialist and/or park PIO will compile and annually update a fire information press kit.

7. **Fire Education Trunks** – RFC&E Specialist will supply the park with fire educational materials. Park staff, with assistance from the RFC&E Specialist, will resupply the materials as needed. Trunks are available; please contact RFC&E to discuss.

8. **Visitor Center Exhibits, Wayside Exhibits, Bulletin Boards, and Displays** – Park staff will maintain and update the interpretive information in visitor centers and wayside exhibits on fire management. RFC&E Specialist will provide support as needed.

9. **Portable Displays and Banner Stands** – RFC&E Specialist will store and organize several portable displays and banner stands for use at trainings, workshops, meetings, public events and conferences.

These portable displays are either kept in an area cache or can be shipped from the Anchorage office as needed.

10. **PIO Supplies** – Fire information kits, banners, nametags, and vehicle magnets are available at the regional office.

11. **Publications** – Park staff will include fire management information in regular park publications. The Regional Fire Management Program will engage with the park staff in development of park publications. RFC&E Specialist with park support will research, write, and design additional handouts specifically about fire management such as newspapers, fire stories, brochures, posters, and templates. The RFC&E Specialist maintains a variety of fire brochures available for the park.

12. **Scientific Papers** – Park researchers and/or Regional Fire Management staff will publish park papers in scientific journals and/or periodicals regarding new information from the park's fire management program.

Emerging Tools

This plan provides recommendations for regional and park level fire communication and education programs. Digital communication tools will continue to emerge. It is important to stay abreast of new technology in order to relay the NPS safety and educational messages about wildland fire. Currently, Twitter and Facebook are the main social web tools used in parks; it is very likely that this will evolve and more tools will be used in the near future.

Guiding Documents

1. The *NPS Wildland Fire Management Strategic Plan* represents input from all levels and disciplines within the NPS Wildland Fire Management Program, from parks to the national office, as well as the NPS Natural Resource Program and our interagency partners. It is intended to establish key strategies that should be applied at all levels of the NPS Wildland Fire Management Program to achieve critical management objectives in support of the mission. This plan is current through 2012; view the plan at http://1.usa.gov/wbwRpD.

2. The *NPS Wildland Fire Management Communication Plan* was written by the NPS Division of Fire and Aviation Management in coordination with the 20th anniversary of the 1988 fires in Yellowstone National Park and the Northern Rockies. This plan has developed a communications initiative to reach internal and external audiences with a clear, consistent message about the role of wildland fire management in NPS units and surrounding communities. The purpose of this initiative is to reinforce the National Park Service's position as a resource for fire management information and to better inform internal and external audiences about the role of wildland fire and the role of NPS Fire and Aviation in managing it. A subsequent goal is to reinforce the cultural significance of the NPS and its historical leadership in land management. View this plan at http://bit.ly/w2ecBX.

3. The draft *Alaska Region Fire Communication Strategy* introduces the duties and responsibilities of the NPS Alaska Regional PIO. Contact the RFC&E Specialist for more information.

4. NPS *Social Media* at http://insidenps.socialmedia.gov provides guidance to parks and programs in the use of social web including policy, guidelines, branding, multimedia sharing websites, blogs and micro blogs, social networking websites, and third party widgets.

The *Katmai National Park and Preserve* Fire Communication and Education (FC&E) Program, tailored to the local level, complements the aforementioned plans in its vision, mission, and goals.

Other Important Fire Information References

While these documents provide the philosophy and general direction for the FC&E Program, there are two other important references for fire information work. For specific operational procedures (checklists, fax numbers, email lists, community contacts, contact the Chief of Interpretation at KATM, based in King Salmon. The Information Officer Step-Up-Plan located at http://bit.ly/wMlLWu provides the PIO recommendations during a park fire incident.

Evaluation

To maintain a successful program, the NPS Wildland Fire Management Program will seek evaluation opportunities such as independent surveys of visitors/residents/employees. Staff will conduct program reviews for the regional and park fire management programs. After action reviews are a part of the fire culture and will be used as appropriate.

Education Annual Plan by Season

The table describes the FC&E annual plan which gives year-round recommended guidelines for the FC&E program. Educational elements and communication methods are emphasized according to season. The table highlights these emphasis areas and links them to communication methods and target audiences. It is important to remember that this plan is general and will not prevent the program from engaging in new, innovative methods in the future.

Table 1 – Communication/ Education Annual Plan by Season (recommended guidelines): Katmai National Park and Preserve.

Season	Communication/ Education Emphasis	Communication Methods	Target Audiences										
			Park Visitors	Virtual Visitors	Park Employees	Local Communities	Studhents /Teachers	Professional Peers	Tourism Groups	Commercial Use Authorizations	Elected Officials	Media	Incident Management Teams
Spring	Pre-Season Information	Interagency meetings Fire interest lists Social web Webpage Press releases /updates Portable displays Publications Brochure distribution	*		*	*		*	*			*	*
	Key messages	Employee training Special events/ public meetings Interagency meetings Media interviews/ press kit Social web Webpage Portable displays Publications	*	*	*	*	*	*	*	*	*	*	*
	Student/ Teacher Education	Education programs Workshops					*						
	Employee Education	Employee training Presentations Special events/ public meetings Fire interest lists AK 2day and Inside NPS			*								
	Restock Comm. Ed Cache	Publications			*								
	Interagency Cooperation	Presentations Interagency meetings Fire interest lists Scientific papers			*			*					*

