

Tetlin National Wildlife Refuge Fire Management Plan



October 2001

FIRE MANAGEMENT PLAN

for

TETLIN NATIONAL WILDLIFE REFUGE

Alaska

October, 2001

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TABLE OF CONTENTS

TABLE OF CONTENTS	i
LIST OF FIGURES	iv
LIST OF TABLES	v
LIST OF EXHIBITS IN APPENDIX	vi
I. <u>INTRODUCTION</u>	1
A. NEPA Compliance	1
B. FMP Authorities	2
II. <u>COMPLIANCE WITH FISH AND WILDLIFE SERVICE POLICY</u>	3
III. <u>DESCRIPTION OF REFUGE</u>	4
A. Physical Description.	4
B. Inholdings	4
C. Climate.	7
D. Topography.	8
E. Surficial Geology and Soils.	8
F. Water Resources and Permafrost.	9
G. Wildlife Resources.	10
H. Ecosystems	11
I. Vegetation.	21
J. Refuge Facilities and Public Use	24
K. Historical and Cultural Resources	26
IV. <u>REFUGE FIRE OCCURRENCE INFORMATION</u>	27
A. Role of Fire on the Refuge.	27
B. Refuge Fire History and Frequency.	27
C. Fuel Models and Fire Behavior.	31
D. Fire Effects	33

V. <u>REFUGE HABITAT MANAGEMENT OBJECTIVES.</u>	38
A. Habitat Management Objectives	38
B. Management Constraints.	40
C. Current Habitat Manipulations.	40
VI. <u>REFUGE FIRE MANAGEMENT OBJECTIVES.</u>	41
A. General Fire Management Objectives.	41
B. Specific Fire Management Objectives.	41
VII. <u>REFUGE FIRE MANAGEMENT STRATEGIES.</u>	42
A. Specific Strategies.	42
B. Constraints to Specific Strategies	43
C. Factors Governing Selection of Strategies.	43
VIII. <u>FIRE MANAGEMENT UNITS.</u>	44
A. Fire Management Unit Descriptions.	44
IX. <u>FIRE MANAGEMENT AND RESPONSIBILITIES.</u>	47
A. Refuge Fire Management Team Responsibilities.	47
B. Refuge Fire Management Team Members and Qualifications.	47
C. Responsibility for Decision Criteria Validation.	48
D. Interagency Coordination.	48
E. Normal Unit Strength	48
X. <u>WILDLAND FIRE MANAGEMENT PROGRAM.</u>	49
A. Wildland Fire Suppression Program	49
1. Suppression Authority and Planning	49
2. Suppression Response Levels.	52
3. Fire Season Description.	54
4. Ecological Impacts of Fire Suppression.	54
5. Economic Importance.	55

6.	Refuge Management Decision Impacts on Fire Management	55
7.	Fire Suppression Guidelines.	55
8.	Completion of Records and Reports.	59
9.	Risks Associated With AIWFMP Suppression Options	61
10.	Determination of Validity	62
11.	Coordination With Adjacent Landowners	62
12.	Prevention	64
13.	Detection.	64
14.	Radio Communication.	65
15.	Electronic Data Processing	65
B.	Wildland Fire Use Program	66
1.	Overview	66
2.	Objectives.	67
3.	General Plan.	67
4.	Responsibility for Initiation of Decision Process.	67
5.	Incident Specific Implementation Procedures	68
6.	Staffing Requirements.	70
7.	Monitoring	70
8.	Funding/Fiscal Tracking	70
9.	Permanent Project Records	71
10.	Information and Interpretation	71
11.	Potential Impacts	71
XI.	<u>PRESCRIBED FIRE MANAGEMENT PROGRAM</u>	72
A.	Overview	72
B.	Objectives	72
C.	Objectives, Constraints and Alternatives By Unit	73

D.	Monitoring and Evaluation	73
E.	Prescriptions	74
F.	Debris Disposal	77
G.	Prescribed Fire Review	78
H.	Suppression Criteria	79
XII.	<u>AIR QUALITY AND SMOKE MANAGEMENT GUIDELINES</u>	79
XIII.	<u>FIRE RESEARCH AND MONITORING.</u>	80
XIV.	<u>PUBLIC AND FIREFIGHTER SAFETY</u>	81
XV.	<u>FIRE MANAGEMENT EDUCATION</u>	82
XVI.	<u>FIRE CRITIQUES AND ANNUAL PLAN REVIEW</u>	83
XVII.	<u>CONSULTATION AND COORDINATION</u>	83
XIX.	<u>APPENDIX</u>	85

LIST OF FIGURES

Figure 1.	Tetlin National Wildlife Refuge Topographic Map (color)	5
Figure 2.	Tetlin NWR Administrative Boundaries and Land Status Map (color)	6
Figure 3.	Large Fire History on the Tetlin NWR (color)	30
Figure 4.	Tetlin NWR CCP Management Categories (color).	39
Figure 5.	Fire Management Units Designated for Tetlin NWR (color)	46
Figure 6.	Appropriate Management Response for Wildland Fire	50
Figure 7.	AIWFMP Option Zones On Tetlin NWR (color)	53
Figure 8.	Risk Assessment Charts for Fire Management Units on Tetlin NWR (color)	63
Figure 9.	Implementation Path for Wildland Fire Use	69

LIST OF TABLES

Table 1.	Land Status Within Tetlin National Wildlife Refuge Administrative Boundaries.	4
Table 2.	Mean Monthly Precipitation and Snowfall by Month at Northway, Alaska.	7
Table 3.	Prevalent 20 Foot Wind Speed and Direction Parameters From April Through September on Tetlin National Wildlife Refuge	7
Table 4.	Northern Eco-region Information Pertinent to Tetlin NWR	13
Table 5.	Ecosystem Characteristics- Upland Spruce- Hardwood Forest	14
Table 6.	Ecosystem Characteristics- Lowland Spruce- Hardwood Forest	15
Table 7.	Ecosystem Characteristics- High Brush	16
Table 8.	Ecosystem Characteristics- Low Brush, Muskeg, Bog	17
Table 9.	Ecosystem Characteristics- Riverine	18
Table 10.	Ecosystem Characteristics- Lacustrine	19
Table 11.	Ecosystem Characteristics- Alpine Tundra	20
Table 12.	Vegetation Types and Acreage On Tetlin National Wildlife Refuge	21
Table 13.	Real Property and Values on Tetlin National Wildlife Refuge, 2001	25
Table 14.	Fires and Acreage Burned on Tetlin NWR lands, 1982-2000	29
Table 15.	Fuel Models and Applications Associated With Vegetation Types Found On Tetlin NWR	31
Table 16.	Resource Management Objectives and Habitat Modification Alternatives By Fire Management Unit	45
Table 17.	Target NWCG Fire Qualifications For Refuge Staff	47
Table 18.	Wildland Fire Implementation Plan Requirements and Timeframes	60
Table 19.	Objectives, Constraints and Alternatives by FMU	73
Table 20.	Measured Fire Behavior and Environmental Conditions	74

LIST OF EXHIBITS IN APPENDIX

Exhibit A. Tetlin NWR Dispatch Plan 2001
Exhibit B. Tetlin NWR Preparedness Plan 2001
Exhibit C. Wildland Fire Situation Analysis Template
Exhibit D. Tetlin NWR Prescribed Burn Plan Template
Exhibit E. ... Prescriptive Criteria for Wildland Fires Managed for Resource Benefit
Exhibit F. References

I. INTRODUCTION.

Tetlin National Wildlife Refuge (Tetlin NWR) is located within the Fish and Wildlife Service-designated Interior Ecosystem Unit of the Northern Eco-Region in Alaska. Management decisions on the Refuge, particularly in relationship to fire management, are based on a landscape scale and an ecosystem perspective. Most upland vegetative communities within the watershed-based Interior Ecosystem Unit are fire-adapted. Consequently, the historic occurrence of fire has played an important natural role in their development.

The Tetlin NWR Fire Management Plan (FMP) provides the planning framework for all Refuge fire management decision-making, and specifies the uses of fire which are consistent with and can enhance Refuge habitat and wildlife management objectives. The Tetlin NWR FMP identifies action to be taken to preserve, protect and enhance natural and cultural resources with specific regard to both wildland fire and prescribed fire. The Tetlin NWR FMP provides the substantiation for wildland fire management actions and prescribed fire management actions taken on the Refuge. This plan also provides the foundation of objectives, guidelines and planning information upon which the Refuge prescribed fire program is based. The Tetlin NWR FMP has been prepared to implement Departmental, Service, Regional and Refuge policies and objectives.

A refuge fire management plan must be prepared for any refuge which has substantiated wildland fire occurrence or conducts prescribed burning activities. Tetlin NWR has a documented history of wildland fire occurrence and an established prescribed fire program.

A. Compliance with the National Environmental Policy Act. The Tetlin NWR FMP meets National Environmental Policy Act (NEPA) compliance requirements. Regulation 621 FW 2.4A(2) states that an environmental analysis for the use of prescribed fire must be prepared and submitted as part of the Fire Management Plan for approval by the Regional Director unless that action is adequately discussed in the field office's current planning documents and the accompanying environmental document or the objectives and goals set for the field office. The management direction and actions specified in this fire management plan have been evaluated in the approved Tetlin NWR Comprehensive Conservation Plan (CCP), Environmental Impact Statement and Wilderness Review, as required by Sections 304 and 810 of the Alaska National Interest Lands Conservation Act of 1980 (ANILCA). Public participation in the planning process was encouraged and documented in the development of alternatives and in the selection of a preferred management alternative, which the direction and intent of this fire management plan is based on. The Tetlin NWR FMP is the implementing document for the following fire management activities as specified in the CCP and analyzed in the CCP's Environmental Impact Statement:

- Creation of a firebreak across the refuge to protect Northway and inholdings in the northern third of the refuge
- Prescribed burning for habitat improvement and hazard reduction
- Managing lightning fires, except where they threaten human life or property
- Actions taken to suppress unwanted wildland fires

Additionally, NEPA Revised Implementing Procedures for the Fish and Wildlife Service (FWS) dated January 13, 1997 provides additional clarification regarding revised plans and fire management activities. 516 DM 6 lists categorical exclusions which apply to FWS wildland fire activities. These categorical exclusions include:

- The use of prescribed burning for habitat improvement purposes, when conducted in accordance with local and state ordinances and laws.
- Fire management activities, including prevention and restoration measures, when conducted in accordance with Departmental and Service procedures.
- Minor changes in existing master plans, comprehensive conservation plans, or operations, when no or minor effects are anticipated.
- Personnel training, environmental interpretation, public safety efforts, and other educational activities, which do not involve new construction or major additions to existing facilities.
- The issuance of new or revised site, unit, or activity-specific management plans for public use, land use, or other management activities when only minor changes are planned.

Suppression response activities on the Refuge adhere to direction found in the Alaska Interagency Wildland Fire Management Plan. This plan is covered under a 1984 programmatic Environmental Assessment and Finding of No significant Impact.

B. Authorities for implementing the FMP. The following laws, departmental manual references and publications are instrumental in providing the authority for implementing the Tetlin NWR FMP:

Alaska National Interest Lands Conservation Act of December 2, 1980 (94 Stat. 2371).
Alaska Native Claims Settlement Act of December 18, 1977 (88 Stat. 668; 43 U.S.C. 1601).
Departmental Manual, Part 620, Chapter 1, Wildland Fire Management, General Policy and Procedures.
Departmental Manual, Part 620, Chapter 2, Wildland Fire Management, General Policy and Procedures - Alaska.
Disaster Relief Act of May 22, 1974 (88 Stat. 143; 42 U.S.C. 5121).
Economy Act of June 30, 1932.
Federal Fire Prevention and Control Act of October 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).
Final Report on Fire Management Policy by Interagency Fire Management Policy Review Team, May 5, 1989.
Federal Property and Administrative Services Act of 1949.
Fire Management Preparedness and Planning Handbook, 621FW.
National Environmental Policy Act of 1969.
National Wildlife Refuge System Administrative Act of 1966 as amended (80 Stat. 927; 16 U.S.C. 668dd-668ee).
National Wildlife Refuge System Improvement Act of 1997.
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)
2001 Interior and Related Agencies Appropriation Act, Public Law 106-291
Tetlin National Wildlife Refuge Final Comprehensive Conservation Plan, Environmental Impact Statement, Wilderness Review and Summary, October 1987.
Wildfire Suppression Assistance Act of 1989, (P.L. 100-428, as amended by P.L. 101-11, April 7, 1989).

II. COMPLIANCE WITH FWS POLICY.

Tetlin NWR was set aside in 1980 as a result of the Alaska National Interest Lands Conservation Act (ANILCA). The specific purposes for which Tetlin NWR has been established and managed as specified in Section 302(8)(B) of ANILCA are:

- to conserve fish and wildlife populations and habitat in their natural diversity including but not limited to waterfowl, raptors and other migratory birds, furbearers, moose, caribou, salmon and Dolly Varden;
- to fulfill international treaty obligations with respect to fish and wildlife and their habitats;
- to provide the opportunity for continued subsistence uses by local residents consistent with the purposes set forth above;
- to insure water quality and necessary quantity within the Refuge to the maximum extent practicable;
- to provide opportunities for interpretation and environmental education.

