Kenai National Wildlife Refuge
2001 FIRE MANAGEMENT PLAN

PREPARED BY:
Fire Management Staff
U.S. FISH AND WILDLIFE SERVICE
KENAI NATIONAL WILDLIFE REFUGE
Soldotna, Alaska

KENAI NATIONAL WILDLIFE REFUGE

FIRE MANAGEMENT PLAN

Revised September 2001

(09/28/01)

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Prepared By Kenai National Wildlife Refuge Fire Management Staff

2001 Fire Management Plan

EXECUTIVE SUMMARY

The U.S. Fish & Wildlife Service Fire Management Handbook states, "Every area with burnable vegetation must have an approved Fire Management Plan. Fire Management Plans must be consistent with firefighter and public safety, values to be protected, and land, natural, and cultural resource management plans, and must address public health issues."

It is the policy of the United States Department of the Interior – U. S. Fish and Wildlife Service (USFWS) to employ fire whenever it is the most appropriate management tool for managing refuge resources and to protect against fire whenever it threatens refuge resources, private property, or human health and safety (6 RM 7.2). Pursuant to this policy, the Kenai National Wildlife Refuge (KNWR) has developed this Fire Management Plan (FMP) to define wildland fire management objectives and provide the appropriate guidelines for fire suppression, fire use, and fuels management activities --- to guide refuge managers in making land-use decisions to achieve specific resource management objectives.

The Kenai National Wildlife Refuge Comprehensive Conservation Plan (CCP) is the "master" land use plan for the refuge. The CCP, as approved in 1985 and supplemented in 1988, established the long-term goals, objectives and directions for Fish & Wildlife Service management of refuge lands and resources. The CCP provided the following general fire management directions: "Prescribed burning will continue to be the principal technique used to modify plant succession, remove accumulated fuels, and create natural firebreaks in non-wilderness areas." "Adjacent private lands, inholdings, and refuge structures will continue to receive the maximum possible fire protection." "Agreements will be formulated with local and state fire suppression agencies." The CCP also stated, "Fire would be considered a desirable component of refuge ecosystems." "Prescribed fire and natural fire would be used to (improve) the habitat of moose and other early successional stage species and to reduce accumulated fuel loads."

According to USFWS policy, the CCP is the foundation upon which a four-tiered land-use planning system is built. By design, the second planning level is the Habitat Management Plan. The habitat management plan should define specific resource management objectives for the refuge. The Fire Management Plan is the third planning level. It should describe activities designed to meet the resource management objectives listed in the habitat management plan and the CCP. The fourth planning level is the site-specific, project implementation plan such as the Prescribed Fire Plan or the Wildland Fire Situation Analysis.

This fire management plan replaces the previous refuge FMP, approved in 1988. The Moose/Habitat Management Plan was prepared by refuge biologists and subsequently adopted in April 1996. The Moose Management Plan recommended the "implementation of a long-term habitat manipulation program using prescribed burning as the primary tool". It further stated, "Prescribed burning is the most practical means to maintain early seral forest stands in the

acreages necessary to sustain near-current moose densities on the KNWR and to manage the amount and continuity of forest fuels in order to decrease the risk of large catastrophic wildfires". The Moose Plan's preferred alternative recommended that 2,000 – 4,000 acres per year be treated with prescribed fire.

This FMP provides the planning framework and management direction necessary to ensure these refuge objectives are met, while providing for the protection and/or enhancement of cultural and natural resources and life and personal property. This planning effort is designed to span a five-year period, at which time it should be reviewed and revised as necessary. Attachments such as the Dispatch Plan will be updated annually. The refuge is scheduled to begin the CCP revision process in the next 12-24 months. In the event that the Refuge CCP is revised before the next revision of the FMP, the FMP will be reviewed and amended as necessary to comply with the new CCP.

ACKNOWLEDGEMENTS

The refuge wishes to acknowledge the following individuals for their significant contributions to this planning effort:

Pamela Ables, Larry Adams, Ted Bailey, Edward Berg, Andrew DeVolder, Alicia Duzinski, Richard Ernst, Elizabeth Jozwiak, Mary Kwart, Bill Larned, Dianne MacLean, Brandon Miner, Doug Newbould, Kelly Shea, Sue Schulmeister, Anthony Snow, Larry Vanderlinden and Brenda Wise.

TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

SECTION SIX
Appendices

LIST OF TABLES

Page

LIST OF FIGURES

Page

1.0 – INTRODUCTION

1.01
Introduction

The Kenai National Wildlife Refuge - Fire Management Plan (FMP) is a landscape-level management plan designed to guide the implementation of department, service, region and refuge policies and objectives. The FMP provides the planning framework for refuge fire management decision-making, and specifies the uses of fire, which are consistent with and can enhance refuge wildlife and habitat management objectives. The FMP identifies procedures for the preservation, protection and enhancement of natural and cultural resources, as well as life and personal property on and adjacent to the refuge, with respect to wildland and prescribed fire. The FMP provides specific guidance and management directions for wildland and prescribed fire management activities on the refuge.

1. ENABLING LEGISLATION

The most important orders and laws affecting the operation and management of the Kenai NWR are Executive Order 12996, the National Wildlife Refuge System Administration Act, the Refuge Recreation Act, the Endangered Species Act, the Fish and Wildlife Act of 1956, and the Alaska National Interest Lands Conservation Act (ANILCA). A complete listing of legislation and policy governing this document follows:

Alaska Interagency Wildland Fire Management Plan, as amended October 1998.
Alaska National Interest Lands Conservation Act (ANILCA) of December 2, 1980 (94 Stat. 2371).
Alaska Native Claims Settlement Act of Dec.18, 1977 (88 Stat. 668; 43 U.S.C. 1601).
Clean Air Act as amended in 1990 (42 USO 7418), Section 118.
Departmental Manual, 620 DM 1 & 2.
Disaster Relief Act of May 22, 1974 (88 Stat. 143; 42 U.S.C. 5121).
Economy Act of June 30, 1932.
Endangered Species Act (as amended in 1973).
Federal Fire Prevention and Control Act of Oct. 29, 1974 (88 Stat. 1535; 15 U.S.C. 2201.
Federal Grants and Cooperative Act of 1977 (P.L. 95-224, as amended by P.L. 97-258, September 13, 1982; 96 Stat. 1003; 31 U.S.C. 6301-6308).
Federal Property and Administrative Services Act of 1949.
Federal Wildland Fire Management Policy of 2001.
Federal Wildland Fire Management Policy & Program Review of December 18, 1995.
Fire Management Handbook, 621 FW (06/28/01).
Fiscal Year 2001 Interior and Related Agencies Appropriation Act.
Kenai National Wildlife Refuge Final Comprehensive Conservation Plan, Environmental Impact Statement, and Wilderness Review, June 27, 1985, and Supplemental EIS for the Wilderness Proposal, October 20, 1988.
National Environmental Policy Act of 1969 (NEPA).
National Historic Preservation Act of 1966, Section 106.
National Wildlife Refuge System Administration Act of 1966 as amended (80 Stat. 927; 16U.S.C. 668dd-68ee).
Protection Act of September 20, 1922 (42 Stat. 857; 16 U.S.C. 594).
Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66, 67; 42 U.S.C. 471).
Supplemental Appropriation Act of September 10, 1982 (96 Stat. 837).
Wilderness Act of 1964, and as may be amended by ANILCA (see Section 702(7)).
Wildfire Suppression Assistance Act of 1989, (P.L. 100-428, as amended by P.L. 101-11, April 7, 1989).

2. NEPA COMPLIANCE

The management directions and actions specified in this fire management plan were previously evaluated in the approved Kenai National Wildlife Refuge Comprehensive Conservation Plan, Environmental Impact Statement, the Supplemental Environmental Impact Statement for the Wilderness Proposal, the Moose/Habitat Management Plan, and to some extent by the Alaska Interagency Fire Management Plan (AIWFMP). Public participation in those planning processes was encouraged and documented during scoping, in the development of alternatives and in the decision documents. The CCP and its associated documents specifically outline the acceptable range and magnitude of fire management actions for the KNWR, and this plan is the landscape-level planning document for those permissible activities. As a mid-level, tiered, internal planning document, the KNWR-FMP is covered under the CCP, the Moose Management Plan and the AIWFMP, and is categorically excluded from further documentation, as it complies with the requirements of the National Environmental Policy Act (NEPA). [See: Environmental Action Memorandum at the beginning of this plan.]

In reference to Section 810 of the Alaska National Interest Lands Conservation Act (ANILCA), the actions outlined in this fire management plan are not expected to have any significant negative impacts upon Subsistence activities on or adjacent to the Kenai NWR.

Individual, ground-disturbing fire management projects designed to implement the management directions and accomplish the goals and objectives of this FMP, will be subject to NEPA requirements. The fire management project planning process will normally follow these steps: 1) Project Proposal, 2) Scoping, 3) Development of Alternatives, 4) Environmental Analysis, 5) Decision Documentation, 6) Project Implementation, and 7) Monitoring and Evaluation. *During scoping, to comply with the requirements of NEPA and ANILCA, the refuge will provide adequate opportunities for the public to comment in writing about proposed new fire management projects including prescribed fire and hazard fuel reduction projects. Ongoing or multi-year projects will undergo the initial public comment period, then will be listed on the annual list of projects until completed.* The level of environmental analysis will depend upon the issues identified during public scoping, upon the alternatives subsequently developed, and upon the potential social and environmental impacts of the alternatives. There are three levels of environmental analysis possible: Categorical Exclusion (CE), Environmental Assessment (EA) and Environmental Impact Statement (EIS). Refuge fire managers will consult with regional FWS environmental compliance experts to select the appropriate level of analysis for each proposed project.

USFWS Fire Management activities which result in the discharge of air pollutants are subject to, and must comply with, all applicable Federal, State, interstate and local air pollution control requirements as specified by Section 118 of the Clean Air Act (42 USO 7418). The Alaska Department of Environmental Conservation (ADEC) reviews refuge prescribed fire plans for air quality compliance and makes recommendations to the refuge about the implementation of those plans. These requirements impact refuge fire

operations in the same way a private individual or other non-governmental entity would be impacted (561 FW 2).

The USFWS Region 7 Historic Preservation Officer (RHPO) will coordinate with the State Historic Preservation Officer (SHPO), on all matters concerning the potential impacts of fire management activities upon historical and cultural resources within the KNWR. Refuge fire management will notify the RHPO during the planning process for all proposed prescribed fire projects, and as early as practical – during the management of a wildland fire. The RHPO will provide direction as to whether a survey of the area has been done or whether consultation with the SHPO is necessary. Resources listed or considered for listing in the National Historic Register, may be subject to special requirements under the National Historic Preservation Act (NHPA).

The Kenai National Wildlife Refuge is located in the USFWS-designated South Central Ecosystem Unit of Alaska (Figure 1).

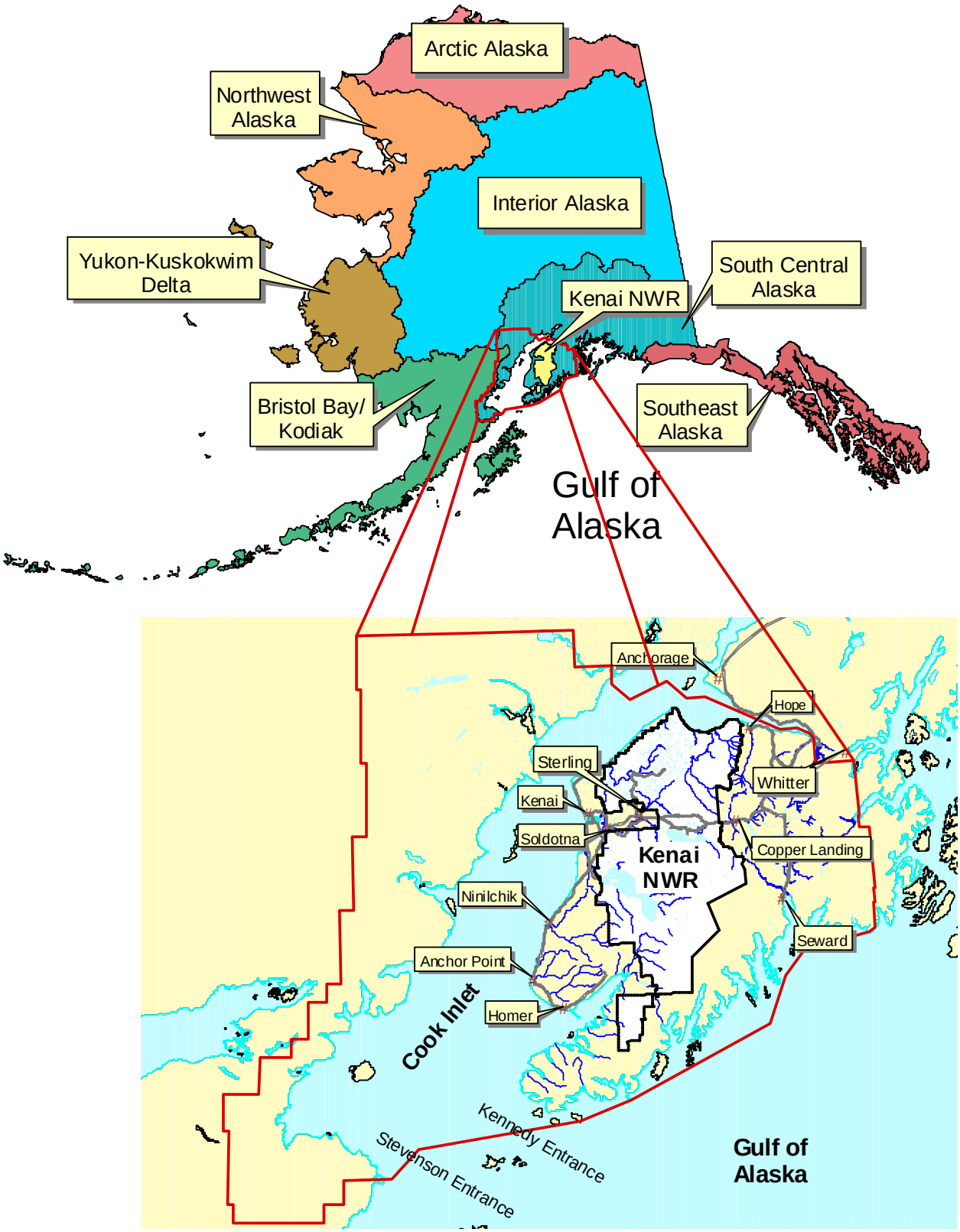

Figure 1: Location of Kenai NWR

1.02
Resource Objectives

The refuge fire management goals and objectives identified in this plan are closely tied to the goals, objectives and management directions outlined in the Comprehensive Conservation Plan, the Moose Management Plan and the Alaska Interagency Wildland Fire Management Plan.

- Protect life, property and identified critical resources from the adverse effects of wildland fire.
- Ensure public, employee and fire fighter safety in all fire management activities on the refuge.
- Reduce the threat of unwanted wildland fire in the wildland-urban interface, in high-use recreation areas and in critical habitats, through mechanical hazard fuel reduction and fire use projects.
- Utilize wildland and prescribed fire as a cost-effective habitat management tool where practicable, to maintain or enhance the natural diversity of ecosystems, wildlife habitats and wilderness values, and to maintain existing populations of moose and other early seral-dependent species.
- Coordinate refuge fire management activities such as prevention, preparedness, fire use, suppression, training and research with cooperating agencies and local fire departments to optimize the effectiveness and efficiency of fire management operations on the Kenai Peninsula and in Alaska.
- Encourage public involvement in refuge fire management programs such as wildfire prevention/mitigation and wildland and prescribed fire use through the promotion of the FireWise Community Action Program, through multi-media public information campaigns, and through environmental education programs.