	Recruitment	Interagency meetings Fire interest lists Webpage			*	*	*						*
Summer	Incident Information	Special events / public meetings Media interviews/ Press kit Recorded phone messages Social web Webpage Fire News/ Inciweb Press releases / updates Public fire maps Exhibits/ bulletin boards Portable displays/ banner stands	*	*	*	*		*	*	*	*	*	*
	Key messages	Special events/ public meetings Media interviews Social web Webpage Press kit Portable displays Publications	*	*	*	*		*	*	*	*	*	*
	Interpretation	Interpretative programs Fire education trunks Exhibits/ displays	*			*						*	
	Employee Education	Fire interest lists AK 2day and Inside NPS Presentations Scientific papers			*								
	Interagency Cooperation	Fire interest list Press releases / updates Fire News/ Inciweb			*			*					*
Season	Communication/ Education	Communication Methods	Target Audiences										

	Emphasis		Park Visitors	Virtual Visitors	Park Employees	Local Communities	Students /Teachers	Professional Peers	Tourism Groups	Commercial Use Authorizations	Elected Officials	Media	Incident Management Teams
Fall	Post-Season Information	Special events / public meetings Media interviews Webpage Press releases / updates Publications	*		*	*	*	*	*			*	*
	Employee Education	AK 2day and Inside NPS Publications/ scientific papers			*								
	Interagency Cooperation	Interagency meetings Fire interest lists Press releases / updates Publications/ scientific papers			*			*					*
	Student/ Teacher Education	Education programs					*						
Winter	Post-Season Information	Webpage Publications	*	*	*	*							
	Development of New Materials	Exhibits/ displays Portable displays Printed publications Publications/ brochures	*		*	*	*	*				*	*
	Key message review	Employee training Interagency meetings			*			*					*
	Restock Comm. Ed cache	Publications											
	Employee Education	AK Today and Inside NPS Publications/ scientific papers			*								
	Interagency Cooperation	Presentations Interagency meetings Fire interest list						*					*
	Student/ Teacher Education	Education programs				*							

Appendix I: Fire Prevention Plan

Katmai National Parkland and Preserve does not meet the threshold of human caused fires to require a fire prevention plan. Fire prevention programs and messages will be coordinated through the NPS Alaska Regional Office. As stated in the Preparedness chapter of *Interagency Standards for Fire and Fire Aviation Operations*, National Park Service units that experience more than 26 human-caused fires per 10-year period are required to conduct a wildland fire prevention analysis and prepare a wildland fire prevention plan.

Appendix J: Duty Officer Manual

Fire Duty Officer Guidebook: See the Redbook Chapter 3 for NPS Duty Officer roles and responsibilities. In addition to the duties/responsibilities as identified in the Redbook, the Duty officer will ensure that all incident operations follow the guidelines as established in the Alaska Interagency Master Agreement and Supplemental AOP and procedures as outlined in the Response Plan (Appendix G). Effectively the Protection Agency Duty Officer for KATM is the SWSC Fire Management Officer. However occasions will occur when another authorized Duty Officer will be identified. The authorized duty officer will be communicated to all parties (ie, Agency Administrator, NPS Regional Fire Management Officer, Protection Agency FMOs and dispatch centers).

The NPS RFMO or designee is generally the Duty officer for KATM who works as a liaison between the park and the Protecting Agency. The Protecting Agency has a Duty officer of their own who coordinates response to reported fires. All fires should be reported to the Protecting Agency Duty Officer. If unable to reach the Protecting Agency, fire reports ought to be directed to the NPS Duty Officer who will get in touch with the Protecting Agency through alternative avenues. A Regional NPS Duty Officer Manual is available at the Regional Office and will be linked to the FMP.

Appendix K: Standards for MIT, BAER and Rehabilitation

See Section 4.4 Burned Area Emergency Response of this FMP.

Appendix L: Cooperative and Interagency agreements

The following documents are on file in the Fire Management Office at the NPS Regional Office in Anchorage, AK.

1. 2011 Alaska Master Cooperative Wildland Fire Management and Stafford Act Response Agreement
2. 2011 Alaska Statewide Annual Operating Plan

Appendix M: Contracts for Wildfire and Prescribed Fire Resources

Alaska Interagency Coordination Center (AICC):

Center Manager	356-5677
Tactical Resources Coordinator	356-5690
Fire Management Officer (SWSC)	524-0037
Assistant Fire Management Officer (SWSC)	524-3010
Southwest District Dispatch (SWSC)	524-3367 524-3366N
Dispatch Coordinator(SWSC)	524-0053

National Park Service:

Superintendent, KATM	246-3305 (Office)
Fire Management Officer, Alaska Region	644-3409 (Office)

Appendix N: Notification Procedure

See the 2011 Alaska Master Cooperative Wildland Fire Management and Stafford Act Response Agreement and the 2011 Alaska Statewide Annual Operating Plan Section 24 for notification procedures.

Appendix O: Serious Injury or Death Procedure

All person assigned to a wildfire shall be under the operational control of the Protection Agency. Serious injury or death procedures will follow the guidelines as established by the 2011 Alaska Master Cooperative Wildland Fire Management and Stafford Act Response Agreement and the 2011 Alaska Statewide Annual Operating Plan. In general, procedures will be conducted jointly between the Protection and Jurisdiction Agencies for serious injury or death procedures that occur associated with a wildfire incident. Serious injury or death procedures for non-wildfire incidents will follow the local SOP process, or Regional process.

Appendix P: Safety Program Plan

See Section 4.1 Safety. Additional Safety information can be found through the NPSafe Program.

Appendix Q: Smoke Management Plan

See Section 4.7 Air Quality and Smoke Management.

Appendix R: WFDSS Objectives and Requirements

See Sections 3.1 Park-wide Fire Management Considerations and 3.2 Fire Management Unit Specific Characteristics.