In October, 1987, the Comprehensive Conservation Plan, Environmental Impact Statement and Wilderness Review were completed and approved for Tetlin National Wildlife Refuge. A common management direction for all alternatives developed and considered is to ensure that fish and wildlife populations and ecological relationships necessary to conserve natural diversity are maintained. The preferred alternative that was selected, and within the scope of which the Refuge has operated since that time, provides in part for the following resource management directions:

- Emphasize restoration of the Refuge's natural diversity and of key fish and wildlife populations and habitats to historic levels.
- Utilize prescribed burning as a primary wildlife habitat restoration technique.
- Provide for increased subsistence use of Refuge resources.
- Provide for increased opportunities for recreational hunting, fishing and wildlife observation.
- Maintain the Refuge in an undeveloped state.

This fire management plan contains a detailed program of action providing for the implementation of fire management policies and objectives within the scope of the Refuge Comprehensive Conservation Plan and the preferred management alternative.

There are resources within the Refuge boundaries that warrant special consideration regarding fire and/or protection from fire. These resources include threatened wildlife species, sensitive biological communities, real property on the Refuge and private inholdings. These resources are addressed in later sections.

III. DESCRIPTION OF REFUGE

Information provided below is a synopsis from sources such as the Refuge Comprehensive Conservation Plan and information not previously consolidated into planning documents that is appropriate for inclusion in this plan.

A. Physical Description. Tetlin National Wildlife Refuge is situated in an upland basin at the head of the Tanana Valley, encompassing approximately 935,000 acres including inholdings. The northern half of the Refuge is largely floodplain and wetlands. The Black Hills bisect the Refuge south of these wetlands and the terrain gradually rises to the south into the foothills of the Mentasta and Nutzotin Mountains.

The Refuge is roughly triangular in shape, bounded on the northeast by the Alaska Highway, bounded on the south by the Wrangell-St. Elias National Park and Preserve, and bounded on the northwest by Tetlin Native lands. The village of Northway, with a population of 393, is located within Refuge boundaries. There are 726,743 acres under actual federal ownership out of the 934,513 acres within the Refuge administrative boundary. See Figure 1.

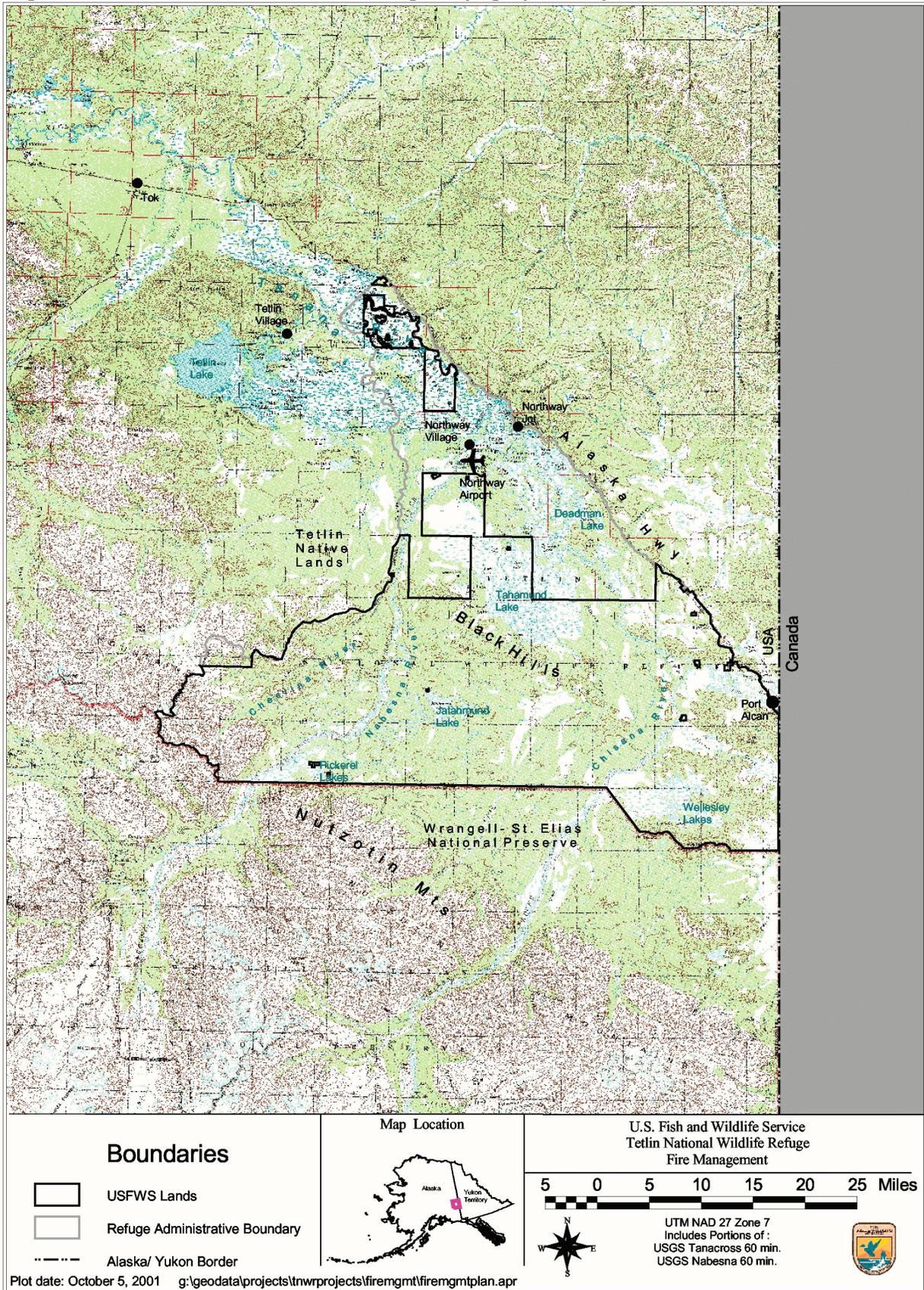
B. Inholdings. There are substantial inholdings within the Refuge administrative boundaries, totaling 207,770 acres. The inholdings are largely a result of ownership transfers authorized by the Alaska Statehood Act, the Alaska Native Claims Settlement Act (ANSCA), and the Alaska National Interest Lands Conservation Act. (See Table 1). These inholdings range from small lots to entire townships. Some inholdings have been developed and inhabited, particularly near Northway and along the Alaska Highway. 95% of the inholdings are located in the northern third of the Refuge. The land ownership mosaic within Tetlin NWR boundaries is still evolving, since specific parcels of land are still in the process of being conveyed, exchanged or relinquished. Refer to Figure 2. Lands within the Refuge administrative boundary which have been selected but have not been interim conveyed or conveyed under ANSCA are still managed by the Refuge. However, before management decisions (including fire management) are made, the selecting entity is notified and must concur with the decision.

Table 1. Land status within Tetlin National Wildlife Refuge Administrative Boundaries (from 2001 Land Protection Plan for Tetlin National Wildlife Refuge).

Ownership	Acreage	% of Total
Federal	726,743	77.8
Selected (village, regional, state)	14,734	1.6
Conveyed or Patented	192,817	20.6
Other (homesteads, mining claims, military)	219	*
Dual Selections (conflicts)	485	*
TOTAL	934,513	100.0

*Lands total less than 1/10 th of 1 percent.

Figure 1. Tetlin National Wildlife Refuge Topographic Map



Boundaries

-  USFWS Lands
-  Refuge Administrative Boundary
-  Alaska/ Yukon Border

Map Location



**U.S. Fish and Wildlife Service
Tetlin National Wildlife Refuge
Fire Management**

5 0 5 10 15 20 25 Miles

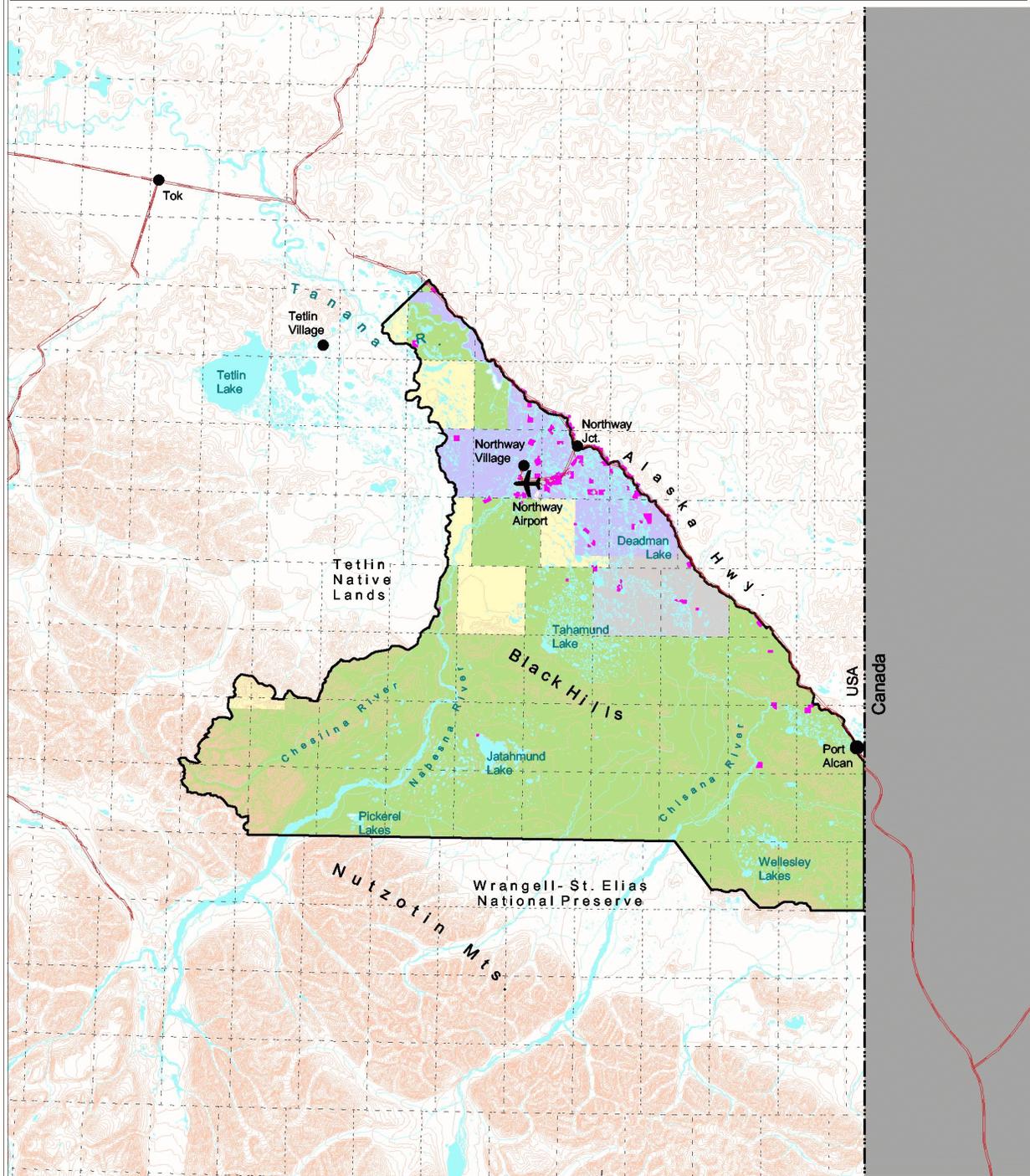


UTM NAD 27 Zone 7
Includes Portions of:
USGS Tanacross 60 min.
USGS Nabesna 60 min.



Plot date: October 5, 2001 g:\geodata\projects\tnwr\projects\firemgmt\firemgmtplan.apr

Figure 2. Tetlin NWR Administrative Boundaries and Land Status Map



<p>Land Status</p> <ul style="list-style-type: none"> Refuge Administrative Boundary USFWS Lands State Doyon Northway Native Native Allotments <p>726,743 Acres USFWS Lands</p>		<p>Map Location</p>	<p>U.S. Fish and Wildlife Service Tetlin National Wildlife Refuge Fire Management</p> <p>5 0 5 10 15 20 25 Miles</p> <p>UTM NAD 27 Zone 7</p>
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C. Climate. Tetlin National Wildlife Refuge is located within the Boreal Biome which is characterized by a continental climate. The Refuge lies within a region which experiences greater temperature extremes than most other areas in interior Alaska.

Summer temperatures may reach into the 90's, although the normal range is 40 to 80 degrees Fahrenheit. The annual precipitation at Northway averages less than 10 inches. Larger amounts of precipitation fall in the foothills of the Nutzotin and Mentasta mountains (Table 2). The summer weather regime is conducive to thunderstorm development and lightning ground strikes, which are a primary cause of fires occurring on the Refuge. Prevalent surface winds during the summer are out of the northwest (Table 3).