The range and magnitude of fire management actions and of land and resource uses on the refuge are defined by management area in the CCP (Figure 2). The Alaska Interagency Wildland Fire Management Plan (AIWFMP) defines wildland fire suppression responses/actions on the refuge and throughout Alaska (Figure 3, Fire Management Options).

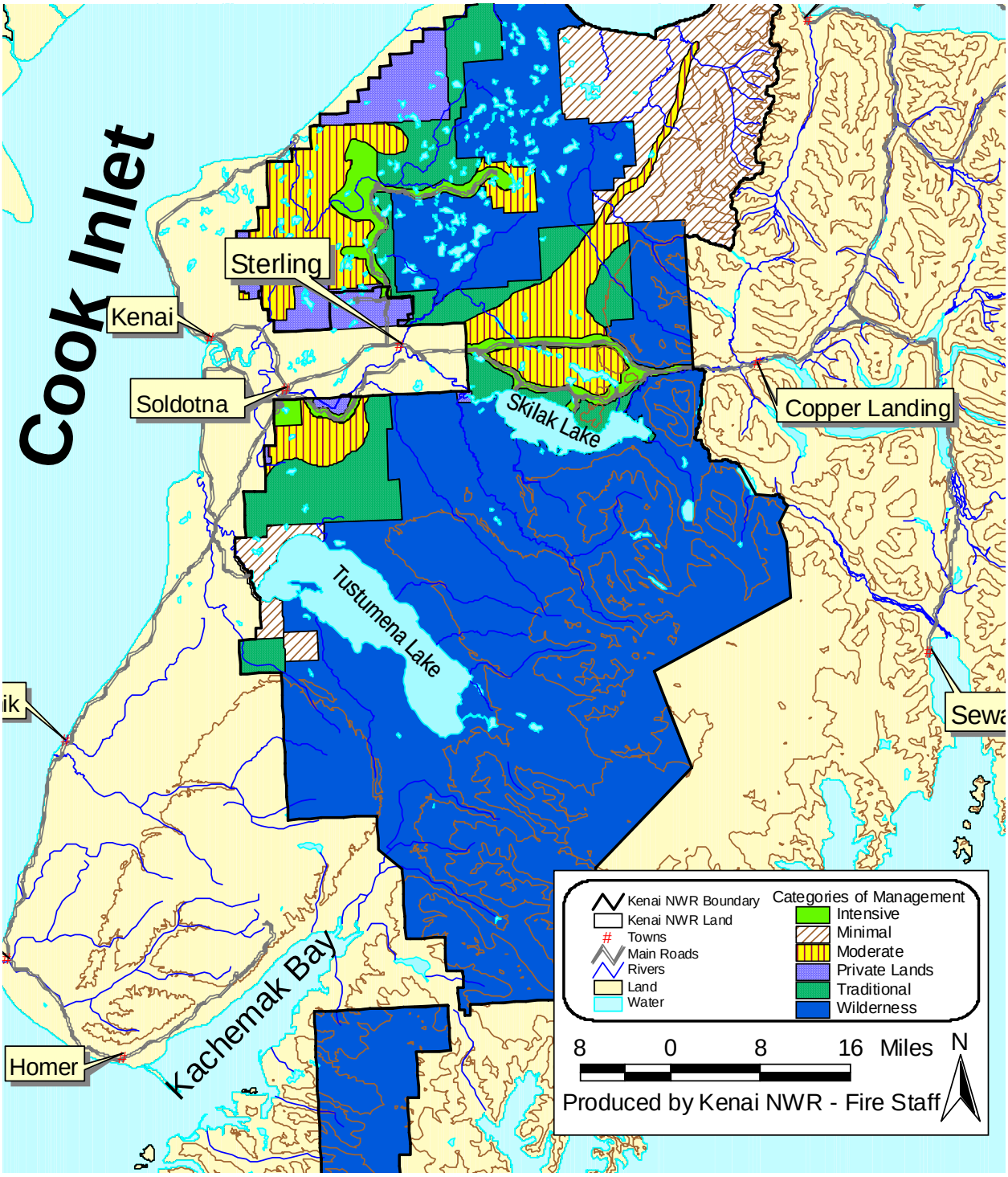

Figure 2: CCP Categories of Management

The CCP divides land management areas into several categories by intensity level. Landscape-level fire management directions or strategies vary by CCP land management category (Table 1). Management directions that apply to all alternatives of the CCP, list prescribed fire as the best tool to enhance wildlife habitat diversity and to modify forest ecosystems to early successional stages.

Wildland fire management directions for the selected alternative provide the maximum possible fire protection for adjacent private lands, in-holdings and refuge improvements. The CCP mandates coordination with local, state and federal agencies for maximum effectiveness of fire suppression and to reduce duplication of effort.

MANAGEMENT CATEGORY	FIRE MANAGEMENT STRATEGY
Intensive	These management areas provide for high intensity public uses and management activities, and are protected under Critical, Full and Modified fire management options by the AIWFMP. Substantial habitat manipulation is allowed, including prescribed fire and mechanical treatment. Wildland fire use is permitted if ignition is natural and prescriptive criteria are met, except in Critical option areas.
Moderate	Public access is allowed. Habitat manipulation including prescribed fire and mechanical treatment is allowed to benefit selected species (Moose), while maintaining a natural landscape. Full, Modified and Limited fire management options are represented. Wildland fire use is permitted if ignition is natural and prescriptive criteria are met.
Traditional	Roadless Areas – a mixture of public and wildlife uses is allowed. Full, Modified, and Limited Protection levels occur. Forest management activities include prescribed fire; mechanical manipulation is not allowed. Wildland fire use is permitted if ignition is natural and prescriptive criteria are met.
Minimal	Maintain Pristine and Unmodified Conditions in areas with fish, wildlife and wilderness values. These areas are not subject to habitat manipulation – no mechanical manipulation, timber harvest or prescribed fire is allowed. Full, Modified and Limited fire management options are represented. Wildland fire use is permitted if ignition is natural and prescriptive criteria are met.
Wilderness	Maintain Pristine and Unmodified Conditions. Some motorized public uses are allowed in relation to traditional use activities. Prescribed fire is allowed only to protect adjacent private lands. Mechanical manipulation and timber harvest are not allowed. Fish and wildlife populations are managed to maintain natural diversity. Full, Modified and Limited fire management options occur. Wildland fire use is permitted if ignition is natural and prescriptive criteria are met.

Table 1: CCP – Fire Management Strategies by Management Category

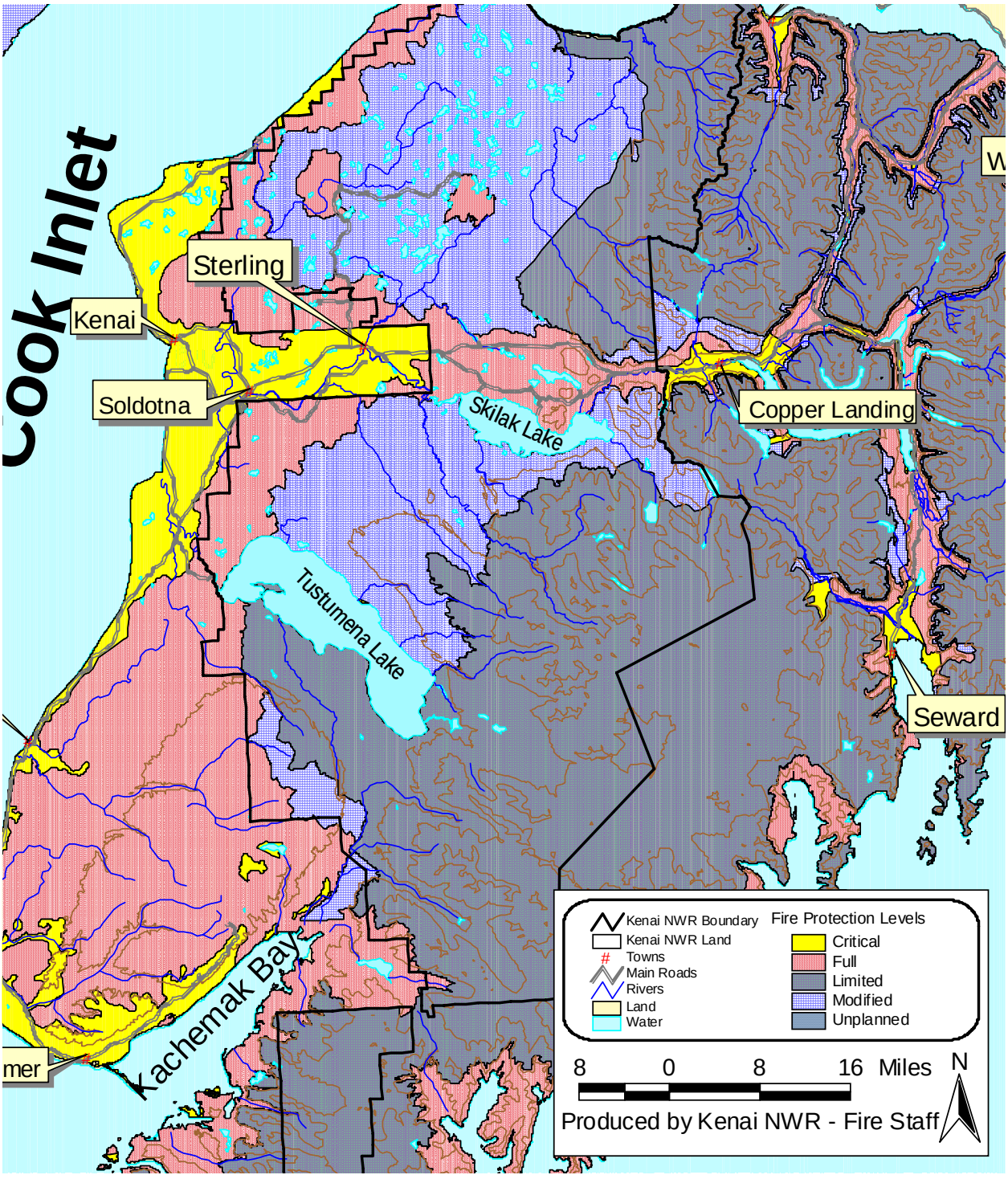

Figure 3: AIWFMP – Fire Management Options

The Alaska Interagency Wildland Fire Management Plan defines wildland Fire Management Options depending upon values at risk (Table 2).

Management Option	Objective	Action
Critical	Protect life and property.	Immediate and aggressive fire suppression.
Full	High value natural resources, cultural and historical sites.	Aggressive initial attack, minimize acres burned.
Modified	Moderate value resources with seasonal risks.	Balance damage against costs, converts to Limited after selected conversion date.
Limited	Low resource values or fire is acceptable.	Monitor fire, protect adjacent high value resources.

Table 2: AIWFMP – Fire Management Options

In Alaska, wildland fire suppression services are provided by the United States Department of the Interior - Bureau of Land Management - Alaska Fire Service (AFS), the Alaska Department of Natural Resources - Division of Forestry (ADNR), and the United States Department of Agriculture - Forest Service (USFS). By interagency agreement with AFS, ADNR provides suppression services on the Kenai National Wildlife Refuge.

However, the United States Department of the Interior Departmental Manual, Part 620, Chapter 2, Section 2.4-A states, "Nothing herein relieves agency administrators in the Interior bureaus of the management responsibility and accountability of activities occurring on their respective lands." Section 2.4 further states, "Each bureau will continue to use it's delegated authority for applications of wildland fire management activities such as planning, education, and prevention, use of prescribed fire, establishing emergency suppression strategies, and setting emergency suppression priorities for the wildland fire suppression organization on respective bureau lands". Therefore, refuge managers must ensure that all wildland fire suppression actions on refuge lands will correspond with the policies, goals and objectives of the U.S. Department of the Interior, the U.S. Fish & Wildlife Service and the Kenai National Wildlife Refuge.

Although the ADNR provides wildland fire suppression services to the Kenai National Wildlife Refuge, there is no federal policy or regulation in effect that precludes or prevents the refuge from responding to any wildland fire incident on refuge lands. Therefore, it is imperative that refuge managers maintain a cooperative involvement with ADNR during all suppression activities implemented on the refuge. It is also imperative

that refuge managers ensure an appropriate management response is implemented on any wildland fire incident occurring on refuge lands. In the event that ADNR suppression resources are unavailable or are unable to respond to a refuge wildland fire incident, refuge managers should make every effort to respond to the incident with the appropriate resources, until such time that ADNR is able to respond in kind.

If a qualified refuge fire fighter is first to respond to a wildland fire on the refuge, he or she may perform the duties of Initial Attack Incident Commander (ICT4) until the fire is out, or until relieved by another qualified refuge or ADOF incident commander or assigned incident management team. A Unified Command may be established on incidents where multiple land ownership, multiple jurisdiction or values at risk indicate such an organization. Although it may be appropriate for qualified refuge incident commanders to participate in a Unified Command on some initial attack or extended attack incidents, standard operating procedures would normally preclude such an arrangement. Normally, refuge fire managers will function as agency representatives or resource advisors to an incident management team on refuge extended attack or project fire incidents.

According to the AIWFMP, fire management options (Critical, Full, Modified or Limited) are determined by the land manager/owner(s). The land manager may need to change the fire management option on a designated area in response to changes in land use, protection needs, laws, mandates or policies. This flexibility is an essential attribute of the fire planning effort in Alaska. Proposed changes to fire management option boundaries should occur between September 30 and March 1 and recorded on the Alaska Fire Management Map Atlas by April 1 in any given year. Any changes to fire management option boundaries and the map atlas should involve adjacent land managers/owners and affected resource management agencies, and should be documented as specified in the AIWFMP. The map atlas is a public document and may be accessed via the Internet at: http://fire.ak.blm.gov/scripts/maps/maps.asp or http://fire.ak.blm.gov/iams/s42map.gif.

The Kenai NWR Fire Management Plan complies with the policies established by the AIWFMP. *The refuge is divided into Fire Management Units (FMU's) that directly correlate with the AIWFMP fire management options. See (Figure 7). These FMU's are discussed further in the Wildland Fire Program Management Section of this plan.*

1.03
Fire Management Staff

The KNWR fire management program is relatively complex, due to its location, its size, heavy summer visitor use, its proximity to Anchorage, urban interface issues, and hazardous fuel complexes (black spruce, beetle-killed white spruce and bluejoint). Staffing levels are based primarily on prevention and preparedness needs and an active hazard fuel/prescribed fire program. The current fire management organization is diagrammed in Figure 4. Position roles and responsibilities are listed in Table 3.

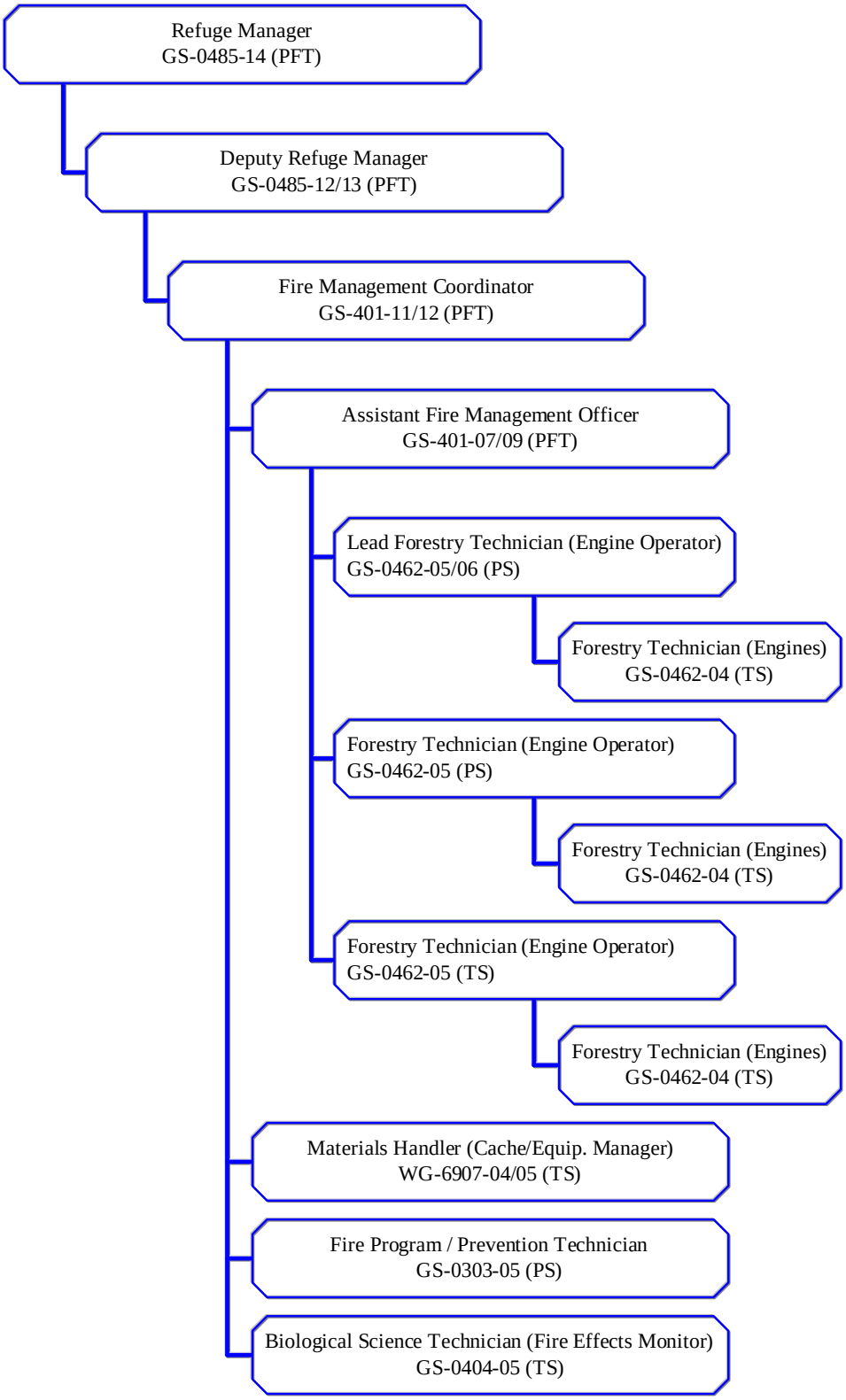

Figure 4: Kenai NWR, FY2001 Fire Management Staff

Position	Refuge Manager (RM)
Fire Management Role	The Refuge Manager (RM) is directly responsible for the planning and direction of all refuge activities and programs. The RM is ultimately responsible for all fire management operations on the Kenai NWR, although specific fire management duties may be delegated to other refuge staff such as the Deputy Refuge Manager and the Fire Management Officer. The RM may delegate certain authorities to qualified personnel, through a written Delegation of Authority.
Specific Responsibilities	*The RM will ensure that an approved Fire Management Plan is prepared for the Refuge. Submission of prescribed fire plans and mechanical hazard fuel reduction plans to the regional office for review and approval. Preparation of Wildland Fire Situation Analyses and Delegations of Authority. Responsible Official for any NEPA decision documents.

Position	Deputy Refuge Manager (DRM)
Fire Management Role	The Deputy Refuge Manager reports directly to the RM and is responsible for daily refuge operations. The DRM supervises refuge program managers such as the Fire Management Officer. The DRM is the Responsible Official when the RM is absent.
Specific Responsibilities	*Same responsibilities as the RM when the RM is absent from the refuge or as delegated by the RM. The DRM is responsible for public information, refuge budget management, accountable property, law enforcement and personnel actions. The DRM may act as the agency representative for the refuge on wildland fire incidents.

Position	Fire Management Officer (FMO)
Fire Management Role	The FMO coordinates all aspects of the refuge fire management program, including supervision of fire management staff, personnel actions, budget planning, preparedness, prevention, safety, training, prescribed fire planning and implementation, fuels management, research, reporting and interagency coordination. The FMO may delegate responsibility to qualified fire management staff such as the Assistant FMO, Lead Forestry Technician or other qualified fire personnel.
Specific Responsibilities	*The FMO coordinates interagency fire management operations with FMOs from the Alaska Division of Forestry (ADOF) – Kenai-Kodiak Area Office and the Seward Ranger District of the Chugach National Forest. Cooperates with the ADOF on all wildland fire operations on the refuge including prevention, preparedness, suppression and training. The FMO may act as the agency representative for the refuge on wildland fire incidents. The FMO may function as an Incident Commander (as qualified) in a Unified Command on interagency wildland fires. Keeps RM, DRM and other key refuge personnel informed of all fire management activities and situations. Prepares refuge Fire Management Plan, Prescribed Fire Plans and Mechanical Fuel Reduction Plans. Participates in regional FWS and Alaska Wildland Fire Coordinating Group (AWFCG) fire reviews and coordination meetings. Prepares and maintains fire records and reports in the Department

	of Interior Fire Management Information System (FMIS). Represents the refuge and the agency on local, regional and national fire management and disaster mitigation committees. Maintains wildland and prescribed fire qualifications and responds to local, regional and national wildland fire incidents as qualified.

Position	Assistant Fire Management Officer (AFMO)
Fire Management Role	The AFMO performs the duties and responsibilities of the FMO when the FMO is absent. The AFMO supervises other fire management employees as directed by the FMO. The AFMO assists the FMO in the coordination of all phases of the refuge fire management program.
Specific Responsibilities	The AFMO is responsible for the daily operations of the refuge fire management program and any specific fire management duties delegated by the FMO, the DRM or the RM. Preparation and implementation of prescribed fire and hazard fuel management plans. Responds to local, regional and national wildland fire incidents as qualified. Manages the refuge fire cache and fire equipment and coordinates the acquisition of supplies.

Position	Lead Forestry Technician (LFT)
Fire Management Role	The primary role of the Lead Forestry Technician (LFT) is to supervise the refuge seasonal fire crew/fuels management crew (usually 3-6 GS-5 & GS-4 forestry technicians), in the implementation of refuge fire management projects. The LFT may also assist the FMO and/or AFMO in the performance of other duties including: preparedness, prevention, suppression, training, research and the preparation of fire management plans.
Specific Responsibilities	The LFT is responsible for the daily operations and safety of the refuge fire crew/fuels management crew. The LFT reports on the status of crew operations to the AFMO or FMO, and takes appropriate action to ensure the maintenance of crew safety and acceptable performance of assigned duties. The LFT maintains a state of fire preparedness for self and crew during the fire season, and responds as assigned to local, regional and national wildland and prescribed fire assignments. The LFT assists fire managers in the preparation of prescribed fire plans, fuels management plans and station fire management plans.

Position	Fire Program Technician (FPT)
Fire Management Role	Provides direct administrative and technical support to the refuge fire management program, and assists fire managers in the implementation of fire management projects as qualified.
Specific Responsibilities	Administrative and technical responsibilities include; technical writing, editing and word processing; preparation and implementation of fire prevention and environmental education programs and events; data entry, editing and maintenance of Fire Management Information System databases, including the Incident Qualification & Certification System (IQCS) and the

	departmental fire reporting system (preparation of DI-1202 reports); procurement of fire supplies and equipment; and other technical assistance as assigned. Fire management project responsibilities include responding to local, regional and national wildland and prescribed fire assignments as qualified and available; preparation of news releases, public service announcements and news articles; corresponding with cooperating agencies and the public.

Position	Fire Crewmembers
Fire Management Role	Fire crewmembers work individually or under the direction of a crew supervisor to assist refuge fire managers in the implementation of fire management projects on and off the refuge as assigned.
Specific Responsibilities	Fire crewmembers respond to local, regional and national wildland and prescribed fire assignments as qualified and available. Crewmembers maintain a state of fire readiness and fitness at all times during the fire season. All crewmembers must be red-carded firefighters, able to pass the Pack Test at the Arduous fitness level. Crewmembers may occupy single resource or crew positions depending on training and experience level and National Wildfire Coordinating Group (NWCG) qualifications. GS-5&6 crewmembers typically occupy the positions of greater responsibility such as Single Resource Boss, Engine Crewleader or Squad Boss. GS-3&4 crewmembers usually fill basic firefighter positions under the direct supervision of a single resource boss, engine crewleader or squad boss. Crewmembers receive training to operate and maintain all refuge fire tools and equipment. Crewmembers may assist other refuge programs in the completion of special projects as assigned and available.

Position	Other Kenai NWR Employees
Fire Management Role	Any Kenai NWR employee may respond to local, regional and national wildland and prescribed fire assignments as qualified and available, with supervisory approval. Refuge employees are often given the opportunity to assist fire managers in the implementation of prescribed fires on and off the refuge. All refuge employees are encouraged to attend fire training and to pursue NWCG qualifications for desired positions. The refuge fire program usually provides the funds necessary for refuge employees to attend desired fire training courses.
Specific Responsibilities	Refuge employees, especially program managers and staff specialists, provide important resource information during fire management planning and environmental analysis. Refuge biologists and the refuge ecologist have completed and are conducting numerous research projects which provide data necessary to the formulation of prescribed fire plans, wildland fire situation analyses and this fire management plan. The refuge ecologist and assistants work closely with fire managers - providing fire history, climate and fuels information, as well as pre- and post-fire monitoring and fire effects data.

Table 3: Kenai NWR – Fire Program Staff

1.04
Key Interagency Contacts

Regional Fire Management Coordinator
United States Fish & Wildlife Service
1011 E. Tudor Road
Anchorage, Alaska 99503-6199
PH (907) 786-3654 / FAX (907) 786-3932

R7, Environmental Coordinator
U.S. Fish and Wildlife Service
Ecological Services
1011 E. Tudor Road, Mail stop 331
Anchorage, Alaska 99503
PH (907) 786-3519 / FAX (907) 786-3350

Regional Historic Preservation Officer
Biology and Archeology Branch
Division of Realty
United States Fish & Wildlife Service
1011 E. Tudor Road
Anchorage, Alaska 99503-6199
PH (907) 786-3386 / FAX (907) 786-3901

Chugach National Forest
Supervisor's Office
3301 "C" Street, Suite 300
Anchorage, Alaska 99503
PH (907) 271-2500 / FAX (907) 271-3992

Chief of History and Archeology
Alaska Department of Natural Resources
Division of Parks
619 Warehouse Avenue, Suite 210
Anchorage, Alaska 99501
PH (907) 274-4646

Chugach National Forest
Seward Ranger District
PO Box 390
Seward, AK 99664
PH (907) 224-3374 / FAX (907) 224-3268

Chugach National Forest
Forest Fire/Aviation Dispatch
Kenai Lake Work Center
29847 Seward Highway
Seward, AK 99664
PH (907) 288-3679 / FAX (907) 288-3601

EIS Review Coordinator
R10, Environmental Protection Agency
1200 6th Avenue, ECO-088
Seattle, WA 98101

Alaska Department of Natural Resources
Division of Forestry
Kenai-Kodiak Area Office
42499 Sterling Highway
Soldotna, Alaska 99669
(907) 262-4124 / FAX: (907) 262-6390

SHPO
Alaska Department of Natural Resources
Office of History & Archeology
550 West 7th Avenue, Suite 1310
Anchorage, AK 99501-3565
PH (907) 269-8721 / FAX (907) 269-8908
Web site: www.dnr.state.ak.us/parks/oha_web

Office of History and Archaeology
Alaska Division of Parks and Outdoor Recreation
550 W. 7th Ave., Suite 1310
Anchorage, Alaska 99501-3565
PH: (907) 269-8721 / FAX (907) 269-8908
E-Mail: oha@alaska.net

Air Quality Division
Alaska Department of Environmental Conservation
555 Cordova Street
Anchorage, AK 99501
PH (907) 269-3066 / FAX (907) 269-7508

State Fire Operations
c/o Alaska Fire Service
P.O. Box 35005
Ft. Wainwright, AK 99703
PH (907) 356-5850 / FAX (907) 356-5220
Web site: http://fire.ak.blm.gov

US Forest Service State and Private Forestry
Web site: http://fs.fed.us/r10/spf/

Bureau of Land Management (AK)
Alaska State Office
222 W. 7th Avenue,
Anchorage, Alaska 99513-7599
PH (907) 271-5960 / FAX (907) 271-4596
Web site: http://www.ak.blm.gov/

National Park Service
Alaska State Office
2525 Gambell Street
Anchorage, AK 99503-2892
PH (907) 257-2690 / FAX (907) 257-2533
Web site: http://www.nps.gov/akso

Advisory Council on Historic Preservation
Old Post Office Building
1100 Pennsylvania Avenue, NW, Suite 809
Washington, DC 20004
Phone: (202) 606-8503
Fax: (202) 606-8647/8672
Web site: www.achp.gov

Alaska Region Headquarters
Office of the Regional Administrator
Federal Aviation Administration
22 West 7th Ave., Suite 14
Anchorage, Alaska 99513

Alaska Department of Environmental Conservation
43335 Kalifornsky Beach Rd., Suite 11
Soldotna, AK 99669
PH (907) 262-5210 / FAX (907) 262-2294

USDA Forest Service
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1.05
Strategies Selected To Implement Fire Management Objectives

Attachment B, to the Record of Decision for the Kenai National Wildlife Refuge Supplemental Environmental Impact Statement for the Wilderness Proposal in the Comprehensive Conservation Plan, states:

Fire suppression is covered in the Final Comprehensive Conservation Plan. In areas of the refuge under intensive management, all fires will be suppressed. In all other management categories, fires will be permitted to burn unless human life or property or significant resource values are threatened. The minimum tool concept will be employed as indicated on page 86 of the Final Kenai Comprehensive Conservation Plan.

The acreage burned by wildfires will not affect the total acreage likely to be subject to habitat manipulation unless areas proposed for manipulation are burned by wildfires. However, timing of manipulation may be affected. If extensive acreage is burned by wildfires in a particular year, manipulation activities planned for that year would likely be postponed.

The CCP Glossary defines "Minimum Appropriate Tool" as – the minimum tool needed to do the job with the least possible impact. Therefore, in Moderate, Traditional, Minimal and Wilderness management areas, if suppression actions are implemented – the impacts to refuge lands and resources must be minimized to the extent possible, while maintaining firefighter and public safety. According to the 2001 Federal Wildland Fire Management Policy, "Firefighter and public safety is the first priority. All Fire Management Plans and activities must reflect this commitment." It is also stated that "fires are suppressed at minimum cost, considering firefighter and public safety, benefits, and values to be protected, consistent with resource objectives". This minimum cost concept also fits the "minimum appropriate tool" direction from the CCP.

The 2001 Policy also states, "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. The response to wildland fire is based on ecological, social, and legal consequences of the fire. The circumstances under which a fire occurs, and the likely consequences on firefighter and public safety and welfare, natural and cultural resources, and values to be protected dictate the appropriate management response to the fire."

As to the use of wildland fire, the Policy states, "Wildland fire will be used to protect, maintain, and enhance resources and, as nearly as possible, be allowed to function in its natural ecological role. Use of fire will be based on approved Fire Management Plans and will follow specific prescriptions contained in operational plans." Naturally ignited wildland fires will be managed within prescriptive criteria established in this plan, otherwise fires will be treated as unwanted wildland fires and suppressed. Wildland fire use is not expected to alter or conflict with actions specified by the refuge CCP and Moose Management Plan. Rather, in combination with prescribed fire and hazard fuel reduction projects, wildland fire use is expected to meet the intent of those refuge plans.