Winters are relatively long. Freeze-up occurs in October. The average period of continuous snow cover extends from October 15 until April 27 in the Northway area, with longer snow cover periods in the foothills and mountains. Snowfall averages 34 inches annually. Winter temperatures are often the coldest in the state. Extended periods of clear, cold, windless conditions may occur anytime from early November through February, where temperatures may stay between 30 below zero and 60 below zero for two to three weeks. Refuge rivers breakup in late April or early May, but the large, deep lakes may not completely thaw until early June. Leaf-out begins in late May, and leaves begin to drop in mid-August.

Table 2. Mean Precipitation and Snowfall by Month at Northway, Alaska 1949-1993

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Precip	.29	.30	.17	.20	.82	1.79	2.4	1.42	.93	.52	.53	.31
Snow	5.4	4.4	2.8	2.5	.5	0	0	.2	.8	6.4	4.9	6.0

ANNUAL TOTAL PRECIPITATION (INCHES) 9.47

ANNUAL TOTAL SNOW (INCHES) 33.9

Table 3. Prevalent 20 Foot Wind Direction and Frequency Parameters for Windspeeds greater than 4 mph from April through September at Northway, Alaska.

Direction Wind Blowing From	20 ft windspeed	Frequency of Time Occurrence
Southwest	> 4 mph	11%
Northwest	> 4 mph	30%
Northeast	> 4 mph	5%
Southeast	> 4 mph	15%
Any Direction	0 - 4 mph	39%
		100%

D. Topography. The basin in which the Refuge is situated is primarily flat, although the Black Hills provide some relief between the Nabesna and Chisana Rivers. Both the Nabesna and Chisana are broad, meandering glacial streams. The Nabesna and Chisana Rivers originate in the Wrangell Mountains south of the Refuge, flow through the Mentasta and Nutzotin mountains, respectively, and out into the flats where they form the Tanana River at their confluence on the north end of the Refuge (Figure 1).

Northeast of the Black Hills, the broad floor of the Tanana Valley is dotted with innumerable lakes, ponds and meander scars on a nearly flat floodplain up to 15 miles wide. Vegetated dunes interrupt this flat floodplain southeast of Northway.

At the foot of the ice-scoured Mentasta and Nutzotin Mountains southwest of the Black Hills the Refuge is covered by glacial till with scattered bedrock hills.

Average elevation in the Refuge basin is 1800 feet. The lowest point on the Refuge is on the Tanana River near the mouth of the Tetlin River at 1650 feet. Elevations of the Nabesna and Chisana Rivers where they enter the Refuge are 2100 and 2150 feet, respectively. The highest elevation on the Refuge is at the southwest corner where the crest of the Mentasta Mountains reaches 8040 feet.

E. Surficial Geology and Soils. Glaciation is the process responsible for most of the land forms, watersheds and surficial deposits which occur on the Refuge. The glacial deposits are composed of clays, silt, sand, gravel, cobbles and boulders, with most originating from volcanic activity in the Wrangell Mountains.

The Black Hills glaciation occurred earliest. The Black Hills deposits are eroded, with only the larger moraines remaining as rounded and flattened terraces along the slopes of the Black Hills. More recent but less extensive glaciation occurred in the Jatamund Lake area. The lake was formed by glacial moraine deposits. These deposits also resulted in rolling till-covered terrain and sinuous, lobe-shaped ridges demarcating the limits of glacial advance and retreat. Differences in topography between the Black Hills and Jatahmund Lake glacial deposits indicate a substantial time interval between the two glaciations. Glaciers currently form the headwaters of the Chisana and Nabesna Rivers.

Substantial outwash has been deposited by glacier meltwater on the Refuge. Outwash occurs downhill from moraines and occupies surfaces not covered by more recent deposits northwest of Chisana River and east of the Nabesna River northwest of the Black Hills.

Sand dunes on the Refuge also resulted from glaciation, formed by windblown glacial flour and silt from the outwash plains. The most highly developed dunes are northwest of Northway in the Big John Hill area, and along the Alaska Highway east of the Chisana River. The 100-200 foot high dunes were stabilized by vegetative cover several thousand years ago.

Most of the lowland portion of Tetlin NWR was formed as a result of rivers

migrating laterally against the dune fields and low terraces, depositing fine-grained sediments and organic matter. This resulted in the formation of many of the lakes prevalent in the lowlands.

Unconsolidated deposits of soil and rock are found in major streams, flood plains, alluvial fans and terrace deposits. They are also common on bedrock exposures in the form of frost-broken rubble and other deposits on and below these slopes.

The primary soils occurring on the Refuge are aquepts and ochrepts. Aquept soils are situated above permafrost in wet lowlands and flood plains on the Refuge. Ochrept soils are found on better drained upland sites. Ochrept soils, which were developed in a continental climate with seasonal drainage, permit oxidation and accumulation of organic matter, and are more conducive to vegetative growth than the colder, more sterile aquept soils.

F. Water Resources and Permafrost. Water is an extremely important resource on Tetlin NWR. Waterfowl production is greatest in the lowland complexes of ponds, marshes and bogs at the north end of the Refuge. Rivers and major streams influence water levels and nutrient levels in these wetlands.

Rivers provide the major transportation avenues for subsistence users of the Refuge during the summer and winter. After freezeup the major rivers are also important transportation corridors for wildlife.

In general, watersheds on the Refuge are not clearly defined. The Nabesna and Chisana Rivers meet at the northwestern end of the Refuge and form the Tanana River, a major tributary of the Yukon River. The Nabesna River, fed by glaciers in the Wrangell Mountains southwest of the Refuge, is 75 miles long and drains 2100 square miles. The Chisana River, also fed by glaciers in the Wrangell Mountains south of the Refuge, is 117 miles long and drains 3300 square miles. Important tributaries of the Nabesna on the Refuge include the Cheslina River, which drains a mountain-enclosed valley on the west side of the Refuge, and Lick Creek, which drains part of the central wetlands. Important tributaries of the Chisana on the Refuge include Moose Creek, which drains the central lake complex, Stuver and Mirror Creeks, which drain the southern plateau, and Gardiner, Scottie and Desper Creeks, which flow out of the Tanana uplands northeast of the Refuge. The Kalutna River, a tributary of the Tanana, forms the western boundary of the Refuge.

In the extreme southeast corner of the Refuge, the Snag Creek watershed drains into the White River, which flows into the Yukon River near Dawson, Yukon Territory. This is the only watershed on the Refuge which does not flow into the Tanana Valley. Alluvial flats crossing the divide indicate that at one time more of the Refuge may have drained into the White River than does today. Foothills of the Mentasta Mountains on the western side of the Refuge separate headwater tributaries of the Cheslina River, which flows to the northeast into the Nabesna River. The Cheslina flows through a belt of low vertical limestone outcroppings.

Non-glacial rivers and streams on the Refuge have maximum discharges during spring runoff. Glacial rivers in the Tanana Basin have peak discharges during July and August corresponding to glacial melt and rain. Sediment loading is

heaviest during this time period. Minimum discharges occur in late winter, when glacial streams virtually run clear. Since tributary streams and glaciers freeze solid during the cold winters, the only major source of runoff during the winter is subsurface water from the larger river systems.

Flooding is a significant habitat modifier on the Refuge. Flooding of major river and stream channels commonly occurs after ice breakup or during spring runoff, when channel icing or ice jams block rivers swollen by snowmelt. Flooding may occur later in the summer if convective rainfall is heavy and glacier melt is high. Flooding rivers may back up into adjacent ponds and lakes.

Most of the standing water on the Refuge occurs in thousands of ponds and lakes, often closely spaced and separated only by thin ribbons of wet meadow, shrubs or trees. These waterbodies range in size from less than one acre to nearly 3000 acres. The northern half of the Refuge is predominantly wetland habitat. Smaller wetland areas are found along Scottie and Desper Creeks, Mirror Creek, and Wellesley Lakes. On the southern plateau, small concentrations of lakes occur adjacent to Jatahmund and Pickerel Lakes. Some of the ponds and lakes are connected to and drain into rivers and streams, but many, especially in the central area, are fed by groundwater and have no outlets.

Tetlin NWR is in a zone of discontinuous permafrost. Permafrost areas on the Refuge are much more common than non-permafrost areas. Permafrost is found most commonly in the poorly drained lowlands and on north-facing slopes in the hills. Non-permafrost areas are most prevalent on south-facing slopes in the uplands, and under and along streams and larger lakes.

Problems can occur when permafrost areas are disturbed, related to soil moisture content and particle size. Permafrost soils which contain a large amount of water are ice rich, and the ice may even be present in lenses several feet thick. If these ice-rich soils and lenses thaw, the free water runoff can result in substantial erosion, settling, and sedimentation. Soil particle size and slope can also be important factors in whether erosion, slumping and sedimentation take place after disturbance. Fine grained soils that are also ice rich are extremely thaw-unstable and erodible when the protective cover of vegetation is removed. Soils that are coarse-grained or contain little moisture are generally thaw stable.

G. Wildlife Resources. The location of Tetlin NWR in the southeast corner of the interior adjacent to mainland Canada is a factor which enhances the diversity of wildlife that utilize the Refuge. The northern limit of ranges for several species of wildlife extends into the upper Tanana Valley encompassing the Refuge. Wetlands on the Refuge are staging areas for many of the migratory waterfowl that enter the state in the spring and leave the state in the fall.

1. Birds. There are 186 species of birds known to occur on the Refuge of which, 116 are documented breeders.

The Tetlin Flats have one of the densest breeding populations of waterfowl in the interior. The Refuge is an important breeding ground for trumpeter swans and an important staging area on the primary migration route for tundra swans and sandhill cranes entering and leaving the State. Eighteen species of ducks are known to breed on the Refuge.

Raptors are well represented on the Refuge with 13 species of hawks and six species of owls. The Tetlin Flats support the only major concentration of nesting osprey in the state.

2. Mammals. The Refuge provides habitat for 44 species of mammals. Moose disperse throughout the Refuge in the summer, and winter in the foothills on and adjacent to the Refuge. Historically, five different caribou herds have wintered on or near the Refuge. In recent years, caribou from the Nelchina and Mentasta herds have increased their winter usage of the Refuge. The Refuge provides important habitat for both grizzly and black bears. Ten species of furbearers are present on the Refuge, with marten, fox, lynx, mink and muskrat commonly harvested by trappers. The territories of several wolf packs are found within the Refuge.

3. Fish. Eleven native species of fish are known to occur on the Refuge. Important species include northern pike and whitefish found in many of the stream-connected lakes, grayling found in clear water creeks, burbot found in the major rivers and lake trout found in Jatahmund Lake. An historic whitefish subsistence fishery is located in the Northway and Fish Lake area.

4. Threatened and Endangered and Sensitive Species. Until it was delisted 1999 the peregrine falcon was the only endangered species found on the Refuge. There are currently three known peregrine nests on the Refuge and four nests along the Alaska Highway adjacent to the Refuge.

The bald eagle, endangered elsewhere in the United States, but not considered endangered in Alaska, is present on the Refuge. Approximately 150,000 acres of Refuge lands are utilized by bald eagles for nesting and foraging, primarily along lake margins and riparian areas.

The osprey is a sensitive species that utilizes approximately 70,000 acres of Refuge lands for nesting and feeding, primarily in riparian areas.

The olive-sided flycatcher is a sensitive species that may use 551,000 acres of boreal forest habitat on the Refuge for feeding and nesting.

Tetlin National Wildlife Refuge supports an expanding population of trumpeter swans, which are threatened elsewhere in the United States but not in Alaska. Approximately 30,000 acres of the Refuge is suitable trumpeter swan habitat, primarily in and along lake margins. The Upper Tanana Valley, including the Refuge, is an important migration route for both trumpeter and tundra swans.

H. Ecosystems. The Refuge lies totally within the FWS-designated Northern Eco-region. Within this broad watershed-based ecosystem are several vegetation-based ecosystems as designated on a map developed by the Joint Federal State Land Use Planning Commission For Alaska in 1973. Northern Eco-region information pertinent to Tetlin NWR is summarized in Tables 4- 11.

The Northern Eco-region is defined as the drainages of the Yukon-Kuskokwim rivers. It is demarcated to the north by the Brooks Range, to the south by the Alaska and Wrangell-St Elias ranges, and to the west by the Yukon and Kuskokwim river deltas. The Canadian border defines the Eco-region's eastern boundary. Topographically, the area is comprised of extensive lowlands, undulating uplands, and the peaks and ridges of the Alaska, Brooks and Wrangell-St. Elias mountain ranges. Continuous permafrost is found in the northern and western parts of the region. The climate is continental with warm, dry summers and cold, dry winters. The vegetation is predominantly forest, although shrub bogs, sedge marshes, and moist tundra areas are common. The forest is dominated by white spruce, black spruce, tamarack, paper birch, aspen and balsam poplar. About 45 percent of the total area within the Northern Eco-region is classified as wetlands.