Fire adapted communities in the refuge that have not experienced a significant fire for more than twice the normal fire frequency for that type, may be undergoing a change in

structure or function. Depending upon other considerations, prescribed fire should be introduced in those communities if the use of fire is consistent with the land management objectives set forth for those communities.

Clearly, national wildland fire policy, land management direction from the CCP and habitat management guidelines from the Moose Management Plan all point to the use of wildland and prescribed fire as a tool to implement the fire management objectives outlined in this Fire Management Plan. The keys to implementation are defined by the appropriate management responses for a given Fire Management Unit (FMU) and in the prescriptive criteria for wildland fire use on the refuge. See: Prescribed Fire and Wildland Fire in Section Three of this plan.

Some of the management constraints which could impact selected fire management strategies on the refuge include: wilderness management guidelines, smoke management considerations, threatened or endangered species, unique or sensitive habitats, cultural and historical resources, public use and historical cabins, existing and proposed oil and gas developments, sensitive soils and wetlands, and permitted recreation uses of the refuge. For example, fire retardant will not be used in wilderness areas, in wetlands or where anadramous streams might be impacted, unless there is an immediate threat to human life. Smoke impacts to Tuxedni Bay (Class 1 Airshed) across Cook Inlet, to Anchorage or to the communities of the Peninsula should be avoided if at all possible. Mechanical equipment should not be used in areas where cultural/historical resources are known or likely to be found until a professional archeologist has been consulted. Refuge biologists and public use specialists should be consulted where potential impacts to sensitive biological resources or high-use recreation areas exist.

While this version of the FMP has been completed, a cabin management plan has not yet been developed for the Kenai NWR. A cabin management plan is important to fire managers with respect to prevention, preparedness, suppression, wildland fire use, prescribed fire and fuels management activities. Presently, more than 75 permitted, non-permitted, public use and/or historic cabins have been identified on the refuge. Some cabins have significant cultural or historical value, refuge visitors frequently use some cabins, and some are eligible for listing in the National Historic Register. The refuge needs to develop a comprehensive cabin management plan that will protect selected high value resources (cabins), to protect users of those cabins, and to protect firefighters sent to defend such cabins from a wildland fire. Refuge fire managers should assist other refuge managers in the development of a cabin management plan and appropriate location maps for Alaska fire suppression agencies, as soon as possible. When completed, the cabin management plan should be attached as an appendix to this FMP.

Another management constraint or issue that can have a significant impact upon fire management activities on the Kenai NWR is oil and gas development. The Swanson River Oil Field contains numerous high value improvements including wells, pipelines, office buildings, employee housing, processing and loading facilities, utility lines, communications and weather towers, vehicles and heavy equipment. These improvements are protected within Critical and Full fire management option areas, and

fire managers must treat the oil fields with the same regard as any other wildland-urban interface. Fire managers need to consider and address the special environmental and health hazards associated with oil and gas development and wildland fire suppression, wildland fire use and prescribed fire activities.

2.0 – DESCRIPTION OF REFUGE

2.01
Narrative Description

The Kenai National Wildlife Refuge is located on the Kenai Peninsula in South-Central Alaska. The northern portion of the Refuge is 25 air miles south of the state's largest population center, the city of Anchorage. Although a scenic 112-mile drive through the Kenai Mountains is necessary to reach the nearest portion of the Refuge by road from Anchorage, commercial commuter aircraft fly into the nearby cities of Kenai and Soldotna daily.

Extending 115 miles southward from the Turnagain Arm of Cook Inlet, to the southern Kenai Mountains east of Kachemak Bay, the Refuge encompasses about one-third of the Kenai Peninsula. The western slopes of the Kenai Mountains form the eastern Refuge boundary, a common boundary with the Chugach National Forest and the Kenai Fjords National Park.

Since the establishment of the Refuge as the Kenai National Moose Range on December 16, 1941, under E.O. 8979, these lands have undergone several boundary changes and a name change. The original Refuge included 2,058,000 acres and, among other mandates, authorized settlement, location, and other disposition under public land laws applicable to Alaska. At that time, the Refuge was bounded on the northwest, from Point Possession to the Kasilof River, by the waters of Cook Inlet. A six-mile-wide strip of land from Boulder Point to the Kasilof River and a six-mile strip of land known as the Sterling Corridor (including portions of the Kenai River), were left open for development. Homesteads, grazing areas, road systems, and other developments occurred in these areas, and they were excluded from the Refuge during a 1964 boundary adjustment. Excluded at the same time were Cook Inlet coastal lands one to three miles inland and considerable portions of the Harding Ice Field, reducing the Refuge area to 1.73 million acres.

Passage of the Alaska National Interest Lands Conservation Act (ANILCA), commonly known as "The Alaska Lands Act," on December 2, 1980, redesignated the Kenai National Moose Range as the Kenai National Wildlife Refuge. The Act increased the Refuge acreage, adding approximately 150,000 acres at the southern tip of the Refuge and about 90,000 acres of former Forest Service lands to the northeast portion of the Refuge near Chickaloon Flats. At the same time, passage of ANILCA withdrew 16,535

acres from the Refuge to satisfy the claims of the Salamatof Native Association under the Alaska Native Claims Settlement Act (ANCSA) of 1971. ANILCA and ANCSA left the Refuge at about 1.97 million acres. Per ANILCA, the Refuge is currently managed to: 1) conserve fish and wildlife populations and habitats in their natural diversity, 2) fulfill international treaty obligations with respect to fish and wildlife, 3) ensure water quality and quantity, 4) provide opportunities for scientific research, interpretation, and environmental education, and 5) provide opportunities for fish and wildlife-oriented recreation. In addition to establishing a new name, new boundaries, and expanded purposes, ANILCA formally designated 1.35 million acres of the Refuge as wilderness.

The Refuge is divided into two main physiographic regions: a mountainous region and a forested lowland. Elevations on the Refuge range from sea level to more than 6600 feet in the Kenai Mountains, with treeline at about 1800 feet. Among the peaks of the Kenai Mountains lies the Harding Ice Field, which thrusts numerous glacial fingers out into the Refuge. The glaciers, mountains, lakes, alpine tundra, and foothills are extremely scenic.

Thirty-nine percent of the Refuge is forested. Scattered stands of black spruce are interspersed with muskeg, peat bogs and grassy wet meadows in the lowlands, while white spruce and mixed conifer-hardwood forests dominate drier upland sites on ridges, and in the foothills of the mountains. White spruce stands are often intermixed with deciduous trees, such as white birch and aspen, especially in old burns and cutover areas. Lowland shrub (alder and willow) covers 9 percent of the Refuge. Mountain tundra covers about 11 percent. Of this class, about 87 percent is dwarf shrub and lichen tundra, and 13 percent is tall shrub (alder and willow) thickets usually associated with tundra. Water and associated wetlands cover 13 percent, and snow, ice, and glaciers cover the remainder of the Refuge.

The Kenai River, the largest and most productive anadromous river system on the peninsula, drains about 2148 square miles (5563 km2). About 54 percent of the watershed is on the Refuge, 37 percent in the Chugach National Forest, and the remainder on state and private lands. Ten major tributaries feed the Kenai River System: Beaver Creek, Slikok Creek, Soldotna Creek, Funny River, Moose River, Killey River, Skilak River, Russian River, Cooper Creek, and Juneau Creek. Other Refuge river and stream systems flowing westward into Cook Inlet include the Kasilof River (which drains Tustumena Lake), Deep Creek, and the Swanson, Fox, Ninilchik, and Chickaloon Rivers.

There are thousands of lakes on the Kenai Peninsula, and most of them are on the Refuge. The largest are two glacial lakes, Tustumena Lake (74,000 acres or 31,000 ha) and Skilak Lake (25,000 acres or 10,000 ha). More than 4500 smaller lakes dot the Refuge, mostly in the Moose, Swanson, and Chickaloon River drainages.

At least 199 species of amphibians, birds, and mammals live on the Refuge. None of these species are known to be threatened or endangered. Five species of salmon, a wide variety of furbearers, and significant populations of brown and black bear, sheep, goats, wolves, bald eagles, trumpeter swans, caribou, moose, and loons occur on the Refuge.

2.02
Fire Ecology

1. Historical/Ecological Role of Fire

An aerial view of the Kenai National Wildlife Refuge reveals a mosaic pattern of spruce and mixed hardwood stands in every stage of post-fire forest succession. Historic records of past fire activity are somewhat lacking compared with other regions of the United States, but a number of studies of fire frequency on the Kenai Peninsula have been done (Lutz, 1960; DeVolder and others, 1999) or are in progress. Fire return intervals have ranged from 90 years to upwards of 300+ years, depending on the area. A study of sediments in a 9-meter core from Paradox Lake has yielded a 13,100 ^{14}C-year record, spanning the entire revegetation process since the end of the last glacial maximum. The sediment core contained burned spruce needles and birch seeds in several samples, the oldest dating back to the arrival of black and white spruce, approximately 8,000 ^{14}C-years ago. Charcoal was present throughout the core, even prior to the presence of forest tree pollen, indicating local tundra fires. Further analysis of the core at more frequent intervals is expected to yield a detailed fire history of the Kenai lowlands since deglaciation.

Native people on the Kenai Peninsula are not known to have used fire extensively to manipulate vegetation, as was done in other parts of the country. Though there were no doubt occasional escaped campfires, pre-settlement fires can be attributed primarily to lightning. Post-settlement fires have been mostly human-caused, although written accounts of post-settlement fires, including refuge annual narratives and other records, do mention occasional lightning-caused fire, and recent years have continued to see sporadic confirmed lightning starts on the refuge. All of the large 20th-century fires are believed to be human-caused. In the coastal climate of the Kenai, lightning strikes are infrequent when compared with Interior Alaska where lightning accounts for hundreds of fire starts in a single season. Nevertheless, lightning-ignited fires do occur and the presence of abundant charcoal in the 13,100 ^{14}C-year sediment record indicates that lightning is an important fire source on a timescale of decades and centuries.

Wildfires have played an important role in shaping the very features of the Kenai landscape that the refuge was created to protect. Moose were present in the language and in the artifacts of native people living on the Kenai. Nevertheless, it is believed that there were few moose on the Peninsula immediately prior to modern settlement. Early trappers and settlers, for example, took great note in journals and other records of the appearance of moose. Fires on the Tustumena bench lands (c.1871 and c.1891) created abundant willow browse, and by 1900 the bench lands had become a world-class trophy moose hunting area, referenced in many journals and publications (testimony by trapper Andrew Berg, cited in Palmer, 1938).

Following a significant disturbance such as a landslide, severe earthquake or intense wildfire (all of which can expose mineral soil), various species of hardwood trees and shrubs will typically revegetate the site, providing quality winter browse for moose and

hare for several decades. Recent wildfires such as in the 1994 Windy Point Fire show abundant birch regeneration. By contrast, the 1947 Fire (see: Figure 1), which once had similar post-fire hardwood regeneration, now exhibits an even-aged carpet of black spruce in many areas, with occasional aspen stands and unburned moraine islands of white spruce and hardwoods. Tree-height differentials outline the edges of older burns, such as the 1926 Slikok Lake Fire and the 1890's fires north of Mystery Creek and the Chickaloon River. Today the hardwood browse in many of these older burns has either been replaced by spruce or has matured to the point that it is no longer suitable as browse (Miner 2000).

In looking at the interagency fire records for the past fifty years, or since commercial and residential development began to accelerate on the Peninsula, there are some evident patterns of wildland fire occurrence. Since the mid-1950s, there have been an average of seven wildland fires per year, consuming about 2,200 acres per year on the Refuge. During that time period, the year with the least number of fires was 1980 (2). The greatest number of fires occurred in 1974 (52). After 1947, the fire year with the greatest acreage consumed was 1969, when 80,932 acres burned. The number of fire starts and the size of fires in any given year tend to mirror the drought cycle on the Peninsula. Wet fire seasons experience few starts and low acreage, while the dry years see a higher frequency of ignitions, greater fire severity and large wildland fires. Table 4 lists the large wildland fires on the western Peninsula since 1870. Figure 5 maps those incidents. The human population has increased dramatically since 1960 and so has the interagency fire suppression organization. The result has been a general reduction of acres burned on the Refuge. The average acres burned per year since 1980 is 1750 acres. Between 1960 and 1980, the annual average acreage was more than double that, at 4335 acres per year. While the number of fire starts has remained relatively constant, the acreage per fire has been cut in half.

In recognition of these trends and the significant role that fire plays in sustaining wildlife habitat on the Kenai Refuge, a fire management program was initiated in 1983. In addition to the habitat maintenance and enhancement benefits of the prescribed fire program, the other key fire management emphasis is hazard fuel reduction in the wildland-urban interface. These hazard fuels tend to increase over time as forest communities mature in the absence of disturbance. Examples of hazard fuels on the Kenai are heavy accumulations of large dead and down woody debris, deepening layers of dried mosses and lichens, large stands of beetle-killed white spruce, Calamagrostis grasslands and large continuous stands of black spruce. The Refuge prescribed fire program and wildland fire use strategies are based upon these resource objectives and concerns, while considering the potential adverse impacts upon the human and natural environments.