Several lowland regions within the interior are important as high waterfowl production areas and provide drought relief for prairie-pothole duck populations. Wildlife populations of drier upland habitats are typical of taiga forests across North America and include such characteristic species as moose, wolves, black bears, snowshoe hares, black-capped and boreal chickadees, gray jays and a variety of other animals. Extensive tundra and mountain habitats are home to caribou, grizzly bears and Dall sheep. The predominant native culture in the region is Athabascan Indian. No one industry dominates the Northern Eco-region as is the case in some other ecosystems in Alaska. Placer mining is common on many of the streams.

Table 4. Northern Eco-region Information Pertinent to Tetlin National Wildlife Refuge.

Climate	Topography	Geology	Permafrost	Physiography	Hydrology
<p>The Interior Ecosystem Unit is characterized by a continental climate zone with long, cold winters and short, warm and dry summers. In this region, annual precipitation is between 10 and 25 inches. Ecosystem processes are strongly influenced by limiting climatic factors. Animals have adapted to this cold region through migration, insulation and hibernation, and other energy conservation measures. Annual plants are shallow-rooted and capable of producing mature seeds in the short growing season. Perennial plants commonly possess cell walls sufficiently resilient to avoid rupture by growth of ice crystals. Tough stems, branches and roots prevent destruction by desiccation during long winters. Forest and shrub ecosystems in the Interior region have adjusted to water balance between low annual precipitation and relatively high summer evapotranspiration.</p>	<p>Less than 2% of the state's population lives between 1000 and 2000 feet elevation. The lowest point on the Refuge is approximately 1650 feet. Approximately 60% of the Refuge is between 1650 and 2000 feet in elevation. Land and water transportation systems lie within this range on and adjacent to the Refuge. This zone is of primary importance for its wildlife resources. The remainder of the Refuge lies above 2000 feet in elevation. Mountainous terrain comprises approximately 40% of the land above 2000 feet, with the remainder plateau and valley bottom.</p>	<p>The basic geology of the area is an important building block of the ecosystems. A direct relationship between the geology, soils and ecosystem productivity exists in some areas.</p>	<p>The Refuge is underlain to a great extent by discontinuous permafrost, and to a lesser extent (along the Tanana and Chisana Rivers bottoms) by isolated masses of permafrost.</p> <p>Shading and insulation favor the formation of permafrost, which limits the rooting depths of plants, prevents internal soil drainage and forces water drainage over the surface to accumulate in peaty material and depressions. This continuous wet condition creates marshes and tundra and increases insulation and freezing depth. The "active layer" is the depth to which the soil thaws each year, and varies in the Refuge area from 16" to several feet.</p> <p>The presence of permafrost greatly increases the fragility of soils in the Interior.</p>	<p>The Refuge lies in an intermountain plateau encompassing the Tanana River basin and its headwaters. This consists of dissected uplands, broad valleys and lowland basins covered by alluvial deposits.</p>	<p>All of the Refuge ecosystems are in the Yukon watershed. The great majority feeds into the Tanana River, a major tributary of the Yukon. The Chisana and Nabesna Rivers, which form the Tanana River at the northern end of the Refuge, are glacial fed. Peak runoff is in July on the Refuge, due to glacier melt. Characteristics of glacier runoff include high year-round average flow, peak flow in mid-summer, distinct day-to-night differences in volume, high silt content of stream water, and occasional outburst flooding. The extreme southeast portion of the Refuge drains into the White River in Canada, another tributary of the Yukon. The groundwater discharge is relatively low due to permafrost conditions.</p>

Table 5. Ecosystem Characteristics- Upland Spruce-Hardwood Forest

Ecologic/Physiognomic Designation	Description	Occurrence on Refuge	Soils	Mammals, Fish and Birds	Human Interrelationship
<p>Upland Spruce-Hardwood Forest (24% of Tetlin NWR lands)</p>	<p>Fairly dense interior forest composed of white spruce, birch, aspen and poplar. Black spruce typical on north slopes and poorly drained flat areas. Root depths are shallow. Fire scars are common--fire occurs frequently in this ecosystem. Water balance is limiting factor to plant growth. White spruce up to 80 feet in height and 16" in diameter occur in mixed stands on south facing slopes and well-drained soils, and can form pure stands near streams. Aspen and birch average 50 ft in height, and poplar average 60 ft in height. Undergrowth consists of mosses with grasses on drier sites, and brush on moist slopes. Typical plants are willow, alder, rose, cranberry, current and horsetail.</p>	<p>Occurs from lowest elevations in valley bottoms to timberline at 3500 feet along Alcan border.</p>	<p>Occupies water-deposited soils of river valleys and adjacent lower slopes. Soils are well-drained shallow to moderately deep gravelly loams and silt loams over coarse materials, with permafrost on sites supporting black spruce-hardwoods. Soils on north slopes are shallow and gravelly with continuous permafrost.</p>	<p>black bear, grizzly bear, wolf, wolverine, caribou, moose, snowshoe hare, coyote, fox, lynx, weasel, marten, red and flying squirrels, songbirds, spruce and ruffed grouse.</p>	<p>Long, cold winters and short summers limit population. Some villages are located within this ecosystem. Inversions are common in winter, resulting in higher temperatures above valley bottoms. South slopes are prime living habitat, with warmer temps, increased solar radiation, and less permafrost and better drainage. Brush zones and brushy immature tree stages occurring after fires furnish excellent moose browse and are preferred hunting areas.</p>

Table 6. Ecosystem Characteristics- Lowland Spruce-Hardwood Forest

Ecologic/Physiognomic Designation	Description	Occurrence on Refuge	Soils	Mammals, Fish and Birds	Human Interrelationship
<p>Lowland Spruce-Hardwood Forest (41% of Tetlin NWR lands)</p>	<p>This ecosystem is a dense to open interior lowland forest of evergreen and deciduous trees, including extensive pure stands of black spruce. Black spruce are slow growing and seldom exceed 8 inches in diameter and 50 ft in height. Cones of this tree open after fire and spread abundant seed, enabling black spruce to quickly invade burned areas. Rolling basins and knolls in the lowlands have a varied mixture of white spruce, black spruce, paper birch, aspen and poplar. Small bogs and muskegs are found in the depressions. Undergrowth species include willow, dwarf birch, low bush cranberry, blueberry, labrador tea, crowberry, bearberry, cottongrass, horsetail, lichens and a thick cover of sphagnum and feather mosses.</p>	<p>This system occurs in the intermountain basins and lowlands . It is also found on shallow peat, sand dunes, glacial deposits, outwash plains, alluvial fans and on north facing slopes. Elevation varies from the lowest levels on the refuge to over 2500 feet.</p>	<p>Soils of interior lowlands supporting this system are deep, wet, silty and loamy textured, with thick surface peat layers and permafrost. Underlying materials are deep stratified sands, silts and gravels. Soils on adjoining terraces and low slopes are shallow to moderately deep, well-drained silt loams in windblown materials, overlying coarse tills and water-deposited materials. Permafrost is discontinuous.</p>	<p>black bear, grizzly bear, wolves, wolverine, caribou, moose, snowshoe hare, red fox, lynx and red squirrel, sharptail grouse, ptarmigan, ravens, hawks, woodland owls, songbirds, some shorebirds.</p>	<p>All of the villages near the Refuge are within this ecosystem. Summers are short and warm and winters are long and cold. Temperature inversions are common in the winter. Soils on old glacier till and outwash areas are well-drained and can be suitable for building, but permafrost makes other sites unsuitable. Surface water is limited to slow streams, and groundwater is largely limited to areas covered by alluvial and glacial deposits. Permafrost increases surface runoff and creates problems in development of either surface or groundwater supplies. Open tree stands with lichens provide excellent winter range for caribou. This system also serves as an important sheltering and browsing area for moose.</p>

Table 7. Ecosystem Characteristics- High Brush

Ecologic/Physiognomic Designation	Description	Occurrence on Refuge	Soils	Mammals, Fish and Birds	Human Interrelationship
High Brush (6% of Tetlin NWR lands)	Dense to open deciduous brush systems. Floodplain thickets develop quickly on newly exposed alluvial deposits that are periodically flooded. Dominant shrubs are willow and alder. Associated shrubs are dogwood, prickly rose, buffaloberry. Birch-alder-willow thickets are found near timberline. This subsystem consists of resin birch, alder and several willow species. Thickets may be extremely dense, or open and interspersed with reindeer lichens, low heath shrubs, or patches of alpine tundra. Other associated species are bearberry, crowberry, labrador tea, spirea, blueberry.	Adjacent to major river courses and at timberline. Some occurrence in 15-30 year burn sites.	High brush occupies poorly drained soils with permafrost in river valleys, and wet to well-drained shallow upland soils on moraines, outwash and mountain slopes with intermittent permafrost.	black bear, grizzly bear, wolf, wolverine, Dall's sheep, snowshoe hare, lynx, fox and coyote, ptarmigan, hawks, owls, ravens, songbirds.	Critical moose forage, important bear forage areas. The Northway Airport Road.laying adjacent to the Chisana River blocks natural high water flows in a segment of this ecosystem.

Table 8. Ecosystem Characteristics- Low Brush, Muskeg, Bog

Ecologic/Physiognomic Designation	Description	Occurrence on Refuge	Soils	Mammals, Fish and Birds	Human Interrelationship
Low Brush, Muskeg, Bog (21% of Tetlin NWR lands)	Extensive bogs are found in areas too wet for tree growth. Bog vegetation consists of varying amounts of sedges, sphagnum and other mosses, bog rosemary, resin birch, dwarf Arctic birch, labrador tea, willow, cranberry, and blueberry. Localized saturated flats have large patches of cottongrass tussocks. Areas of tall willow, alder brush and widely spaced dwarf black spruce are found within and around the marginal higher portions of this system. Bog surfaces often have uneven, string-like ridges. Surfaces between the ridges are too wet for shrubs.	In unglaciated areas, bogs occur on old river terraces, filling ponds and old sloughs.	Soils supporting this ecosystem are poorly-drained, deep, sandy or silty loams with overlying peat layers of varied thickness. Permafrost is continuous under muskeg areas. Deeper underlying strata are composed of stratified sands, silts and gravels. Deep peat soils occupy depressions along drainages. Because of the insulating mat and low temperatures, soil organisms often cannot break down the annual accumulation of plant growth and peat beds are formed. Both sphagnum and sedge peats may be formed and often occupy entire lake basins.	black bear grizzly, wolf, wolverine, caribou, moose, beaver, coyote, red fox, mink, weasel, muskrat and land otter, sharptail grouse, ptarmigan, ravens, songbirds, dabbling and diving ducks, geese, swans, grebes, loons, sandhill cranes, shroebirds, marsh hawks, gyrfalcons and open country owls.	Not occupied except seasonally, this ecosystem is important for production of plants, mammals and birds used for subsistence. Good building sites are rare unless excavation and backfill are provided. Surface waters are generally contaminated with iron-organic complexes affecting color and taste. Groundwater supplies are scarce and may contain surface contaminants.

Table 9. Ecosystem Characteristics- Riverine

Ecologic/Physiognomic Designation	Description	Occurrence on Refuge	Soils	Mammals, Fish and Birds	Human Interrelationship
Riverine (1% of Tetlin NWR lands)	The major riverine systems on and adjacent to the refuge are glacier in origin. Also includes some non-glacial systems. High rates of runoff and low water temperatures limit productivity. Larger rivers provide overwintering haven for grayling, northern pike and some salmon. Fecal bacteria survives longer in colder northern streams and may cause pollution downstream of developed areas.	Glacial streams-- Nabesna and Chisana River basins and Stuver Creek Non-glacial streams-- Cheslina River, Mirror Creek, Gardiner Creek and other smaller streams. .	Stream bed materials are sandy and gravelly to stony, with fine sands, silts and silty clays in areas of slow moving waters. As stream beds change course in lowlands, extensive terrace and Stream bed deposits become sites for vegetative invasion. The Glacier-fed streams carry large quantities of sand and silt-sized particles, forming deep deposits in lowlands. Daily summertime fluctuations of a foot or more are common in glacial streams. Non-glacial streams tend to be somewhat warmer and carry a lower content of fine materials than glacial streams.	black bear, grizzly, wolf, wolverine, moose, beaver, coyote, red fox, lynx, mink, weasel, muskrat, and land otter, grayling, whitefish, pike, salmon, ravens, dabblers and diving ducks, geese, grebes, loons, shorebirds, bald eagles, owls, hawks (including osprey and peregrine falcons)	Vital for surface transportation routes during the summer and winter. Limited bridges and roads restrict overland travel during the summer. The riverine system enhances scenic and primitive enjoyment of the area. Road access to these systems adjacent to the Refuge results in recreational use, hunting, fishing and subsistence hunting and fishing. Migrating fish are important seasonal food sources. Rivers are constantly changing and cutting new channels, sometimes forcing small communities to relocate. Channel changes and periodic flooding can result in loss of community dwellings and facilities.

Table 10. Ecosystem Characteristics- Lacustrine

Ecologic/Physiognomic Designation	Description	Occurrence on Refuge	Soils	Mammals, Fish and Birds	Human Interrelationship
Lacustrine (4% of Tetlin NWR lands)	Lakes serve as important water storage areas on the Refuge. The few large deep lakes on the Refuge freeze later in the fall and thaw later in the spring than shallower lakes. The great majority of lakes on the Refuge are shallow. Production of organic material is higher in shallow lakes than deep lakes because more water is circulated within the photosynthetic zone. Aquatic plants in and near shore areas are common in shallow lakes. Common rooted submerged aquatics are burreed and pond weed. Rooted emergent aquatics include mareetail and marsh fivefinger. The rooted emergents are highly productive, commonly resulting in large amounts of accumulated top and root material along shorelines. Lake types include oxbow lakes along meandering rivers, and lakes formed by depressions left by ice chunks melting during glacial retreat.	Concentrated in central and northern portions of the Refuge and scattered elsewhere.	Organic materials within lakes influence soil production and decline rates. Small shallow lakes in low bog areas fill rapidly with floating vegetative mats and often reach a tall brush climax. Submerged mucks, consisting of mixed mineral and organic deposition, are the best producers of underwater vegetation which serves as food and shelter for aquatic life.	Inhabitants and utilizers of this ecosystem include: Mammals: moose, beaver, mink, land otter, weasel, muskrat Birds: songbirds, dabbling and diving ducks, geese, brant, swans, grebes, loons, shorebirds, bald eagles, owls and hawks. Fish: pike, whitefish, grayling, burbot, planted lake trout and rainbow trout	Lakes are significant sources of food and avenues for transportation in both summer and winter, both for subsistence and recreational purposes. They are critical nesting, breeding and resting areas for migratory waterfowl; they provide forage for moose along shorelines and in shallow areas; they are highly utilized when ice-covered during the winter as resting areas for migrating caribou because of the protection through visibility they offer from predators.

Table 11. Ecosystem Characteristics- Alpine Tundra

Ecologic/Physiognomic Designation	Description	Occurrence on Refuge	Soils	Mammals, Fish and Birds	Human Interrelationship
Alpine Tundra (3% of Tetlin NWR lands)	<p>Found in mountainous areas in the southwest corner of the refuge. Consists of barren rock and rubble interspersed with low herbaceous and shrubby plant mats. Common plants include white mountain avens, moss-campion, oxytrope, sandwort and various sedges, grasses and lichens. Associated species are resin birch, cassiope, crowberry, labrador tea, mountain heath, dwarf and bog blueberry and cranberry.</p>	<p>Alpine tundra occurs above 3500 feet on the refuge, and uncommonly in some locations on the Refuge between 3000 and 3500 feet elevation.</p>	<p>Shallow gravelly loams with permafrost overlying bedrock on steep slopes and ridges, with coarse till in upper valleys and on high hills.</p>	<p>Mammals: black bear, grizzly bear, wolf, wolverine, caribou, Dall's sheep, fox, marmot, ground squirrels, lemmings, pika.</p> <p>Birds: ptarmigan, ravens, songbirds, surf birds, horned lark, Smith's longspur, golden eagles, American golden plover, Northern harriers, gyrfalcons.</p>	<p>Most use is of short duration except mining. Includes sport and subsistence hunting, and recreation.. Very short growing season, permafrost usually continuous. Fragile plants, regeneration very slow. Vegetation important for caribou and other large game animals used for subsistence purposes.</p>

I. Vegetation. Basic burnable vegetation types occurring on the Refuge include white spruce forest, black spruce forest, hardwood forest, scrub lands and graminoid and forb herbaceous (Table 12).

Table 12. Vegetation Types and Acreage on Tetlin National Wildlife Refuge

VEGETATION TYPE	ESTIMATED ACREAGE
Black Spruce Forest	308,000
White Spruce Forest	65,000
Broadleaf Forest	37,000
Scrub lands (includes burns < 15 yrs old)	242,000
Graminoid Forb Herbaceous	17,000
TOTAL BURNABLE	669,000
TOTAL UNBURNABLE	58,000
GRAND TOTAL	727,000

These vegetation types are common components of one or more of the ecosystems listed previously. The vegetation types listed are derived from Viereck's Level 2 classification, grouped for application to fire management. A wide range of mixtures of these types commonly occur. Descriptions of the vegetation types follow.

1. Black Spruce Forest. Black spruce is found most commonly on cold, wet lowland sites and north-facing slopes. Mature trees rarely exceed 30 feet in height and 160 years in age. Black spruce occurs in open and closed stands. Open stands are prevalent on poorly drained sites associated with the occurrence of permafrost. On better drained sites, some mixing with white spruce occurs.

A carpet of feather mosses and lichens is very common as a primary component of the understory. Graminoid tussocks, various shrub willow species and ericaceous shrubs such as blueberry, crowberry leatherleaf and labrador tea may also be present. Sphagnum moss may be present on moister sites.

A common growth form of black spruce is characterized by dead lichen-covered branches present on live tree boles from the forest floor to the tree canopies. Live lower branches can take root creating clusters of smaller trees around parent trees. Litter is primarily composed of a light loading of dead downed black spruce.

In poorly drained wetland areas, stringers of black spruce commonly occur between water bodies adjacent to wet graminoid or forb herbaceous vegetation types.

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

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

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

Aspen stands occur on dry south-facing slopes on the Refuge with an understory commonly including willow, bearberry and fireweed.

Paper birch occurs on a wide range of upland sites. Birch generally grows on moister, cooler sites than aspen. On drier sites, lichens are an important component of the understory. On moist sites, alder, willow and field horsetail may predominate in the understory.

Mixes of birch and aspen are found on moderately warm sites, generally as a mid-successional stage to climax white spruce forests. Prickly rose, graminoids and bearberry are common in the understory.

Stands of balsam poplar occur on the river floodplains with willow, alder and graminoids common in the understory.

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

Dead leaves and smaller branches cast from trees and shrubs are major contributors to the continuous litter layer on the forest floor.

4. Scrub lands. Scrub vegetation types are very common on the Refuge. They are found in a wide variety of niches including along lake and stream margins, in poorly drained lowlands, in areas which experience occasional flooding, in old burns, in moist uplands and on sites at or above treeline.

Tall scrub willow stands are common on the Refuge floodplain in association with field horsetail, graminoids and alder. The leaf litter layer is well developed. Low concentrations of white spruce seedlings may also be present. Willow also occurs in dwarf scrub form at higher elevations in association with graminoids, crowberry, feather mosses and lichens.

Alder often occurs with willow on steep slopes near timberline and on floodplain terraces. Alder also occurs in closed stands with a graminoid understory on floodplains.

Scrub birch is found on the Refuge in open boggy areas in association with ericaceous shrubs, labrador tea, sweetgale and sedges.

Ericaceous shrub bogs occur on peat mounds in the poorly drained lowlands and floodplains. Primary components include crowberry, shrubby cinquefoil, leatherleaf, lingonberry, blueberry, labrador tea and graminoid tussocks. Sphagnum moss may also be present. Willow graminoid bogs occur in wet depressions and stream bottoms. Sweetgale-graminoid bogs sometimes occur along pond margins.

Dryas dwarf scrub occurs on gravel bars along the major rivers and to a lesser extent in the alpine areas on the Refuge. Some plants associated with dryas scrub include willow and graminoids along the rivers, and lupine and ericaceous shrubs such as blueberry in alpine areas.

Ericaceous dwarf scrub also occurs in alpine areas on the Refuge. Components include blueberry, bearberry, labrador tea, cassiope and lichens.

5. Graminoid/Forb Herbaceous Vegetation. This vegetation type is found in a wide variety of site conditions on the Refuge, from dry south facing slopes to bog meadows and some lake margins. On mesic sites, herbaceous vegetation types often extend into scrub and forest types as a well developed understory.

Wet forb herbaceous vegetation occurs in saturated soils along lake margins. Horsetail, maretail and buckbean are common plants found in this type.

Wet graminoid herbaceous vegetation types occur in bogs, and in pond depressions where the water table is dropping and the basins are drying up. Sedges, grasses, potentilla and horsetail are common components. Sphagnum moss and shrub birch may be present.

Mesic graminoid herbaceous vegetation types on somewhat drier sites include bluejoint meadows, sedge tussock tundra and sedge-birch tundra.

Dry graminoid herbaceous vegetation is found on some dry, south-facing slopes and alpine meadows on the Refuge. Fireweed, wormwood and crowberry may be associated with the graminoids.

6. Threatened and Endangered Plants. None of the 29 plant species identified in the Alaska Rare Plant Field Guide have been found on the Refuge. However, four of the species are found within a 150 mile radius of the Refuge. These species are Aster yukonensis, Smelowskia borealis villosa, Cryptantha shackletteana, and Thlaspi acticum.

7. Sensitive Biological Communities. Riparian balsam poplar forest, comprising approximately 12,500 acres on the Refuge is the only sensitive biological community noted. This vegetation type is used by a variety of neotropical migrant birds for nesting and migration. Neotropical migrant bird populations are currently in serious decline.

Refuge-wide vegetation maps currently available for Tetlin NWR have been derived from LANDSAT Multi-Spectral Scanner (MSS) Imagery. 1:250,000 scale maps were developed for generalized use in comprehensive conservation planning utilizing land cover classes that could be distinguished through enhancement of spectral reflectance data. The LANDSAT scene utilized was generated in September, 1977. There are some inaccuracies with regard to deciduous and shrub land cover classes, in all probability because leaf drop was already well underway by that date.

Fire fuels have been mapped at 1:250,000 scale using summer and winter LANDSAT scenes for the area encompassing the extreme northern portion of the Tetlin National Wildlife Refuge (Tanacross Quadrangle). These maps covering all fire prone acreage between the Alaska Range and the Brooks Range were developed and digitized by the Bureau of Land Management and incorporated into the Alaska Initial Attack Management System as a tool in fire management planning. These maps are very general and useful only for very broad applications. Fire fuels categories mapped are:

- 1) Black Spruce
- 2) White Spruce
- 3) Deciduous Forest/Mixed forest/Woodlands/Shrublands
- 4) Graminoid Tussocks/Grasslands
- 5) Alpine Tundra/Barrenlands/Ice/Snow
- 6) Water Bodies/Sparsely or Unvegetated Gravel Bars/Floating and Emergent Wetlands.

Wrangell-St. Elias National Park has mapped fire fuels in the Nabesna quadrangle at a 1:250,000 scale as part of their recent fire management plan development process. This area includes a large portion of the Refuge.

J. Refuge Facilities and Public Use. Tetlin National Wildlife Refuge lands are to a large extent undeveloped. The Refuge administers two campgrounds: the Deadman Lake campground with sixteen campsites, and the Lakeview campground with eight campsites. These campgrounds are used throughout the summer by locals and by tourists traveling the Alaska Highway.

The Tetlin National Wildlife Refuge Visitor Center is located along the Alaska Highway approximately 8 miles from the Alaska-Canada border, and is open to the public from Memorial Day to Labor Day. Seven interpretive sites accessible by pullouts have also been developed along the Alaska Highway. These are administered by the Refuge staff. One of these pullouts includes a parking lot and trailhead for the Hidden Lake trail.

A bunkhouse utilized by seasonal employees and volunteers is located at Northway Junction (Mile Post 1264 of the Alaska Highway). This facility is within the administrative boundary of the Refuge. Refuge headquarters and permanent staff housing are located approximately 30 miles northwest of the Refuge, in the community of Tok.

Three administrative public use cabins are located on the Refuge. Special use permits have been issued for five additional cabins which are utilized by private individuals for subsistence or guiding purposes. Real property and values located on the Refuge are listed in Table 13.

Table 13. Real Property and Values on Tetlin National Wildlife Refuge, 2001.

Facility Type	Number of Facilities	Estimated Replacement Cost
Leased Office Buildings	2	\$ 1,287,250
Visitor Centers	1	\$ 1,068,932
Leased Shop/Service Buildings	1	\$ 771,900
Fire Cache Buildings	1	\$ 50,419
Residences	4	\$ 1,758,176
Leased Residences	1	\$ 602,330
Bunkhouses	2	\$ 484,248
Leased Bunkhouses	1	\$ 346,013
Storage/Other Buildings	19	\$ 871,438
Leased Storage Buildings	2	\$ 306,613
Campgrounds	2	\$ 370,728
Communication Systems-Antennae/Repeaters	6	\$ 448,000
Remote Automatic Weather Stations	2	\$ 50,000
Gravel Roads	3	\$ 4,377,000
Parking Areas	9	\$ 922,936
Culverts	7	\$ 15,000
Fences/ Gates	8	\$ 18,000
Trails/ Boardwalks/Fire Breaks	7	\$ 6,202,416
Visitor Contact Points	18	\$ 137,033
Signs	80	\$ 15,000
Utility Systems/Water-Sewage Treatment/Fuel Tanks	37	\$ 541,532
Boat Launching Ramp	2	\$ 161,788
Docks	1	\$ 535,000
Observation Decks/Towers	2	\$ 262,000
TOTAL ESTIMATED REPLACEMENT COST		\$ 21,603,752

The two primary categories of public use on the Refuge are subsistence use and recreational use.