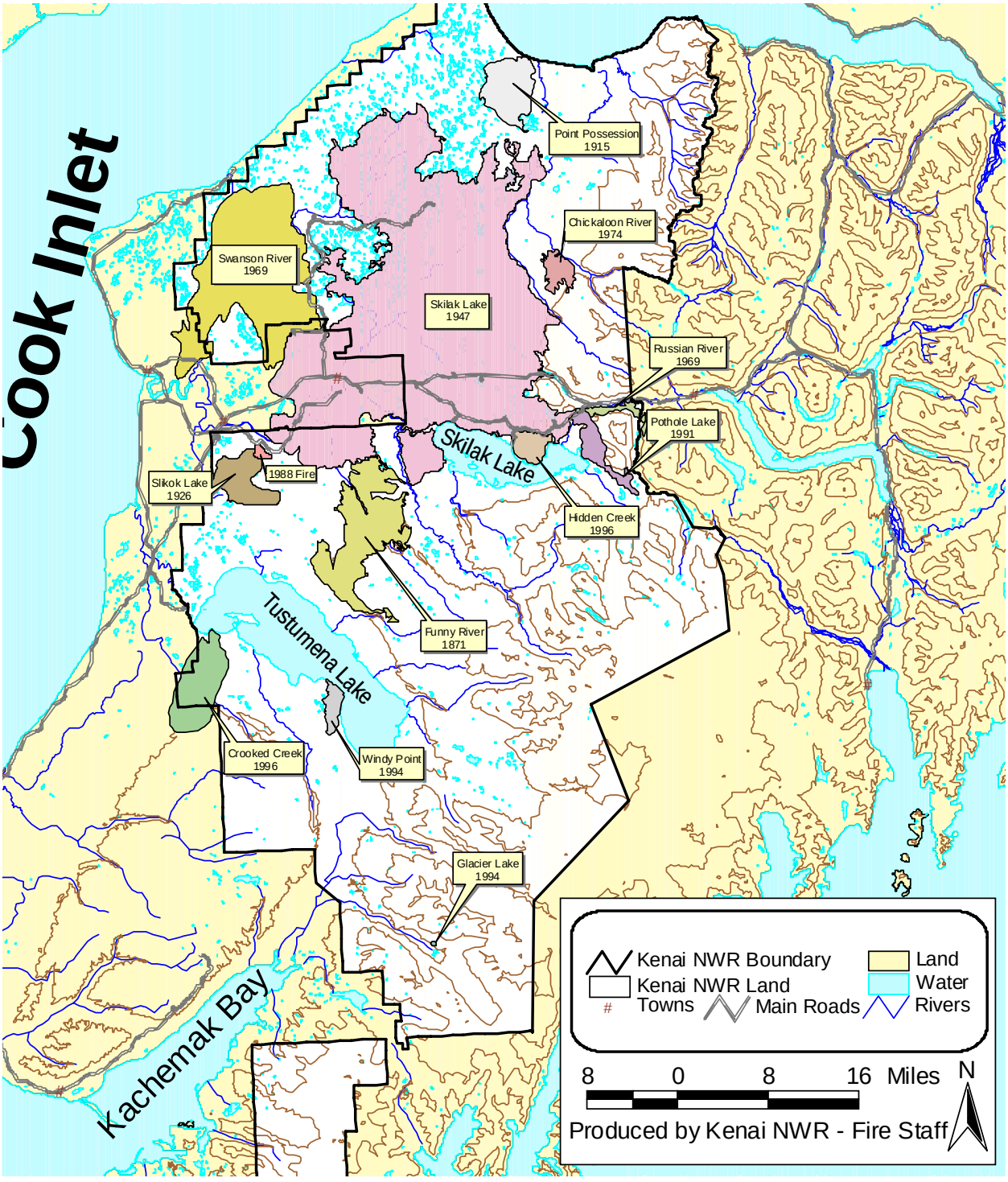

Figure 5: Known Major Forest Fires on the Kenai Peninsula, 1870 – 2000

Fire Name	Year	Size (acres)	Date of ignition & Cause	Owner	Source of info.
Tustumena Benchlands	1870–1910	106,000	Unknown	Kenai NWR	Spencer and Hakala
Point Possession	1915-1920	10,400	Unknown	Kenai NWR	Spencer and Hakala
Slikok Lake	1926	4,000	Probably man-caused	Kenai NWR	Spencer and Hakala
Skilak Lake	1947	310,000	6/3/47 Campfire	Kenai NWR	Spencer and Hakala
Engineer Lake	1963	240	7/1/63 Campfire	Kenai NWR	Spencer and Hakala
Russian River	1969	2,570	6/14/69 Campfire	Kenai NWR	NWR Annual Narrative
Swanson River	1969	79,000	8/3/69 Cooking fire	Kenai NWR	BLM Fire Reports
Echo Lake	1969	1,000	Unknown	Private	Anecdotal
Island Lake	1970	2,760	Unknown	Private	Anecdotal
Chickaloon River	1974	3,780	8/22/74 Campfire	Kenai NWR	BLM Fire Reports
Cabin	1979	125	5/12/79 Warming Fire	Kenai NWR	DI 1201 Fire Report
Funny River Rd.	1988	355	5/26/88 Escaped RX	Kenai NWR	BLM Fire Reports
Pothole Lake	1991	7,900	May Hunters	Kenai NWR	DI 1202 Fire Report
Glacier	1994	320	Unknown	Kenai NWR	DI 1202 Fire Report
Windy Point Tustumena	1994	2,800	September Campfire	Kenai NWR	DI 1202 Fire Report
Hidden Creek	1996	5,200	May Hiker	Kenai NWR	DI 1202 Fire Report
Crooked Creek	1996	17,510	June, Logging debris burning	Kenai NWR	DI 1202 Fire Report
Mystery Hills	2001	750	6/28/2001 Lightning	Kenai NWR	DI 1202 Fire Report
Total Acreage		554,710			

Table 4: Wildland Fires on the Kenai Peninsula, 1870 - 2001

2. Fire Behavior and Fuel Types

The lowland areas of the western Kenai Peninsula are populated by large stands of black spruce. Fires characteristically burn with fairly high intensity and slow, predictable rates of spread. Surface fuels of shrubs, feather mosses and lichens are the primary carrier of fire. Ignition of the tree crowns will occur just behind the flaming front if flame lengths are sufficient to ignite the lower lichen-covered branches. Very low relative humidity and high wind can produce sudden, extreme fire behavior.

Large portions of the refuge include stands of mixed spruce/hardwoods, white spruce, shrublands, and grasslands. Mixed spruce/hardwood stands generally burn with less intensity than black spruce, having less ladder fuel and more canopy shading. Pockets of hardwoods provide a natural barrier to fire spread; crowning spruce fires will normally drop to the ground when encountering a hardwood stand, in all but the most extreme conditions. Fires also do not carry as well in the brush and shrubland found on the refuge, especially where sparse. Labrador tea however, can be a primary carrier of fire. Stands of *Calamagrostis canadensis* (bluejoint reedgrass) are an early season carrier of fast moving fire. Activities that create an environment favorable to *Calamagrostis*, such as roadside disturbance or very light surface burning of vegetation, are to be avoided.

Historically, the Kenai NWR and other areas of the Kenai Peninsula suffer periodic infestations of the spruce bark beetle (*Dendroctonus rufipennis*) in white, Sitka and Lutz spruce. Tree-ring studies on the refuge indicate outbreaks in the 1820's, 1880's, 1910-20's and 1950's. The present outbreak began in the late 1960's, when substantial beetle-kill was observed in the Swanson River Road area in the northern portion of the refuge. The infestation eventually involved hundreds of thousands of acres from Point Possession to Kachemak Bay and throughout the valleys of the Kenai Mountains. Recently, spruce mortality has declined sharply, primarily because there are few large, uninfested spruce remaining. The risk of a large, catastrophic fire remains high in dense stands of beetle-killed trees, especially in wildland-urban interface areas. After needle drop, the risk of crown fire declines, although some stands still contain enough fine, dry aerial fuels to support crown fire. As dead stands break down, large dead woody fuels accumulate on the ground - increasing the intensity and residence time of wildland fires and making suppression activities more difficult.

Several interagency programs are currently underway on the Peninsula - to identify the hazards to Peninsula communities caused by spruce bark beetle forest mortality, and to mitigate hazards where possible (See Figure 6: Spruce Bark Beetle Damage, 1989-1999). The refuge and other fire management agencies are using the Firewise Community Action Program to educate homeowners about wildland fire mitigation practices. Mechanical fuel reduction and prescribed fire projects are being implemented throughout the Kenai Peninsula in a large-scale, interagency effort to reduce the threat of wildfire. The refuge has been a leader in these efforts and will continue to participate in wildland fire prevention and mitigation activities on the Peninsula, especially in the affected urban interface areas along its boundaries.

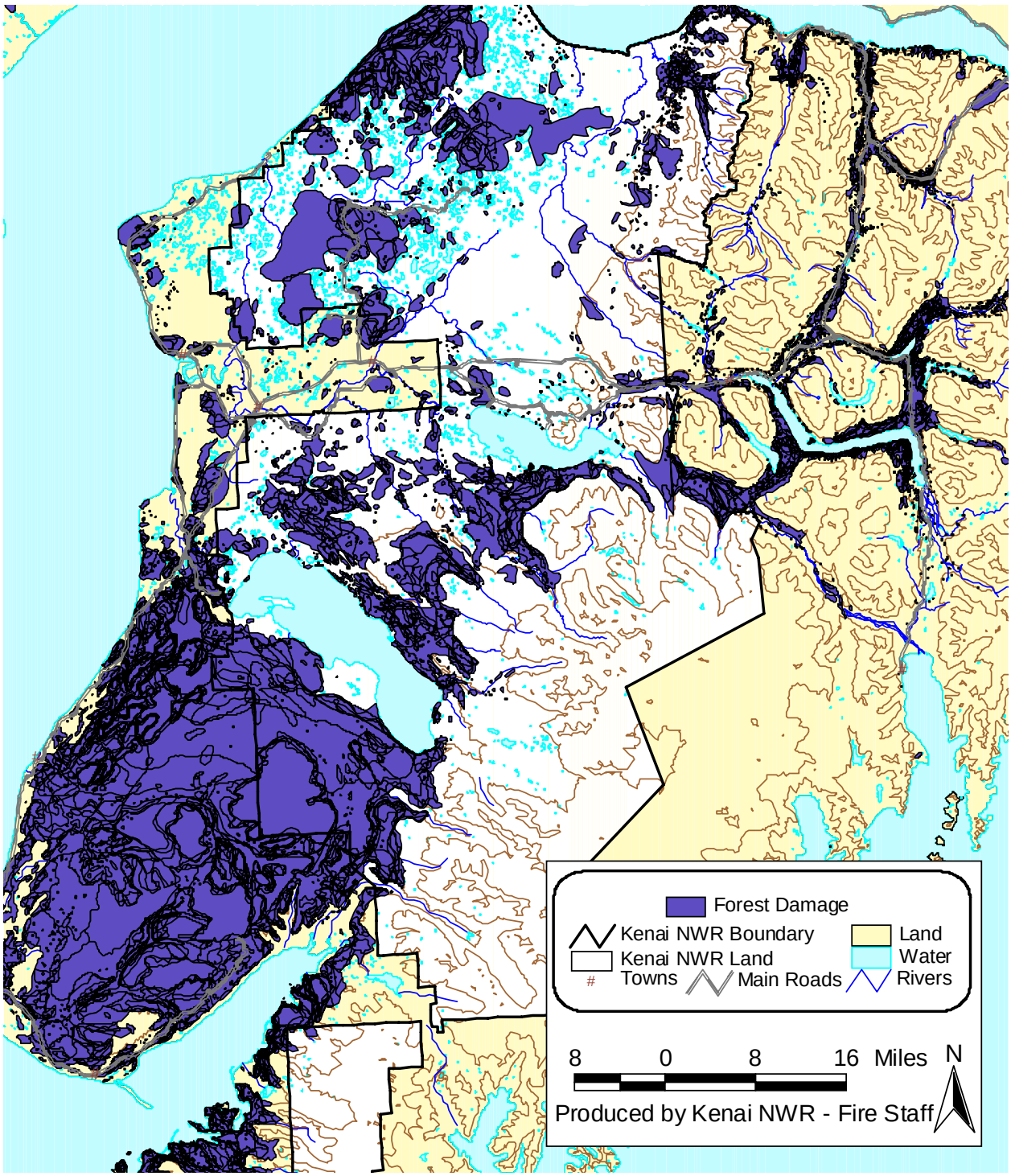

Figure 6: Spruce Bark Beetle Damage, 1989 – 1999

3. FIRE WEATHER

Some of the topographic and climatic features of the western Kenai Peninsula can have a major influence on fire behavior on the refuge. Cold air drainage from the Harding ice field and associated large glaciers produce localized turbulence and downslope winds that can be extreme and can arise suddenly, producing dramatic changes in fire behavior. The Skilak glacier and the downslope winds it produces on Skilak Lake, is one example. Severe turbulence and downslope foehn or east winds can occur anywhere along the west slope of the Kenai Mountains when conditions are right.

During the late spring and early summer fire season, moist ocean breezes from the southwest are the norm. These diurnal or daily sea breezes tend to have a dampening effect on fire behavior as relative humidity is increased. However, when temperatures are high, these moist winds can produce thunderstorms and lightning along the foothills of the Kenai Mountains. Occasionally, cool, dry north winds occur on the refuge. These winds have been known to cause severe fire behavior with relative humidities in the 20 percent range.

Due to the rain shadow effect of the Kenai Mountains to the east and the Alaska Range to the west, annual precipitation is low on the Kenai lowlands, ranging from 25 inches at Homer, to 19 inches at Kenai, and 17 inches at Sterling (CCP). About half of this annual precipitation falls as frequent light rain or drizzle between early August and November. Soil and duff moistures during this period are generally high, and fire severity or depth of burn is correspondingly low and spotty. From mid-April to July, the refuge experiences its longest days (up to 20 hours of sunshine) and lowest relative humidities. These factors in addition to the typical lack of precipitation in early summer, can contribute to extreme fire weather and fire behavior on the Kenai. Running crown fires and long-range spotting are possible during these times.

4. FIRE EFFECTS

The white or Lutz spruce forests of the Kenai National Wildlife Refuge are generally intolerant to fire, experiencing a high level of mortality and stand replacement on drier upland sites. Underburning for stand maintenance is not generally practicable. Black spruce, however, is a fire-adapted species. It possesses tightly compacted, semi-serotinous cones that release seeds over a period of several years, but will release an especially large pulse of seeds following a fire. The cones are high in the canopy and usually remain viable even after intense crown fires. Hardwood species on the refuge - willow, birch, aspen and cottonwood - typically regenerate vigorously following fire, providing abundant browse for moose and hare. The key to stand replacement is mineral soil exposure. The more soil exposed, the greater is the likelihood of hardwood regeneration.

The effect of fire on understory vegetation is varied. Lichens recover slowly following a fire. Without fire however, mosses may replace lichens as forest canopies close over a period of many decades. This can have a negative impact on caribou, which rely on

lichens for sustenance. Some grasses such as Calamagrostis are stimulated by fire, while others are suppressed, depending upon the season and the intensity of the fire. Moss layers may be consumed by fire, though usually not entirely, creating a mosaic pattern of exposed mineral soil and providing a seed bed for both hardwoods and conifers.

3.0 – WILDLAND FIRE MANAGEMENT PROGRAM

3.01 Preparedness

Fire season on the Kenai NWR can begin as early as mid-April when the lowlands and south slopes become snow-free. Fuel moistures and average relative humidities range from low to high depending on snowpack and spring precipitation. Early season fires tend to burn rapidly through surface fuels and forest canopies, not penetrating ground fuels due to high soil and duff moistures. During periods of drought when winter snowpack is minimal and spring precipitation is low, extreme fire behavior and catastrophic fires are possible.

As the fire season progresses through June and July, the long days and short nights limit humidity recovery. This can cause extreme fire behavior, particularly in black spruce. Flame lengths can range from less than a foot with a slow, steady rate of spread, to crown fires with 200-foot flame lengths as relative humidities drop below 35 percent. Suppression resources become limited, as the fire season on the Kenai corresponds with the fire season elsewhere in Alaska. Canadian Fire Danger Rating System indices typically reach their highest levels in June and July, often reaching extreme levels.

Over the past ten years, the Kenai NWR has averaged seven wildland fires per year. While most refuge fires are human-caused, lightning has played a role in the fire history of the refuge. Lightning caused two fires on the refuge in 2001, the Thurman Creek and Mystery Hills fires. The latter burned about 700 acres in a 48-hour period at the end of June. Season-ending precipitation typically occurs sometime in July, although there are occasional years when dry periods extend well into August. A late fire season with less potential for extreme fire behavior can occur in late August through early September.

The roles of the various agencies involved in fire management on the Kenai Refuge and other lands in Alaska are described in the Alaska Interagency Wildland Fire Management Plan. The Alaska Division of Forestry (DOF) provides fire suppression services on the Kenai Refuge through a cooperative agreement with the Alaska Fire Service (BLM). However, this does not relieve the refuge of its responsibility for activities occurring on refuge lands, including wildland fire prevention, preparedness and suppression response. In order to meet these responsibilities, the refuge must be notified immediately of any potential suppression action planned by the DOF. The refuge Fire Management Officer or a designated duty officer will be available by phone or radio to the DOF and neighboring

suppression agencies around the clock during the fire season. Notification will be made to the DOF when the refuge duty officer changes. Qualified refuge personnel will normally participate in refuge prevention patrols during periods of high fire danger, and will participate in initial and extended attack suppression activities on refuge fires.

In order to meet the prescribed fire objectives identified on the Kenai NWR, qualified personnel and specified equipment must be available to implement prescribed burn plans. As the DOF's suppression resources are committed to suppression response locally and statewide, the refuge must maintain its own resources in order to accomplish prescribed burns. Although fire suppression services on the refuge are provided by DOF, refuge fire equipment and personnel will be available for suppression assignments when not involved in ongoing prescribed burns. In addition, refuge firefighters and other resources will respond to other local, regional and national wildland and prescribed fire assignments as qualified and available.

All refuge fire personnel need the following prior to availability for fire assignments: basic fire training, bear and firearm training, annual Fireline safety refresher training, first aid, and must pass an annual fitness test at the 'arduous' level. This training takes place during the months of April, May and early June. Additional training is dependent on availability but may include boat training, S-212 Chainsaw Safety, S-217 Interagency Helicopter Training, Basic Aviation Safety, and Helidunk or Dunker Training. A qualified helicopter manager will supervise helicopter use on prescribed burns, and will maintain currency by attending required helicopter manager refresher training.

All refuge fire personnel must maintain fire readiness and will be issued appropriate gear. Helicopter gear is also available and may be issued to individuals depending on need. The fire cache maintains fire gear for a minimum of 20 firefighters, chainsaws, inventory for restocking engines and supply for hose lays and hose packs. Each spring the Lead Engine Crewleader or the Cache/Equipment Manager readies the cache and the engines. Each fall, engines are winterized for storage. Inventories are to be maintained for all vehicles, engines, first aid kits, and the cache (See: Appendix 6.01, Normal Unit Strength).

In preparation for the potential threat from wildfire to the Funny River urban interface and populated areas on the east side of Soldotna, the Funny River fuel break is being prepared, to provide a break along approximately 6.5 miles of the Funny River Road. No other firebreaks have been constructed, but several mowed pipelines and utility corridors provide fuel breaks across other portions of the refuge. Natural firebreaks exist to the north of Kenai and Soldotna in the form of extensive wetlands, lakes and rivers. These wet areas could still be vulnerable to a wind-driven fire under drought conditions.

The Kenai National Wildlife Refuge does not use a step-up staffing plan. The Refuge FMO will determine if conditions require an adjustment in staffing to ensure adequate coverage during periods of high fire danger. The Refuge FMO, or a designated duty officer, will be available to the State DOF by phone or radio, on a daily basis during fire season. A statewide Multi-Agency Coordination (MAC) group will be convened when

the Alaska Preparedness level reaches level 4 or 5, to establish priorities for suppression resource allocation and to determine the need for a temporary change in the selected fire management option identified in the Alaska Interagency Wildfire Management Plan for specific geographic areas. There have been recent discussions among the various fire management agencies of the Peninsula, about the possible formation of a Kenai Peninsula MAC Group to manage wildland fire resources and preparedness here. The refuge will likely be an important participant in this interagency effort, because of the number and types of wildland fire resources the refuge provides and because of the qualifications of refuge fire personnel.

3.02
Prescribed Fire

1. LONG TERM PROGRAM

The CCP places refuge lands into five categories of management (See Figure 2 and Table 1). The categories are: Intensive, Moderate, Traditional, Minimal and Wilderness. The CCP provides maps and descriptions of each category. In terms of prescribed fire, there are two levels of activity identified in the CCP. One level is minimal interference with natural processes. The Wilderness and Minimal management categories together represent this level. Prescribed burning is allowed only to protect life, property, or resources. An example of this might be a prescribed burn to develop a hardwood stand adjacent to private residences, providing a 'break' in a continuous stand of decadent spruce and therefore reducing the likelihood of a wildfire burning into homes. Prescribed burning for selected habitat enhancement would not be allowed.

Since the refuge CCP was executed in 1985, national wilderness management policies have changed. It is now permissible to use prescribed fire in wilderness areas under certain conditions. As the Kenai NWR begins the CCP revision process in the next few years, refuge land managers will need to consider these policy changes and develop land management alternatives that allow for the use of prescribed fire in wilderness and primitive areas on the refuge.

The second level of activity is a more intensive management strategy; prescribed burning is allowed in order to meet various resource objectives. An example of this would be a burn to produce early successional vegetation to benefit moose as a primary objective. All types of prescribed fire are allowed, when conducted under an approved prescribed fire plan. The "traditional", "modified" and "intensive" management areas collectively comprise this elevated level of prescribed fire application. The emphasis is on using prescribed fire as a tool to accomplish refuge land and fire management objectives.

The priority for either of these levels of prescribed fire management, as stated in the "introduction" section of this document, is to re-establish fire in the ecosystem in something that resembles the past fire history of the area, while still accomplishing certain contemporary objectives.

2. PLANNING

To achieve management objectives it is necessary that the refuge work toward a goal of 2,000-5,000 acres of prescribed burn accomplishment a year. The use of aerial ignition, Maximum Allowable Areas (MAA), readily available refuge resources, and contingency through interagency cooperation, will be required to achieve large acreages. In addition, small, more easily managed burn and/or mechanical treatment units will be planned in order to safely reduce hazardous fuel loadings in the urban interface. There will no doubt be seasons when the weather will present very little opportunity for any prescribed burning at all. However, during favorable seasons, and particularly as the Refuge develops personnel and equipment around the prescribed burning program, greater efficiency will allow for substantial accomplishment.

Qualified personnel will undertake the planning of prescribed fire projects on the Kenai NWR. Burn plans will be prepared by at least an RXB2 level Burn Boss, although involvement by Burn Boss trainees will provide valuable experience. Planning will require coordination with the fire ecologist, and refuge biologists and fisheries personnel. Specific prescriptive parameters for the implementation of the prescribed burn will be contained in the burn plan document and are therefore not discussed here. The Region 7 archeologist will be informed of the size and location of upcoming prescribed burns and will coordinate with the State Historic Preservation Officer (SHPO) as needed, and will also inform the Kenai refuge of any potentially impacted cultural resources and any actions necessary. The Fire Management Officer and Regional Fire Coordinator will review all burn plan documents prior to Refuge Manager approval. Final authority for the implementation of the prescribed burn plan rests with the assigned Burn Boss.

All aerial ignitions will have an aerial ignition appendix to the burn plan. Aerial ignition plans will be written by at least a RXB2 with an aviation background, and, if a helicopter is involved, will be reviewed by the helicopter manager and pilot prior to commencement of operations. All aerial ignition plans will meet requirements of the Interagency Aerial Ignition Guide.

Training requirements for those involved in prescribed fire projects are dependent upon function. All prescribed fire operations personnel must be qualified firefighters (at least FFT2) and must have current red-cards to participate in prescribed fire projects. All refuge firefighters must pass the national firefighter work capacity test (pack test) at the "arduous" level, and take the fireline safety refresher annually. Training, task books and On-the-Job (OJT) for the following identified positions will adhere to NIIMS standards: "Burn Boss" (required, qualified at the appropriate level); "Holding Specialist" (required on all prescribed burns); "Ignition Specialist" (optional, as Burn Boss may perform this).

Annual preparation for the prescribed burning program will include bringing equipment, engines and pumps, etc. out of winter storage and into a state of readiness for both wildfire and prescribed fire use. Needs will be assessed and equipment or gear ordered. Radios should be sent in for maintenance mid-winter, to insure their timely return. Control lines or boundaries identified in burn plans will be reaffirmed prior to ignition.

Coordination with the State Department of Environmental Conservation will occur throughout the burning season. Reconnaissance of possible burn projects for the following year and coordination with in-house specialists will take place during the summer months when fuel loading and habitat condition can be inventoried or verified. Burn plans will be written throughout the winter, to be reviewed and approved by the following spring.

3. SEASONS AND STRATEGIES

Conditions favorable to the accomplishment of prescribed burning objectives on the Kenai National Wildlife Refuge fall within the regular wildland fire season. Generally, the season begins in late April or early May and continues through June and into July. July rains often eliminate any window of opportunity for prescribed burning about mid-month, but when rains hold off well into August, conditions may become too severe for prescribed burning. A second opportunity sometimes occurs in late August or September during a few weeks of dry weather, but this period is often not dry enough for prescribed fire to meet objectives.

Contingency personnel and equipment may be difficult to obtain during the prescribed burning season, as resources become committed to large wildfires in the interior of Alaska, and later in the lower 48. Coordination with neighboring agencies is critical to the ability of the Refuge to implement prescribed burns. More information about prescribed fire management strategies can be found in section 1.05.

4. FIRE BEHAVIOR/MONITORING

Early season burns will likely be limited to "black-lining" of some identified control boundaries to reinforce containment of prescribed burn units. As the season progresses, long day lengths and low humidity recovery contribute to more intense fire behavior well into the evening hours. Ground fuels will "carry" the fire better; duff moistures are low enough to insure consumption resulting in the mineral soil exposure necessary for regeneration of hardwoods. Fire behavior can respond rapidly to changes in relative humidity, so that a low intensity ground fire could quickly become an intense, difficult-to-control, rolling crown fire.

Prescribed fire will be monitored both during ignition and post burn. During ignition, the Burn Boss will monitor weather, flame length, fuel moistures, rate of spread and spotting component. These parameters are outlined in the individual burn plan documents. A visual post burn evaluation of first order fire effects will determine whether objectives such as mortality, hazard fuel loading reduction and mineral soil exposure, were met. The prescribed burn plan will contain an area for a post-burn write up documenting results of the evaluation. More specific monitoring may be done on selected sites. Permanent or semi-permanent plots may be established, or are already established in some areas of the refuge. These plots allow for consistency in measuring pre- and post-burn fuel consumption, fire effects on soils, vegetation and woody fuels, and a variety of other elements.

5. COMPLEXITY

The majority of prescribed fire projects throughout the Kenai NWR fall into the "moderate" level of complexity. Large maximum allowable areas (MAA) associated with many projects provide more options with regard to containment of the burn. Wind currents are generally favorable for dispersion of smoke. However, as projects that treat hazard fuels in and around the urban interface are planned, the potential for more complex burns will increase. Windows of opportunity can be short, as sequential rainstorms can keep a unit just barely out of prescription for long periods of time. Fire behavior during ideal conditions can present control problems, and there is the potential to impact residences, highways and area airports with smoke. Aerial ignition will often be involved, although for small units, or those portions of large units that are near residential areas, ignition will likely be by hand. Complexity will be determined on a case-by-case basis, utilizing the Interagency Complexity Element Rating Guide, and will be included in each individual burn plan.

6. IMPACTS

Public support for prescribed burning on the refuge has been generally favorable and consistent. Due to the severity of the spruce bark beetle infestation and the subsequent public information campaigns in south-central Alaska, the public has a high level of awareness about fire danger and the hazardous levels of dead woody fuels present in many areas of the Peninsula. Educational programs, such as "Project Impact" and "Firewise" have motivated a number of citizens to take steps to reduce hazardous fuels around their homes and communities. In addition, the over-mature condition of hardwood stands and the resulting decline of suitable moose browse has been visible to the public during recent winters as moose mortality has increased in the area. Much of the suitable moose winter range that was created by the wildland fires of the 1940s and 1960s has lost its productivity in recent years. The public recognizes the need to treat suitable vegetation with wildland and prescribed fire to maintain critical moose habitat on the refuge.

The impacts of prescribed burning on the Kenai NWR can and do include the sight and smell of smoke at times. Hunters and other backcountry visitors might be adversely impacted by smoke at different times during the fire season. There is also the potential to impact local communities with smoke. These impacts can be exacerbated by smoke from the Interior of Alaska, or at times from as far away as Siberia or Canada.

Impacts to sensitive soils, wetlands and riparian areas can occur during line construction, heavy equipment use, or through the spillage of gasoline products such as drip torch fuel or aircraft fuel. Adverse impacts to refuge lands and resources will be avoided or mitigated by: using natural or existing barriers whenever possible in order to avoid control line construction; using approved "screens" or foot-valves when drafting water out of streams that support anadromous fish; coordinating prescribed fire activities with refuge biologists to avoid adverse impacts to wildlife; ensuring that spill kits or absorbent

materials are available where fuel spills could occur; and avoiding refueling activities near wetlands and streams.

7. PRESCRIBED BURN CRITIQUE

Prescribed fire projects will be evaluated for effectiveness and burn plan objective accomplishment as soon as possible after firing and holding operations cease. The level of success for each objective - will be noted on the post-burn evaluation portion of the prescribed burn plan. A post-burn briefing is desirable, to discuss successes, failures and ideas for improvement. Further debriefings will follow to inform refuge staff of project happenings.

8. CONTINGENCY

The Maximum Allowable Area (MAA) is identified in the burn plan and is outlined on the project map that is attached to each burn plan. The MAA identifies the maximum burned area that is acceptable and the "trigger points" at which further significant fire activity would result in conversion of the prescribed fire to a wildfire. The MAA makes it possible for fire managers to select natural or pre-existing boundaries that would serve to contain fingers of fire spread that are outside of the immediate ignition zone and unit boundaries, but that pose no threat to critical resources. The MAA represents adjacent land that also meets the criteria for prescribed fire application, but might be too large an area to plan for ignition all at once (for example, a finger or slopover that is expected to burn up into a snow-covered slope on a mountain in an area that would likely be included in future projects anyway). The MAA is important to successful landscape burning in that it allows fire managers to limit costs and the negative impacts of strict suppression in sensitive areas outside the immediate prescribed fire unit, or to manage the occasional slopover without the need to declare an escaped wildfire. The prescribed burn plan will give limits and considerations for use of the MAA, which may include a total acreage limit, weather limits or a limit on simultaneous directions of spread within the MAA. The Regional Fire Coordinator will be advised of the status of any fire that persists within an MAA.

Contingency forces identified in the prescribed burn plan document will be available during ignition, and are able to be brought on-site within the time frame specified in the burn plan. Acceptable time frames may vary according to levels of risk to adjacent resources. For example, in a very remote area with a large MAA, the arrival of contingency forces within a 4-hour time frame might be acceptable, whereas a burn near an area of urban interface or other structures might require all contingency forces to be immediately on hand during the burn. Other forces may be noted in the burn plan as those that are normally readily available for reference only, but are not required to handle projected fire activity in the event of a slopover. A spot fire that is outside the immediate project area, but within the Maximum Allowable Area will be evaluated for necessary action and does not of itself constitute an escaped wildfire. If the prescribed fire exceeds prescription parameters, if relative humidities dip below those prescribed, for instance, ignition will be shut down and will not continue until prescription parameters can be met.

Any fire that threatens to escape the MAA or exceeds parameters and cannot be returned to control with contingency and other readily available resources will be declared an escaped wildfire. The Refuge Fire Management officer or their acting, and/or Refuge manager or their acting can declare a prescribed burn an escaped wildfire for any reason, even if the fire remains within the MAA.

Should it become necessary to declare an escaped wildfire, the State Department of Forestry will be notified and a unified command will be formed to initiate the most appropriate suppression response. In the meantime, the Burn Boss will serve as the Incident Commander until notified otherwise, and all assigned refuge personnel will continue on the project as suppression forces unless relieved by DOF personnel. Personnel that have passed the physical fitness test at the "moderate" level may not remain on the fire beyond the first shift, and should be relieved as soon as possible. All personnel remaining on the declared wildfire will meet all training and physical requirements for wildland firefighters, including a fitness test score of "arduous".

3.03
Wildland Fire

1. FIRE MANAGEMENT UNITS (FMU'S)

The CCP states that fires should be permitted to burn unless life, property or significant resource values are at risk and that fire should be managed to meet refuge goals. The Fire Management Units for the Kenai NWR (Figure 7) are delineated by the Fire Management Options from the Alaska Interagency Wildland Fire Management Plan. This format allows the refuge to coordinate directly with DOF to meet management objectives for suppression.

Determination of refuge FMU's and the respective policy is based on the values at risk, management objectives, and the strategies selected for vegetative communities within the refuge. Variables such as fuel loading, fuel type, moisture levels, relative humidity and topography will be used in the decision-making continuum for wildland fire incidents. However, predetermined management directives for the FMU's will be based on the threat to life, property and resources of value.

A statewide Multi-Agency Coordination (MAC) group is formed when fire danger preparedness levels reach Level 4 or 5. The MAC group establishes priorities for allocation of suppression resource and to determine if a temporary change in the assigned fire management option under AIWFMP is necessary for a specific region due to increased fire danger. The duration and extent of any temporary changes will be determined by the MAC group and will be managed accordingly under the Refuge FMU's.

The Fire Management Units directly correspond with the Fire Management Options shown in the AIWFMP Map Atlas and are managed according to those options. The following map (Figure 7) shows the FMU boundaries on the refuge.