The Refuge is mandated by ANILCA to provide for subsistence uses by local residents. While subsistence use of the Refuge is not intensive, it does have precedence over other public use, including recreational use. Subsistence uses include hunting, fishing, trapping, and gathering activities. Primary subsistence users of the Refuge are residents of the village of Northway, and to a lesser degree, the village of Tetlin. Secondary users live along the Alaska Highway and in the outlying communities of Tok, Tanacross, Dot Lake, Mentasta and Chicken. Access is most commonly provided for their subsistence activities by snowmobiles in the winter and boats in the summer. Some Tok area trappers use aircraft to access traplines on the Refuge.

Recreational use on the Refuge is concentrated along the northeast border where the Alaska Highway parallels the refuge for 65 miles. Annually, 160,000 people travel the highway, most between May and September. Visitors have numerous interpretive opportunities at the Refuge Visitor Center, two campgrounds, and seven scenic interpretive pullouts along the highway. Many enjoy wildlife watching, camping, boating, photography, fishing and hunting while on the Refuge.

K. Historical and Cultural Resources. As a result of the Alaska Native Claims Settlement Act (ANCSA), many of the areas historically used by indigenous peoples within Refuge boundaries have been selected for conveyance or have already been conveyed to individuals, local village corporations, or regional corporations.

In 1997 two sensitive cultural resource sites were identified at Scottie Creek and High Cache. If fire should approach these sites, which are within the South Central Fire Management Unit, mitigation measures will be implemented after consultation with a cultural resource specialist and the tribal council.

An archaeological survey of areas in and adjacent to the Refuge was completed in 1999. A total of 7 previously unknown sites (four prehistoric and three historic) were recorded. The most significant find was located on Tetlin Village land, about 16 km east of Tok. This site dates to between 2,000 and 5,000 years before present and contains a diverse assemblage of artifacts including side-notched projectile points and microblades. Other areas surveyed were Jatahmund Lake, Scottie Creek and Ten Mile Hill. Any fire management activities in these areas, which are within the South Central Fire Management Unit, will be properly mitigated to avoid damaging cultural artifacts. In addition, if cultural resources are discovered while implementing any fire management activity, they will be protected from damage and consultation with a cultural resource specialist will occur to determine the best mitigation measures.

Other Refuge priorities for further investigation of cultural resources include the following: Scottie Creek, Desper Creek, Moose Creek, Cheslina River, Dry Creek, Jatahmund Lake, American Wellesley Lake and Pickerel Lake. As ongoing consultation with the Northway Village Council brings to light additional cultural resources, these will be added to the Fire Management Plan for potential mitigation actions as well.

Fire management staff should also be trained in what to look for in potential sites and the kinds of information to collect. If cultural resources are discovered while implementing any fire management activity, they will be protected from damage and consultation with a cultural resource specialist will occur to determine the best mitigation measures.

IV. REFUGE FIRE OCCURRENCE INFORMATION.

A. Role of Fire on the Refuge. Subsequent to the retreat of glaciers from the Refuge thousands of years ago, fire and flooding have by far been the most significant environmental modifiers on the Refuge. The mosaic of habitats present on the Refuge today and the wildlife they support are for the most part a result of historical flooding and fire occurrence. The upland and lowland forest ecosystems which encompass much of the Refuge are fire-adapted. Fire is a primary catalyst for nutrient recycling, since decomposition in this cold soil region is otherwise very slow. Fire is also an important catalyst for seed dispersal in black spruce.

Until recent times, most of the fire occurrence on the Refuge was a result of lightning. However, anecdotal accounts about the use of fire by local Athabaskan Indians exist. Burning was done to enhance moose and muskrat hunting opportunities. Characteristically, areas were burned in spring to eliminate dead grass that would make muskrat holes more visible and provide more nutritious feed for the moose in the fall. Moose would be hunted in fall in the same areas that were burned in spring. Comments in early diaries and journals of white travelers have documented their encounters with smoke and fire activity in the ecosystem. As the population of Athabaskan Indians and white settlers increased in the Upper Tanana Valley, human-caused fire activity also increased. Most of the area's human-caused fire activity has occurred along the Alaska Highway corridor. Suppression action on wildland fires in the area which includes the Refuge has only taken place to any significant extent since the 1950's.

Since 1985, a prescribed fire program has been in place on the Refuge in recognition of the significant role fire plays in sustaining wildlife habitat.

B. Refuge Fire History and Frequency. There is evidence of fire through most of Tetlin National Wildlife Refuge lands below 2500 feet elevation. Accurate fire history records are not available before 1959 for the area which includes Tetlin National Wildlife Refuge. From 1959-2000, a total of 112 wildland fires occurred in the area that is now within Refuge boundaries--49 fires less than 1/4 acre in size, 41 fires between 1/4 and 9 acres, 6 fires between 10 and 99 acres, 2 fires between 100 and 299 acres, 5 fires between 300 and 999 acres, 5 fires between 1000 and 4999 acres and 4 fires 5000 acres or greater in size (Figure 3).

The Kennebec fire, which burned 31,430 acres in 1982 and is the largest single fire on record for the Refuge. It was actively suppressed as a Type I incident. The Kennebec Fire occurred in a relatively remote area and did not threaten any developed areas other than a permitted cabin. In 1991, the Wellesley fire burned 18,750 acres, including 750 acres in Canada. Surveillance was performed on this fire for most of the summer without incident. This fire did require a Type II

overhead team response to protect structures along the Alaska Highway when high winds pushed the fire several miles in one afternoon. In 1993, the Nabesna fire burned 4000 acres. This fire required extended crew action to protect a permitted cabin and to prevent the fire from burning onto nearby Tetlin Native lands. This fire jumped the Nabesna River when pushed by high wind. In 1994, the Spring Lake fire burned 8045 acres, but required no action beyond surveillance.

The size and behavior of these fires underscores the importance of hazard reduction including pre-suppression action around cabins and settlements and of establishing blackline buffers to enhance protection of developed areas from fire.

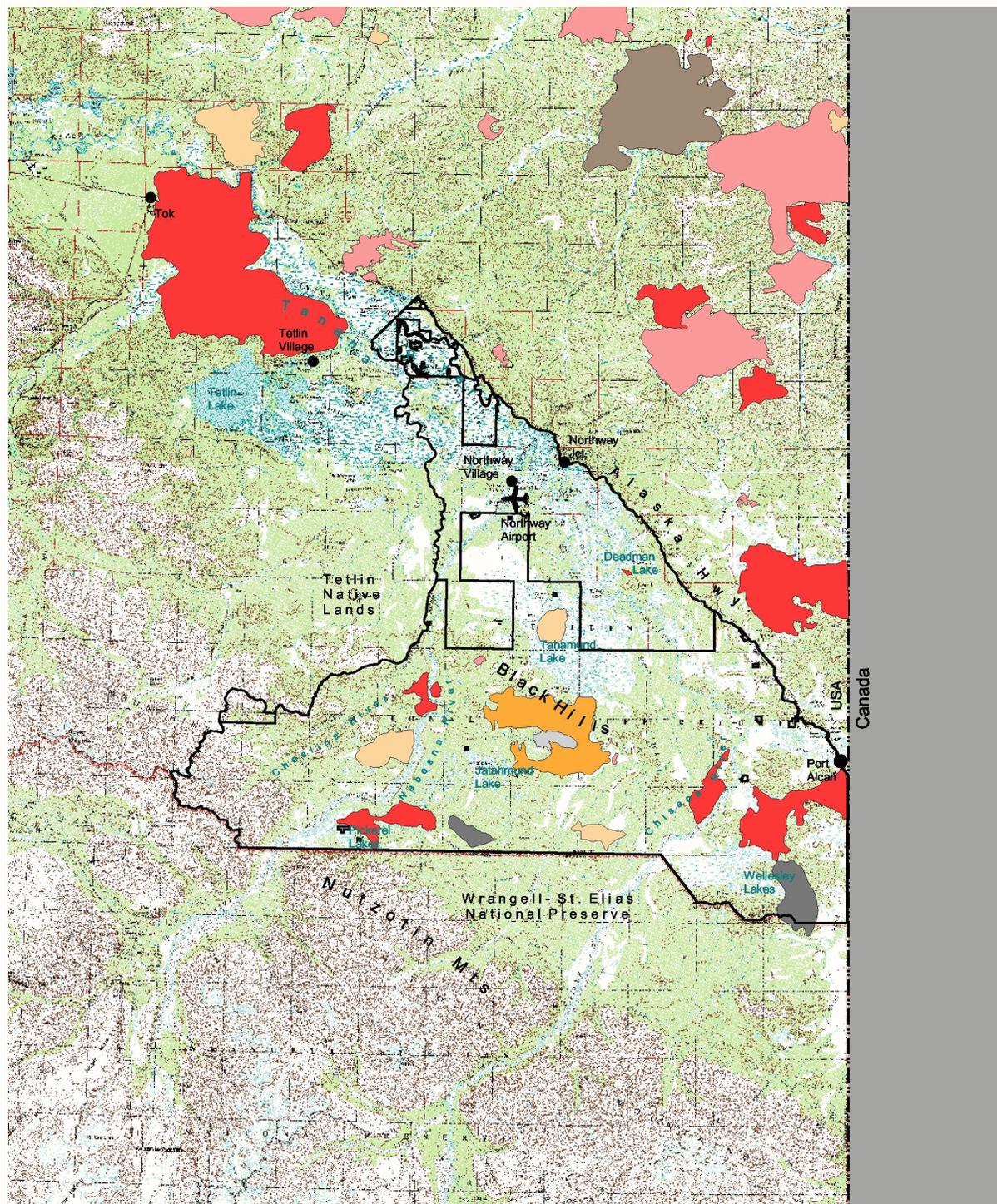
Human-caused fires have accounted for approximately 60% of all fire starts in the general area including the Refuge since records have been kept. Most of the human-caused fires occurred in proximity to the Alaska Highway and developed areas near the village of Northway. Due to accessibility, higher protection standards, and rapid detection, these fires were suppressed before they became large. Fires that have occurred in other, more remote areas of the Refuge have for the most part been started by lightning. These fires generally have taken longer to detect and to get suppression forces on the ground, which has generally resulted in larger fires. The Alaska Wildland Fire Management Plan provides for a range of suppression responses, which may be aggressive suppression and control of fires to minimize acreage burned in developed or high resource value areas on the Refuge, and may be only surveillance and confinement of fires in remote areas of the Refuge.

Over the nineteen year period from 1982-2000, a total of 77,636 Refuge acres have burned as a result of wildland fires, and 11,895 acres have been burned through the use of prescribed fire (Table 14).

Table 14. Fires and Acreage Burned on Tetlin National Wildlife Refuge, 1982-2000.

Year	WILDLAND FIRE		PRESCRIBED FIRE	
	Number of Fires	Acreage	Number of Fires	Acreage
1982	2	31,431	0	0
1983	0	0	0	0
1984	1	0	0	0
1985	1	1	1	1
1986	2	3301	2	620
1987	0	0	2	10.5
1988	2	6	2	200
1989	2	10,994	1	4166
1990	1	1	1	5
1991	2	19,075	1	330
1992	0	0	0	0
1993	2	4,101	2	5,872
1994	3	8,096	1	50
1995	1	1	0	0
1996	3	164	0	0
1997	2	465	0	0
1998	0	0	1	370
1999	1	0.1	1	176
2000	0	0	0	0
TOTAL	25	77,636	15	11,800

Figure 3. Large Fire History on the Tetlin NWR



Fire Scars Greater Than 100 Acres

- | | | | |
|---|-------------|---|-------------|
|  | 1950 - 1954 |  | 1975 - 1979 |
|  | 1955 - 1959 |  | 1980 - 1984 |
|  | 1960 - 1964 |  | 1985 - 1989 |
|  | 1965 - 1969 |  | 1990 - 1994 |
|  | 1970 - 1974 |  | 1995 - 1999 |

106,545 Refuge Acres Burned 1950-1999

Map Location



U.S. Fish and Wildlife Service
Tetlin National Wildlife Refuge
Fire Management

5 0 5 10 15 20 25 Miles



UTM NAD 27 Zone 7
Includes Portions of :
USGS Tanacross 60 min.
USGS Nabesna 60 min.



Plot date: October 5, 2001 g:\geodata\projects\tnwrprojects\firemgmt\firemgmtplan.apr

C. Fuel Models and Fire Behavior. Some of the National Forest Fire Laboratory (NFFL) National Fire-Danger Rating System (NFDRS) and Canadian Fire Behavior Prediction System (CFBPS) fuel models utilized for making fire behavior predictions and fire danger determinations are applicable to vegetation types found on the Refuge. As on-site fire behavior and fuels data are collected on wildland fires and prescribed fires, custom models for fire behavior prediction can be developed which will more closely describe the complexes of fuels found on the Refuge. Table 15 can be used as a general guide correlating vegetation types with fuel models and applications.

Table 15. Fuel Models and Applications Associated With Vegetation Types On Tetlin National Wildlife Refuge.