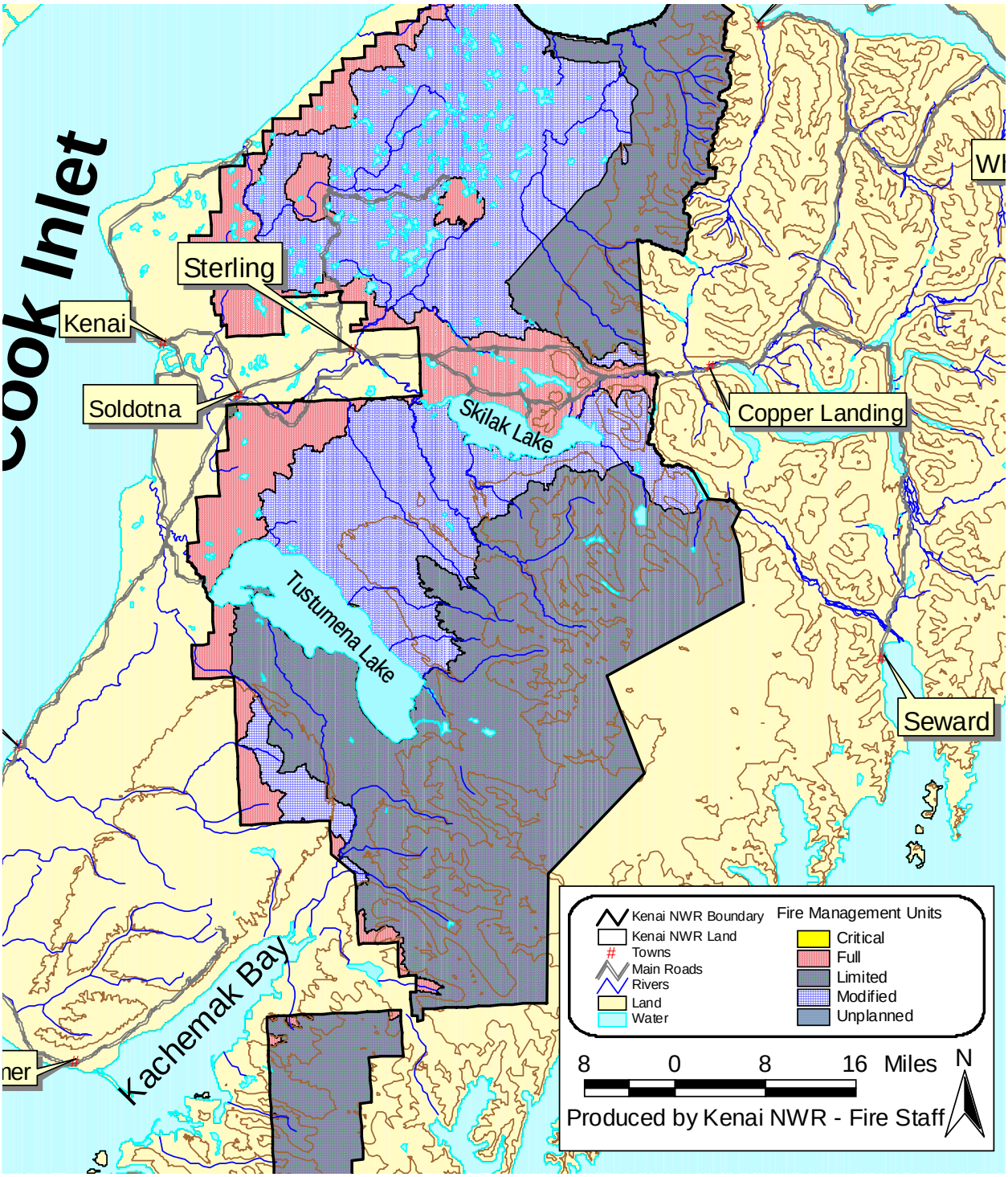

Figure 7: Kenai NWR – Fire Management Units

Fire Management Units	Appropriate Management Response	Policy Intent
Critical	Suppression by DOF or closest refuge fire qualified personnel as soon as possible. Fire Management Officer or Agency Contact receives immediate notification. Refuge may implement AMR ranging from full suppression to monitoring fire behavior depending on values at risk.	Prioritize agency suppression actions for wildfires threatening human life, inhabited property, and other designated structures. Firefighter safety is the first priority. Critical FMU's receive the highest priority in terms of suppression resource assignments.
Full	Suppression by DOF or closest refuge fire qualified personnel as soon as possible. Fire Management Officer or Agency Contact receives immediate notification. Refuge may choose to implement Appropriate Management Response (AMR) ranging from full suppression to monitoring of fire depending on values at risk.	Protection of uninhabited structures (cultural, public use, and historical), private property, and valuable natural resources. Full FMU's receive the second highest priority in terms of suppression resource assignments.
Alternate Response	Fire Use for Resource Benefit under natural ignition conditions if prescriptive criteria are met.	Fire may be used for resource benefits i.e. to improve moose habitat, to remove hazard fuels, etc. Fires would be closely monitored for any changes that would affect adjoining private property or values at risk.
Modified	Suppression by DOF or closest refuge fire qualified personnel as soon as possible, if prior to conversion date. Agency contact receives immediate notification. Refuge may implement AMR from full suppression to monitoring of fire behavior depending on values at risk.	Fires receive initial attack depending on available resources, unless FMO or Agency Contact chooses otherwise and documents decision through the WFSA process. After the designated conversion date, Modified FMU's will have the same response as Limited FMU's.
Alternate/Preferred Response	Fire Use for Resource Benefit under natural ignition conditions if prescriptive criteria are met.	Fires allowed to burn for resource benefits. Fire is monitored to ensure that resource management objectives are met and that values at risk are not threatened.
Limited	Suppression by DOF or closest refuge fire qualified personnel as soon as possible. Fire Management Officer or Agency Contact receives immediate notification. Refuge may implement AMR ranging from full suppression to monitoring fire behavior depending on values at risk.	Fires allowed to burn within predetermined areas. Continued protection of human life and site-specific resources as specified in the FMP or WFSA.

Preferred Response	Fire Use for Resource Benefit under natural ignition conditions if prescriptive criteria are met.	Fire allowed to burn for resource benefits. Fire is monitored closely to ensure that resource management objectives are met and that values at risk are not threatened.

Table 4: Fire Management Units with Appropriate Management Responses

Prescriptive criteria for wildland fire use are listed in Appendix 6.07.

2. WILDLAND FIRE USE

The Fire Management Staff may manage certain ignitions within the Refuge for a resource benefit. An example might be to reduce hazard fuel loading, maintaining or restoring wildlife habitat, or creating a healthier forest community or habitat.

Wildland Fire Use will be the *preferred response* for ignitions detected in Limited and Modified FMU's (after the conversion date), if the ignitions are natural. These FMU's are predominantly located within or immediately adjacent to wilderness or primitive areas where there is little threat to life, property or values at risk.

Wildland Fire Use is an alternate response in Full protection FMU's, when it is determined that life, property and values at risk are not threatened. The Full management option FMU's occur mostly in or adjacent to areas of heavy public use.

Wildland Fire Use is not permitted in Critical management option Fire Management Units. In Critical FMU's, immediate and aggressive suppression action is the only response, so long as firefighter and public life safety are protected.

3. SUPPRESSION STRATEGIES

Wildland fire suppression on the Kenai NWR is provided by the State of Alaska – Division of Forestry (DOF) through an agreement with the BLM- Alaska Fire Service under the AIWFMP, as approved by the U.S. Fish & Wildlife Service. By agreement, all suppression actions implemented by the DOF must follow AIWFMP guidance and the refuge FMP. Suppression is prioritized under the AIWFMP and designated by management option. Suppression resource availability may be severely impacted during a heavy fire season statewide. Large fires in other areas of Alaska may affect the availability and response time of suppression forces in this area. During these times, it becomes more critical for refuge fire personnel to patrol for wildfires and to perform backcountry fire prevention patrols.

The use of Minimum Impact Suppression Tactics (MIST) is required for suppression activities on refuge lands whenever practicable. Minimum impact tactics and strategies meet management objectives with the least amount of cultural and environmental impact. The use of minimum impact tactics requires the assessment of both long and short–term

values at risk and a comparison with suppression costs. This can be a difficult, often subjective process and should therefore be documented in the WFSA process.

Minimum impact tactics can be achieved by including an agency resource advisor in the decision making process on wildfire incidents, briefing overhead and crews on minimum impact tactics to ensure full understanding and implementation, including MIST in the Incident Action Plan (IAP), and ensuring that all fire staff officers (Command, Planning, Logistics, Operations, etc.) are briefed on their responsibilities where minimum impact tactics are used. At no time should the use of minimum impact tactics supercede the safety of firefighting personnel.

4. WILDLAND FIRE SITUATION ANALYSIS

The Wildland Fire Situation Analysis (WFSA) is a systematic decision making process used by the land manager and the suppression agency to determine the appropriate management response for a wildland fire incident. A WFSA is prepared when a fire: 1) escapes initial attack, 2) threatens to escape a fire management option into a higher management option, 3) warrants suppression action but has not been suppressed due to resource shortages, 4) is beyond the capabilities of available initial attack resources, or 5) management objectives are not being met and a new strategy is required.

A WFSA is jointly prepared and documented by the land manager and the suppression agency. The land manager approves the WFSA and any amendments or revisions with the concurrence of the suppression organization. The land manager must ensure that the WFSA is prepared and reviewed by experienced and qualified personnel, such as the refuge FMO. The WFSA is a tool for the development of alternative suppression strategies and for analyzing the potential costs, benefits and impacts of those strategies. The assigned Incident Commander should validate the WFSA to ensure the selected alternative is achievable.

While the AIWFMP requires the use of the WFSA process, it does not specify a format. The refuge manager and fire management officer should cooperate with the fire suppression agency in selecting an appropriate WFSA format for any given incident. There are several acceptable WFSA formats available in Alaska and nationally. It is preferable that the cooperators decide on one particular format prior to the fire season to save time and effort during incident management activities.

4.0 – AIR QUALITY & SMOKE MANAGEMENT GUIDELINES

4.01 General

As required by the Clean Air Act, all prescribed burning and wildland fire use on the refuge will be managed in compliance with conditions set forth by the State of Alaska, in

a smoke management permit issued by the Alaska Department of Environmental Conservation (ADEC). Prior to prescribed fire ignition, the following refuge cooperators and other agencies will be notified: Alaska State Troopers, Central Emergency Services and other local fire departments, adjacent landowners, the Flight Service Office in Kenai, the Federal Aviation Administration tower in Anchorage and the Alaska Division of Forestry. The State of Alaska is the sole permitting authority. There are no local or interstate air pollution control regulations. Prescribed fires will be closely monitored for smoke trajectory, ventilation factor, and for adverse impacts to known sensitive areas or resources and to overall air quality. Firing will begin only when conditions are expected to remain favorable for dispersion of smoke.

If smoke hampers visibility along paved public highways or in and around airports with scheduled carrier service, or significantly impacts or is expected to impact populated areas due to changes in weather, actions will be taken to reduce emissions and mitigate negative impacts. These may include but are not limited to: firing of unburned portions of a unit to reduce smoldering; terminating ignition; mop-up of smoldering portions of the unit; use of natural barriers or constructed fireline to halt fire spread. Warning signs will be posted along impacted roads, including reduced speed if necessary. Aviation and traffic control will be coordinated with the appropriate agencies.

All fire management projects will have approved plans that provide specific smoke management parameters for each individual project. All prescribed fire projects will be conducted under the supervision of a qualified Burn Boss. The Burn Boss will shut down ignition of their prescribed burn if air quality objectives deteriorate. The refuge Fire Management Officer will shut down ignition of any and all burning on the refuge for any reason deemed necessary, including air quality. The Kenai NWR will coordinate smoke management with ADEC and adjacent state and federal agencies that might conduct prescribed fire activities on their lands, with potential to affect the same airshed.

Impacts to the public and the smoke produced during the course of fire management activities must be evaluated in light of the impacts and smoke produced during uncontrolled wildfires. Public Education programs on the Kenai National Wildlife Refuge will increase public understanding of the natural processes of fire, of fire's role on the refuge, and of refuge efforts to protect air quality while using fire as a land management tool.

The Kenai NWR contains no Class I airsheds. The nearest is Tuxedni Bay, which is located about 50 miles west of the Kenai Refuge boundary, on the west side of Cook Inlet and along the eastern boundary of Lake Clark National Park. See Figure 1 for the position of the refuge relative to Tuxedni Bay, Anchorage and other communities (Tuxedni Bay is almost due west across Cook Inlet from Ninilchik). After Tuxedni Bay, the next most sensitive smoke target is the city of Anchorage and its surrounding communities. Sensitive airspace around the Kenai and Soldotna airports are shown in Figure 8.

The FWS is currently involved in an interagency effort to develop a Smoke Management Plan for Alaska by 2005. A Regional Haze Plan for Alaska is required by 2007. Either or both plans could impact prescribed fire activities on the refuge in the future.

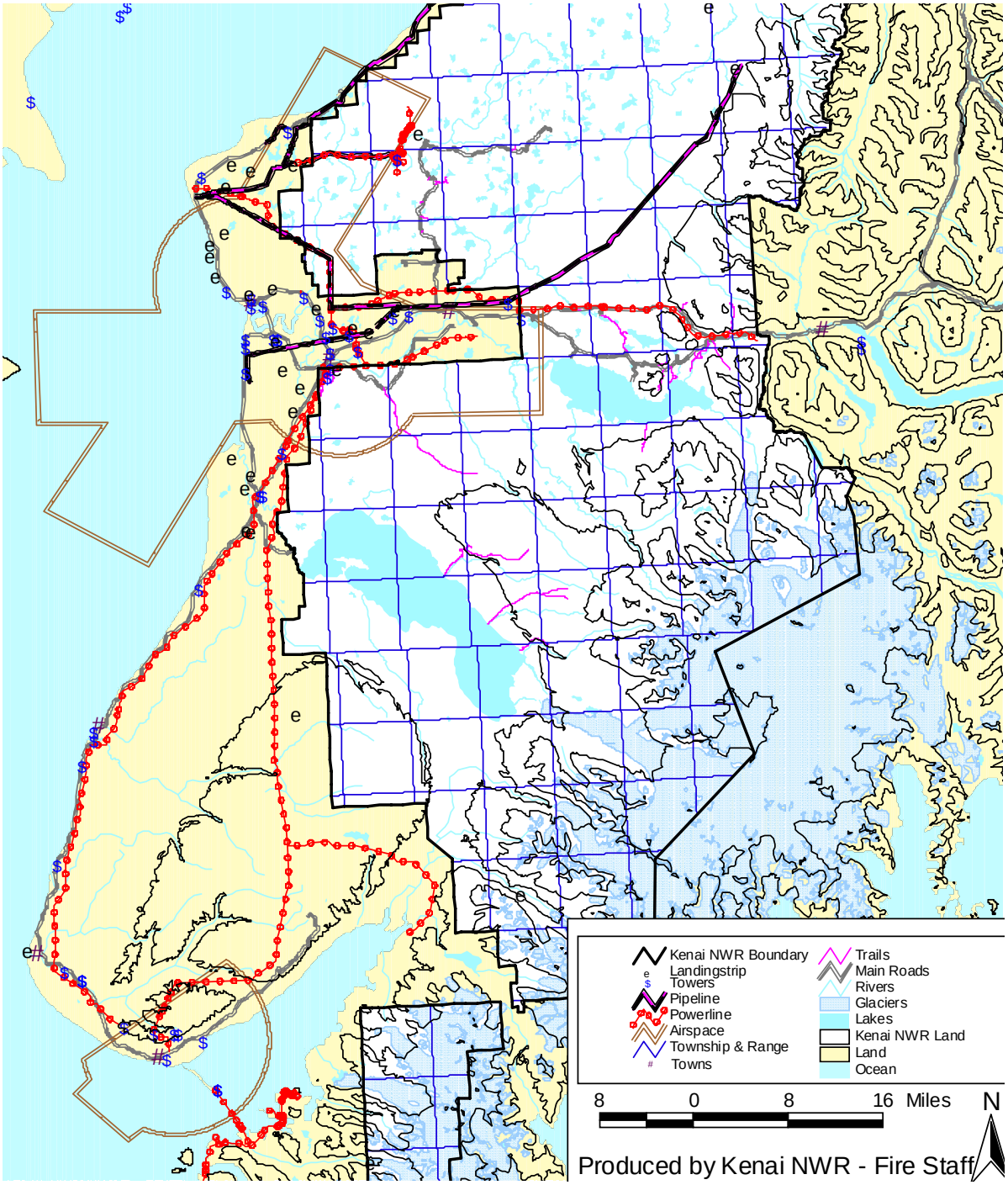

Figure 8: Kenai NWR – Access & Airspace Hazards

5.0 – PUBLIC INFORMATION AND EDUCATION

5.01
General

The following steps will be taken to facilitate public awareness of Kenai NWR fire management policies, objectives, and actions.