VEGETATION TYPE/DESCRIPTOR	FUEL MODEL DESIGNATION	APPLICATION
Black Spruce Forest	NFDRS Model Q	regional fire danger
Black Spruce Forest	NFFL black spruce custom model	fire behavior predictions
Boreal Spruce	CFBPS Model C-2	ties in drought conditions with fire behavior predictions
Short Needle Conifer	NFDRS Model H	regional fire danger
White Spruce Forest	NFFL Model 8	fire behavior predictions
White Spruce Forest	NFFL Model 10	fire behavior predictions in downed fuel jackpots
Hardwood Forest	NFFL Model 8	fire behavior predictions
Hardwood Forest	CFBPS Model M-2	ties in drought conditions with fire behavior predictions
Hardwood Litter	NFDRS Model R	regional fire danger
Mixed Spruce and Hardwood Forest	NFFL Model 8	low spruce component
Mixed Spruce and Hardwood Forest	NFFL Model 9	moderate spruce component
Mixed Spruce and Hardwood Forest	CFBPS Model M-2	Spruce expressed as a specific percentage in model. Ties in drought conditions with fire behavior predictions.
Shrublands	NFFL Model 2	high grass component with ericaceous shrubs
Shrublands	NFFL Model 5	high dwarf ericaceous shrub component
Shrublands	NFFL Model 6	significant amount of dead woody material with live shrubs
Mature Brush	NFDRS Model B	regional fire danger
Tundra	NFFL Model 1	tussocks < 1 ft high
Tundra	NFFL Model 3	tussocks > 1 ft high
Marsh grasses	NFDRS Model N	regional fire danger
Tundra	NFDRS Model S	regional fire danger

Brief descriptions of fire effects by basic vegetation type follow.

1. Black Spruce. Fires characteristically burn in black spruce forests with relatively high intensities and slow, predictable rates of spread. Fires in black spruce are generally carried by surface fuels such as feather mosses, lichens and graminoids. Ignition of the tree crowns (individuals or groups of torching trees) will occur just behind the flaming fire front if flame lengths are sufficient enough (two feet or more) to ignite the lower lichen covered black spruce branches. Because black spruce often grows on poor sites, the trees are commonly moisture distressed. The combination of dryness, lichens on the tree branches and fine surface fuels, results in more persistent flammability throughout the fire season than any other fuel type on the Refuge. Smoldering is usually limited to red squirrel middens and peat accumulations unless conditions are very dry. Areas where fire has only partially burned surface fuels are susceptible to re-burns.

Spotting by aerial firebrands from torching trees is common. Instability of the atmosphere, surface winds, and fuel moisture of receptor fuels are critical factors influencing the degree and scope of spotting.

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

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

4. Brush, Shrublands. Where surface fuels are sparse, fires often will not carry in this fuel type. Where surface fuels are present in sufficient quantities, rate of spread and fire intensity are dependent upon the size class and amount of fuels present. A large grass component will greatly increase the rate of spread. Live ericaceous shrubs contain combustible chemicals and oils which can increase fire intensity. Under dry conditions, fire may smolder in the root systems of shrubs. Significant

quantities of dead woody material can also contribute to higher fire intensities if surface fuels are sufficient to carry fire. The moist conditions in which some shrubland fuel types thrive can substantially limit flammability.

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

D. Fire Effects. Information regarding the effect of fire on specific plant and wildlife species has been developed in the national Fire Effects Information System (FEIS) database, accessible through the Internet at "<http://www.fire.org>". As of 2001, information is available for many bird, mammal, and plant species which occur on the Refuge. Printouts for each reviewed species are available in the Refuge library. This printout will be updated as new species are reviewed.

1. Fire Effects On Vegetation. The forces of fire and water have played an important role on the Refuge in creating the vegetation mosaic and ecological diversity that now exists. Diversity is a key to long term ecological stability and a limiting factor in the occurrence of large scale catastrophic events. Animals found on the Refuge are thriving in the diverse array of habitats available as a result of fire. Maintaining this natural role of fire in shaping the environment is an important factor in accommodating a primary purpose for which the Refuge was set aside, namely to conserve fish and wildlife populations and habitat in their natural diversity.

Fire effects on vegetation can generally be anticipated by taking a close look at the site and the vegetation occurring on it. Many of the plants that are established on the site prior to fire will re-establish on the site after fire. Key factors in how quickly this will happen are how hot the fire burned and how much of the organic layer on the surface was consumed. If a low intensity fire occurs leaving most of the resident plant root systems and seed bank intact, the resident plants resistant to fire will quickly regenerate and re-occupy the site. If root systems and seed banks are destroyed and the organic layer is consumed by fire down to mineral soil, re-vegetation will occur much more slowly. Introduction of invader species may be delayed until soil and environmental conditions reach a level that will support plant life. Sucker shoots from some plant species on the perimeter or in unburned islands within the perimeter will only be sent into the burn a relatively short distance. How effective this method of re-vegetation is relates to the size and shape of the fire, the perimeter, and how much of the organic mat was consumed.

Site suitability is also an important factor in determining what may come become established or re-established on the site. For example, poorly drained sites underlain by permafrost where stands of open black spruce are prevalent will likely return to that vegetation type following fire; if no willow are present on those sites prior to fire, one cannot expect willow to significantly appear after fire.

Brief descriptions of fire effects by basic vegetation type follow.

a. Black Spruce. Fires generally burn into the crowns of the trees, with isolated areas where the fires are confined to the surface fuels. Mosaics of unburned, lightly burned and moderately burned areas with substantial fingering of the perimeter are common. Unburned areas provide seed sources for adjacent burned areas and cover for wildlife. Black spruce are easily killed by fire. However, seeds from the semi-serotinous cones normally survive and provide a readily available seed source for a few years following fire. Seedling establishment is most effective where mineral soil is exposed. Aerial stems of shrubs are often killed, but resprouting and regeneration are stimulated if root systems are not destroyed. Lichens may not return in the short term unless residual fragments are present in lightly burned areas. The low shrub and moss layers quickly regenerate in lightly burned areas.

b. White Spruce. White spruce is a climax species. Mature white spruce stands may be replaced by broadleaf forest stands following fire--quaking aspen on drier sites and paper birch on moister sites--but white spruce will ultimately return. Open stands on dry sites may be replaced by shrub or broadleaf vegetation types if white spruce seed is not available. Crown fires can destroy seed-bearing cones. Lower intensity fires will set back herbaceous and shrub layers without impacting mature white spruce. As intensity increases, survivability of aerial stems of spruce and shrubs decreases. Plants possessing light, easily airborne seeds such as willow, birch, aspen, grasses and fireweed will readily invade burned areas. Sucker shoots from willow, alder, birch and aspen will readily invade adjacent to unburned areas. Decadent tall shrubs will be stimulated by removal of dead stems and old growth in low to moderate intensity burns. Herbaceous plants such as field horsetail and grass may have regeneration stimulated in low intensity burns. Smoldering fires in root systems of mature white spruce can result in substantial blowdown following fire.

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

d. Shrublands. In low intensity burns, regeneration of both the shrub and herbaceous components will occur very quickly. In higher intensity burns, the shrub component may initially be replaced by herbaceous invaders, with shrubs such as dwarf birch and willow in adjacent unburned areas sending sucker shoots and airborne seeds into the burn.

e. Tundra/Bogs. Graminoid regeneration following fire occurs very quickly, often within the same year. In very dry years, high intensity burns may inhibit regeneration, particularly in peat bogs. New growth can be significantly stimulated by the removal of buildups of dead thatch which helps to increase surface and soil temperatures after fire occurrence.

2. Fire Effects On Wildlife. The greatest overall benefits to wildlife from fire occur in stable fire-dependent ecosystems when fires burn with variable intensities and leave significant unburned inclusions for escape cover. Positive responses by wildlife to large catastrophic fire occurrence (high intensity with few unburned inclusions) are much slower. Research is needed to improve understanding of the interactions between fires, habitats, and wildlife.

a. Birds. The response of waterfowl to fire corresponds with effects of fire on habitat utilized for nesting and feeding. Timing is important. Fire that occurs in nesting habitat immediately prior to nesting, during incubation, or before the young leave the nest can be very detrimental in the short term. Fires occurring outside of the nesting period can promote increased productivity of graminoids used both for cover and for a food source. Fires occurring along marsh margins can inhibit or set back the development of peatland bogs and maintain suitability for waterfowl habitat by removing decadent or dead plant materials.

Raptors benefit from fires which create abundant early successional habitat favored by prey species such as microtines, and passerine birds.

Sharptailed grouse and ruffed grouse flourish in young broadleaf and mixed forest habitat subject to periodic low intensity burning. Ptarmigan repopulate burned areas as birch, willow and other shrubs revegetate and produce buds they utilize as a food source. Woodpeckers and other birds which feed upon tree-boring and bark-inhabiting beetles benefit in the short term from fires in coniferous and mixed forests as those insects infest burned trees.

b. Furbearers. Predators such as lynx and fox respond to effects of fire on their primary prey species. Snowshoe hare populations thrive in a mosaic of herbaceous plants and low shrubs for food, and spruce, willow and alder thickets for cover. This habitat can be maintained by the occasional occurrence of low to moderate intensity fires. Hares are the primary prey species of lynx, and increases in local snowshoe hare populations will normally result

in increases in numbers of lynx unless other factors such as heavy trapping pressure restrict the response. A study of lynx use of habitat on the Refuge indicates that the optimal lynx habitat occurs approximately 30 years following fire occurrence.

Red foxes are not as prey-specific as lynx and thrive in many habitat types in and out of burned areas, feeding on snowshoe hares, rodents, and to a lesser extent, birds, fruits and berries. Microtines repopulate burned areas relatively rapidly, especially in lightly burned areas and near burn perimeters.

Recent research in Alaska and northwestern Canada has shown that where voles repopulate burned areas, marten may reach or exceed pre-fire population levels. Many of these pioneering marten are juveniles, suggesting that newer burns may not provide all the habitat components needed for breeding.

c. Other Mammals. It is widely recognized that fire can favorably affect moose habitat. The production of tender new shoots of willows preferred by moose for forage is increased, when fires of low to moderate intensity occur. Moose will not readily utilize burned areas unless these areas are either adjacent to or within their current range. Edge effect is also an important factor. Moose prefer to utilize feeding areas which are near cover. Fire induced vegetative mosaics in moose habitat provide a greater variety of species. A wider range of forage age classes results in increased availability, particularly during critical winter periods.

Moose and caribou utilize many of the same plants for forage, but differences in proportions in the diet and seasonal preferences minimize direct competition. There is some controversy regarding the effect of fire on caribou populations and caribou range. Caribou lichens are a source of nourishment for caribou, particularly in the winter. Even fires of relatively low intensity destroy these slow-growing lichens. Research in northwestern Alaska indicate the recovery period for fire-disturbed ranges of the Western Arctic Caribou Herd is well over 25 years. Preliminary studies of the Nelchina Caribou herd winter range indicate that there may be a 50-100 year period for lichen recovery in burned winter range. However, burned areas may act as a caribou population control and a "lichen bank" for future caribou winter range. Caribou avoid the burned areas and graze in unburned areas, providing a recovery period for the lichen and the assurance of a future food source.

Fire is also necessary over the long term for regeneration of the northern coniferous forest communities that favor lichens in the understory. The primary limiting factors that affect caribou use of the Refuge are predation, hunting pressure and winter snow conditions which can restrict the availability of forage plants. Carrying capacity of the habitat is not thought to be a limiting factor at this time. Caribou do benefit from increased productivity of other plant species they use for forage such as graminoids, labrador tea and other shrub species after the occurrence of fire.

3. Fire Effects on Air Quality. Large fires burning outside of the Refuge in the interior region of Alaska, Canada, and Russia impact air quality in the Upper Tanana Valley much more than fires burning within the local area. This is because fire frequency and size are greater in the lower Tanana and Yukon Valleys and in Canada than in the upper Tanana Valley, where the Refuge is. The upper Tanana Valley, on the average, experiences 7-10 days per summer with significant smoke in the air, usually from sources outside the local area.

4. Fire Effects on Soils. Fire occurrence does affect the active layer of permafrost and organic soil depth. After the fire burns off the vegetation cover, soils receive increased heat and permafrost melts, causing characteristic slumping of soil. Trees and other standing live or dead vegetation may collapse, significantly contributing to the surface fuel loading within the burned area. The exposure of mineral soil, on the other hand, encourages the reproduction of a variety of plant species unable to grow on moss and so contributes to vegetation diversity.

5. Socio-Cultural Fire Effects. Local attitudes regarding fire vary. Protection of life and property is a major concern. Subsistence users are concerned about the impacts of wildland fire and prescribed fire on harvest levels. For some, firefighting provides necessary income.