- The Fire Management Program will work closely with the public use program to effectively implement fire management and prevention interpretive programs at refuge headquarters, in refuge campgrounds and at area schools.

- The Fire Management Officer and other fire management staff will: submit articles to the local newspaper regarding fire management activities, participate in radio talk shows and interviews when possible, and otherwise make the most of every opportunity to share information with the public, both internally and externally.

- The Fire Management Program will be included in interpretive hikes, talks, and video presentations and off-site programs presented by other refuge staff whenever possible.

- During wildland and prescribed fire operations, news articles and press releases will be written and released to local media in a timely fashion. Designated refuge personnel will perform the duties of information officer as qualified and as needed.

- When fire use projects are in areas of concern to visitors or adjoining private property owners every effort will be made to disseminate information to the public. This will occur through newspaper articles, refuge mailing lists, radio public service announcements, handouts or signs.

- The Fire Management Officer will keep refuge employees informed about the fire management program and on-going incidents/projects.

- Fire management program personnel will be trained and active in the implementation of the FireWise Community Action Plan for wildland fire mitigation and preparedness.

- Fire management will develop and maintain a fire management information web page as funding and policy permits, to inform interested parties about: current and future fire management projects, fire prevention and mitigation information, wildland and prescribed fire incidents and projects, and links to other regional and national fire management websites.

- Fire management will publish an annual program of work notice (a list of current and future projects) in the local media.

- During fire prevention patrols of the refuge, fire personnel will distribute fire prevention and safety information to refuge visitors.

6.0 – APPENDICES

6.01
Normal Use Strength (NUS)

According to "3.1.4 Preparedness Activities", section of the USFWS Fire Management Handbook there is a basic requirement for supplies, material and equipment that Kenai NWR must have in its cache. The items listed below, when combined with capitalized equipment (See Appendix 6.03, Kenai NWR Dispatch Plan), are designed to provide adequate support to all refuge initial attack staff, and are known as the Normal Use Strength (NUS) inventory. This NUS list is the minimum level of the items required for the initial attack fire suppression efforts of the refuge fire staff, and is not intended for support of extended attack fires or for prescribed fire activities. The current NUS list for Kenai NWR is as follows:

Item	NUS Formula
Rations, Shelters, Hard Hats, Head Lamps, Goggles, Packs, Line Gear, First Aid Kits, Sleeping Bags, Water Bottles	1 per red-carded individual plus 20%
Tents	1 per red-carded individual
Nomex Pants, Nomex Shirts, Gloves	2 per red-carded individual plus 20% for each size issued
Shovels, Pulaskis, McLeods, Flaps, Fire Rakes (Hand Tools)	2 per red-carded individual plus 10% for each type of tool. Mix of tools is determined by station based on local needs.
Flight Helmets	6 per helicopter contract plus 2 spares. Stations w/o contract aircraft that frequently use helicopters for fire activities should obtain 4.
Back Pack Pumps	1 per 2 red-carded individual
Chain Saws, Portable Pumps, Fold-A-Tank	As approved by the RFMC depending on firefighting tactics.
Foam	15 gallons per engine
Hose - Portable Pump used for Hose lays or any size engine	1.5 inch -900 feet 1 inch - 900 feet
Nozzles (1" and 1.5" - total)	2 - Portable Pump 4 - Light Engine 5 - Medium or Heavy Engine Plus 20% for total number of nozzles on engines, water and foam combined
Wyes, Tees, Wrenches, Relief Valves, Hose Clamps, etc.	2 - Portable Pump 2 - Light Engine 3 - Medium Engine 4 - Heavy Engine Plus 10% for each item listed as required in the inventory
Adapters and Reducers (Based on Local and anticipated needs)	2 - Portable Pump 2 - Light Engine 4 - Medium Engine 5 - Heavy Engine In addition, 10% for each item listed as required in the inventory.

Table 5: Kenai NWR – Fire Cache NUS Listing

6.02
Definitions

Definitions listed here are for some of the official terms and acronyms used in this plan. These terms are nationally and/or regionally recognized and accepted by the National Wildfire Coordinating Group (NWCG) and/or the Alaska Wildland Fire Coordinating Group (AWFCG), respectively. The definitions have been collected from a number of different sources, especially those listed in section 1.01 Introduction.

- **Airshed** – a geographical area that shares the same air mass due to topography, meteorology, and climate.
- **Anadromous** – (of fish) that are born and reared in freshwater, move to the ocean to grow and mature, and return to freshwater to reproduce, e.g., salmon, steelhead.
- **Appropriate Management Response** – the response to a wildland fire is based on an evaluation of risks to firefighter and public safety, the circumstances under which the fire occurs, including weather and fuel conditions, natural and cultural resource management objectives, protection priorities, and values to be protected. The evaluation must also include an analysis of the context of the specific fire within the overall local, geographic area, or national wildland fire situation.
- **CCP** – Comprehensive Conservation Plan – the land and resource management plan of the U.S. Fish & Wildlife Service, National Wildlife Refuge
- **CFFDRS** – Canadian Forest Fire Danger Rating System – the process by which relative fire danger indices are assigned. Fire weather information is integrated with fuel and topographic information to arrive at various fire danger indices. CFFDRS indices are widely used by fire management agencies in Alaska to predict fire danger, to prepare for wildland fire suppression, and to define the conditions that will permit the use of wildland or prescribed fire.
- **Extended Attack** – the measured suppression response to a wildland fire that has exceeded the suppression capabilities of the initial attack resources in a specified time period, usually one operational period or 24 hours after initial attack began.
- **FMP** – Fire Management Plan – strategic plans that define a program to manage wildland fires based on an area's approved land management plan. Fire management plans must address a full range of fire management activities that support ecosystem sustainability, values to be protected, protection of firefighter and public safety, public health and environmental issues, and must be consistent with resource management objectives and activities of the area.
- **Initial Attack** – the aggressive suppression response to a wildland fire based on values to be protected, benefits of response, and reasonable cost of response.
- **KNWR** – Kenai National Wildlife Refuge – approximately 1.97 million acres of public land located in south-central Alaska on the Kenai Peninsula.
- **MAA** – Maximum Allowable Area – a secondary perimeter around a prescribed fire unit, usually defined by natural or man-made barriers such as streams, ridges or roads. A prescribed fire that escapes the MAA is usually classified as an escaped wildland fire, triggering a Wildland Fire Situation Analysis (WFSA) and an appropriate management (suppression) response.

- **MAC Group** – Multi-Agency Coordinating Group; national, regional, or local management groups for interagency, intergovernmental planning coordination, and operations leadership.
- **MIST** – Minimum Impact Suppression Tactics – using the least amount of force (resources, equipment, personnel) necessary to achieve fire management objectives.
- **NIIMS** – National Interagency Incident Management System – a common command system for day-to-day operational procedures that can be expanded to manage major single or multijurisdictional emergencies.
- **NUS –** Normal Use Strength – a cache of firefighting tools and personal protective equipment adequate to support all refuge initial attack staff.
- **Preparedness** – the process of planning and implementing activities prior to wildland fire ignitions. This process includes actions that are completed on a routine basis prior to each fire season, as well as incremental actions conducted in response to increasing fire danger.
- **Prescribed Fire** – any fire ignited by management actions to meet specific objectives. Prescribed fires are conducted in accordance with prescribed fire plans.
- **Prescriptive Criteria** – measurable criteria or parameters that define conditions under which a prescribed fire will be ignited, a wildland fire will be managed to accomplish specific resource management objectives, or to guide the selection of appropriate management responses. Prescription criteria may include safety, economic, public health, and environmental, geographic, administrative, social or legal considerations.
- **Scoping** – the process of defining and documenting the issues, concerns and opportunities that arise during land management planning when a specific action is proposed. This is an information gathering process involving resource management professionals and interested publics.
- **Smoke Management** – conducting a prescribed fire under suitable fuel moisture and meteorological or atmospheric conditions, using firing techniques that keep smoke impacts within designated areas and below violations of air quality standards or within visibility protection guidelines. Smoke management parameters often are listed as prescription criteria in prescribed fire plans.
- **Unified Command** – an authority exercised by all agencies or individuals who have jurisdictional responsibility, and in some cases those who have functional responsibility at the incident, to contribute jointly to (a) determining overall objectives for the incident, and (b) selection of a strategy to achieve objectives.
- **WFSA** – Wildland Fire Situation Analysis – a decision-making process that evaluates alternative management strategies against selected safety, environmental, social, economic, political, and resource management objectives.
- **Wildfire** – an unwanted wildland fire
- **Wildland Fire** – any non-structural fire that occurs on wildland.
- **Wildland Urban Interface (WUI)** – the line, area, zone or condition where structures and other human improvements or values at risk, meet or intermingle with undeveloped wildland or vegetative fuels.

6.03
Kenai NWR – Dispatch Plan

6.04
Refuge Planning Documents Cited

- Record of Decision and Final Comprehensive Conservation Plan, Environmental Impact Statement, and Wilderness Review (CCP) for the Kenai National Wildlife Refuge, January 1985.

- Kenai National Wildlife Refuge Fire Management Plan, February 1988.

- Record of Decision and Final Supplemental Environmental Impact Statement for the Wilderness Proposal in the Final Kenai National Wildlife Refuge Comprehensive Conservation Plan/Environmental Impact Statement/Wilderness Review, October 1988.

- Kenai National Wildlife Refuge Moose/Habitat Management Plan, April 1996.

- Alaska Interagency Wildland Fire Management Plan, October 1998.

- U.S. Fish & Wildlife Service Fire Management Handbook, June 2001.

- Review and Update of the 1995 Federal Wildland Fire Management Policy, January 2001.

6.05
Additional Support Documents

- Miner, B. 2000. Forest regeneration and use of browse by moose in large-scale wildfires and managed habitat areas, Kenai National Wildlife Refuge, Alaska. MS Thesis, Alaska Pacific University, 118pp.

- DeVolder, A. 1998. Fire history of lowland black spruce forests, Kenai National Wildlife Refuge, Alaska. MS Thesis, Northern Arizona University, xxxpp.

- Palmer, L. J. 1938. Management of moose heard on Kenai Peninsula, Alaska. Research Project Report for March, April and May, 1938. Unpublished report, Juneau, Alaska, dated June 1, 1938.

6.06
Cooperative Agreements

Following is a list of current cooperative agreements that apply to fire management activities on the Kenai National Wildlife Refuge:

- Memorandum of Understanding among the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service of the United States Department of the Interior; the Forest Service of the United States Department of Agriculture; and the National Weather Service of the United States Department of Commerce for the Joint Operations of the National Interagency Fire Center at Boise, Idaho (BIFC), effective this 27th Day of January 1993. A bureau or agency may terminate this Memorandum of Understanding upon twelve (12) months written notice to the other participating bureaus/agencies.

- Memorandum of Understanding between the Secretary of Agriculture and the Secretary of the Interior to establish the National Wildfire Coordinating Group (NWCG), effective this 18th Day of March 1976, until terminated by either party upon thirty (30) days written notice to the other.

- Interagency Agreement for Fire Management between the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service of the United States Department of the Interior; the Forest Service of the United States Department of Agriculture; the Department of Natural Resources, Department of Fish & Game of the State of Alaska; and the Native Organizations Tanana Chief Conference, Inc. and Chugachmiut, effective this 4th Day of December 1998. The Agreement is known as Alaska Interagency Wildland Fire Management Plan (AIWFMP).

- Interagency Agreement for Fire Management between the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, and the U.S. Fish and Wildlife Service of the United States Department of the Interior and the Forest Service of the United States Department of Agriculture, effective this 20th Day of February 1997. [FS Agreement #: 97-SIA-004, FWS Agreement #: 1448-93510-97-H-504] This Agreement shall remain in effect until the 30th Day of September 2002. Amendment No.1, FS Agreement #: 97-SIA-004-01, signed 08/26/1999.

6.07
Prescriptive Criteria

Prescriptive criteria referenced in sections one and three of this plan, are applicable for wildland fire use and for prescribed fire planning. All Prescribed Fire Plans are required to use some accepted measurement of drought condition as a prescriptive ceiling or upper limit for ignition. The Kenai NWR uses the Canadian Forest Fire Danger Rating System indices calculated hourly for local RAWS weather stations on or adjacent to the Refuge, wildland fire use and prescribed fire planning and implementation.

There are three RAWS units on the refuge: Swanson River, Kenai NWR at Mystery Creek, and Skilak Lake Guard Station. Real-time weather data and CFFDRS indices are available through the Alaska Fire Service website at: http://fire.ak.blm.gov. Data from these stations and spot weather forecasts from the National Weather Service in Anchorage (907-266-5105) provide the current and expected fire weather information needed to make fire behavior predictions and GO-NO-GO decisions. The indices most often used by refuge fire managers as prescriptive criteria and indicators of drought are Duff Moisture Code (DMC), Build Up Index (BUI) and/or Fire Weather Index (FWI).

On the refuge, a DMC of 50 can be the upper limit for slash pile burning. A higher DMC index would indicate the possibility of a creeping or smoldering ground fire. A DMC of 100 is usually a good indicator of drought conditions on the Kenai, since it indicates a relatively-low duff moisture percentage, and conversely very high to extreme fire danger. So a DMC between 50 and 100 can be a logical prescriptive range for implementation of a prescribed fire in black spruce.

In addition to these fire weather and fuel moisture criteria, other factors can be used as prescriptive criteria for wildland fire use and prescribed fire planning and implementation, including smoke management guidelines such as ventilation factors or wind direction, management guidelines such as preparedness level or resource availability, and health factors such as smoke impacts on local residents or firefighters.

1. Wildland Fire Use

The following prescriptive criteria will preclude or prevent wildland fire use on the refuge:

- The fire cause is anything other than natural (lightning)
- DMC or BUI at the nearest representative weather station is greater than 100
- A national preparedness level of 5 has been implemented
- The fire is within or threatening Critical management option areas

- The fire is within Full, Modified or Limited areas and threatens human life or high value resources

2. <u>Prescribed Fire</u>

The following prescriptive criteria will preclude or prevent prescribed fire implementation or will prevent further ignition:

- DMC or BUI at the nearest representative weather station is greater than 100
- Sustained winds greater than 20 miles per hour from any direction
- A wind direction that will cause sustained smoke impacts on sensitive targets such as Anchorage, Tuxedni Bay, or any community on the Kenai Peninsula
- Ignition will be stopped if the prescribed fire escapes the maximum allowable area, if conditions change and exceed prescriptive limits, if fire behavior threatens firefighter safety, or if spot fires outside the unit boundaries exceed the holding capabilities of the prescribed fire organization