The effects on trapping and potential threats to private inholdings are the biggest concerns expressed. Misconceptions and misinformation surface at times regarding the effects of fires on trapping. Trapping activities on the Refuge can also be disrupted by fire. Trapping on the Refuge is not a widespread economic endeavor. There are approximately 12 active traplines in use on the Refuge. There is controversy about fire effects on trapping. Large catastrophic fires leaving little or no unburned inclusions could have a longer term negative impact on furbearers and consequently on trapping success (where traplines within the burn cannot be relocated) due to dispersal of furbearers to areas offering more cover. The probability of occurrence of large scale catastrophic fires in actively trapped areas is rare, and the Refuge is undertaking action to further minimize this probability. A more likely possibility is the occurrence of smaller fires which only serve to enhance furbearer habitat over the long term. However, there is also recognition that fire does play a beneficial role in hazard reduction and wildlife habitat enhancement. The public has been generally supportive of the Refuge fire management program.

Since 1991, two catastrophic wildfires have burned near local communities; the Red Fox Fire in July, 2001 destroyed several structures in the town of Tok. As a result, local people are developing an awareness of hazard reduction needs for their homes and communities. Thinning for hazard reduction within the wildland/urban interface is a management option that is receiving wider recognition and implementation by local, federal, tribal and state organizations. "Firewise"—a program that aims to educate homeowners about fire hazard reduction needs is starting to be implemented in local communities.

It is critical to the success of the Refuge fire management program that local organizations and residents are involved in the fire planning process and are kept current regarding refuge fire management activities. The public is kept informed of the role of fire in the management of Tetlin National Wildlife Refuge and the effects of fire and fire exclusion on the resources of the Refuge through public education and press releases.

It is also important for local residents to participate in operational aspects of wildland fire and prescribed fire management activities, both from an economic and philosophic standpoint. Local involvement and support results in an increased awareness of the role of fire on the Refuge, allows local residents a voice and role in protecting and enhancing Refuge resources, and benefits local residents through employment and improved subsistence opportunities.

Incorporating fire management information into the environmental education program on the Refuge has been a priority and will continue to be an important facet of the Refuge fire management program. Indoor and outdoor lessons and activities relating to fire effects and fire management are scheduled annually with schools throughout the local school district. Refuge Information Technicians play a key role in disseminating fire information to village members and the public during campground talks and visitor center contacts.

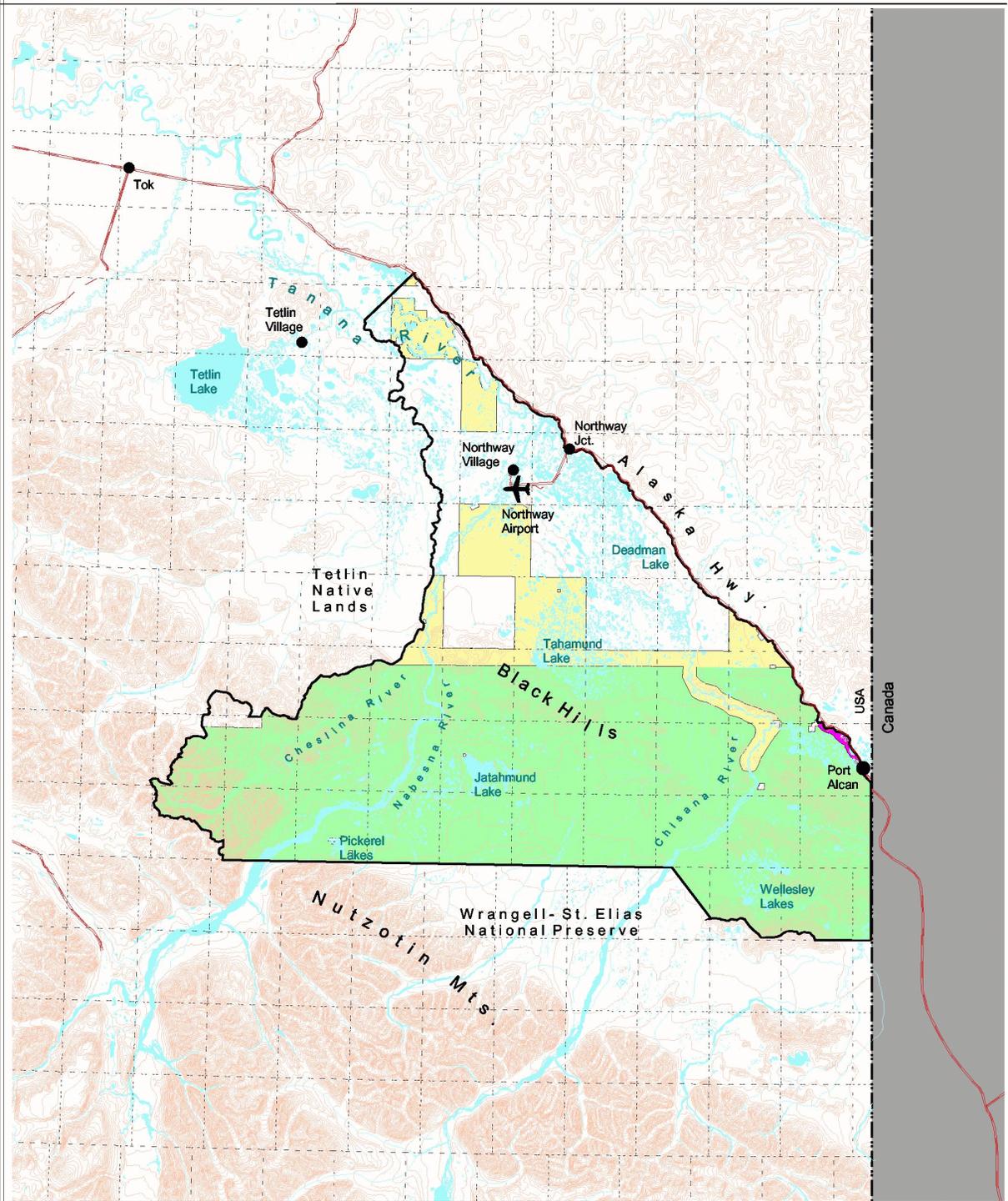
V. REFUGE HABITAT MANAGEMENT OBJECTIVES.

A. Habitat Management Objectives. As mentioned in the introductory section, ANILCA directed that a primary purpose for the creation of Tetlin National Wildlife Refuge was "to conserve fish and wildlife populations and habitats in their natural diversity". Other important purposes include providing opportunities for continued subsistence uses and providing for interpretive opportunities. The Tetlin National Wildlife Refuge Comprehensive Conservation Plan Adopted in 1987 provided further direction in habitat management objectives, specifically to "emphasize restoration of the Refuge's natural diversity and key fish and wildlife populations and habitat to historic levels", to "maintain the refuge in an undeveloped state", and to "increase the annual amount of prescribed burning".

Natural diversity of habitat is maximized by 1) reducing the probability of occurrence of large scale catastrophic events which could result from long term fire exclusion (fires greater than 50,000 acres) and 2) allowing for a series of smaller landscape-scale events (fires 1,000-50,000 acres) to occur in order to create a mosaic of differing succession levels and differing age classes within vegetation types.

The preferred management alternative in the Tetlin National Wildlife Refuge Comprehensive Conservation Plan designated 1,428 acres of Refuge land in intensive management, 127,321 acres in moderate management, and 597,994 acres in minimal management. Management designations are depicted in Figure 4.

Figure 4. Tetlin NWR CCP Management Categories



**Tetlin NWR
Comprehensive Conservation Plan
Management Categories**

	Intensive	1,428 acres
	Moderate	127,321 acres
	Minimal	597,994 acres

Map Location



**U.S. Fish and Wildlife Service
Tetlin National Wildlife Refuge
Fire Management**

5 0 5 10 15 20 25 Miles



UTM NAD 27
Zone 7



Plot date: October 5, 2001 g:\geodata\projects\tnwr\projects\firemgmt\firemgmtplan.apr

The intensive management category encompasses areas that could benefit from habitat manipulation or have a potential public or economic use if intensively developed. Management of these lands can include practices such as mechanical habitat manipulation, intensive prescribed burning allowing the use of motorized equipment, water level manipulation to restore or artificially maintain habitats for selected species such as moose, furbearers, and waterfowl, and development of interpretative facilities and opportunities.

The moderate management category places less emphasis on public use while maintaining or restoring fish and wildlife populations in areas that receive little public pressure. Habitat manipulation is permitted on a site-specific basis to restore natural vegetation patterns and targeted wildlife habitat, as well as to provide for the reduction of hazardous fire fuels.

Management under the minimal management category is directed toward maintaining fish and wildlife populations in their natural state. Natural fish and wildlife population dynamics and habitats are emphasized.

B. Management constraints. There are several management constraints relating to habitat management. Subsistence uses of the Refuge have precedence over other uses as long as they are consistent with the other purposes set forth by ANILCA. Fire management activities, especially the use of prescribed fire, must not adversely impact subsistence uses. If there is reason to believe that a fire management activity is having adverse impacts on subsistence uses, an environmental assessment must be prepared, and a finding of no significant impact must be issued for the activity to proceed.

The "light hand on the land" concept is encouraged at Tetlin NWR. Any activities permitted on Refuge lands should use methods, such as minimum impact suppression guidelines, which mitigate environmental damage. To avoid unnecessary scarring of terrain, damage to wetlands and waterfowl habitat, and erosion problems probable in permafrost areas, the use of tracked vehicles on the Refuge is normally not permitted.

Cost is another management constraint. A beneficial effect achieved by habitat manipulation must be balanced against the cost in dollars required to achieve the effect.

C. Current Habitat Manipulations. Wildland fires managed for resource benefit and prescribed burns are habitat manipulation tools currently in use on the Refuge. Prescribed fires, within the framework of prescribed fire plans, have been used and will continue to be used to achieve specific habitat management objectives including enhance waterfowl nesting habitat, enhance production of forage plants for wildlife, increase habitat diversity, reduce hazardous fire fuels, create of fuel breaks, and provide interpretive opportunities to the public to show the beneficial effects of fire. Wildland fires managed for resource benefit provide the same habitat benefits as prescribed burns.

Habitat is certainly being influenced as a result of wildland fire occurrence on Refuge lands, specifically those in areas on the Refuge designated in the Alaska Interagency Fire Management Plan as modified or limited management option areas. The primary objectives of wildland fire management in these areas is to

reduce expenditures by balancing suppression costs and effort with values at risk, and providing opportunities for wildland fire to help achieve land and resource management objectives. Resulting fire impacts in modified and limited management option areas will be an increase in vegetation mosaics, ecosystem diversity and prevention of unnaturally large scale catastrophic fires.

In addition, national wildland urban interface fire hazard reduction initiatives that target communities at high risk from unwanted wildland fire have focused attention on the use of hand mechanical treatment around high risk areas. Northway and Port Alcan are two areas considered to be at high risk from unwanted wildland fire. Hand mechanical treatment, such as thinning in dense spruce stands near these areas, can help mitigate fire hazard. The Refuge has a responsibility to assist local communities in achieving hazard reduction goals. These goals can be achieved by partnerships in hazard reduction on Refuge lands adjacent to private and tribal inholdings, using the combined tools of hand mechanical thinning, prescribed fire and wildland fires managed for resource benefit.

VI. REFUGE FIRE MANAGEMENT OBJECTIVES.

A. General Fire Management Objectives.

1. Protect life, property and identified critical resources from fire.
2. Utilize fire as a habitat management tool within the scope of the preferred management alternative of the Refuge Comprehensive Conservation Plan.
3. Undertake wildland fire management within the scope of the Alaska Interagency Fire Management Plan.
4. Integrate state of the art techniques to collect, analyze and apply information and develop decision making tools to aid in implementing and sustaining the refuge fire management program.

B. Specific Fire Management Objectives.

1. Protect Refuge-administered cabins and buildings and inhabited private inholdings from unwanted wildland fire. Protect Refuge campgrounds, picnic areas and interpretive pullouts from unwanted wildland fire.
2. Protect permitted cabins on the Refuge from unwanted wildland fire to the extent possible given the availability of suppression resources and safety considerations.
3. Provide assistance and information to the public regarding the protection of private structures and property from wildland fire.
4. Through sound and timely fire management decisions, and through the construction of pre-fire fuel breaks, minimize the threat of fire occurring on the refuge from incursion onto private lands. Protect uninhabited inholdings from fire if requested by the owner.

5. Utilize fire to maintain and enhance natural diversity of wildlife habitat.
6. Utilize fire to minimize the occurrence of large catastrophic fires by reducing the extent and buildup of hazardous fuels.
7. Maintain naturally ignited fire as a dynamic ecosystem process to the maximum extent possible.
8. Educate the public through school programs, media, public meetings and other involvement on the role of fire in northern boreal ecosystems.
9. Balance expenditures for prescribed fire against resource benefits. Balance suppression costs against resource values at risk.
10. Approximate the average annual fire acreage target provided in the Refuge CCP preferred alternative. This alternative anticipates a total of 7,500 acres burned annually, including 6,650 acres burned as a result of wildland fires, 450 acres of prescribed fire burned per year for blackline fuel breaks, and 400 acres per year of prescribed fire to benefit habitat diversity.

VII. REFUGE FIRE MANAGEMENT STRATEGIES.

A. Specific Strategies.

1. Fire management emergencies take precedence over other Refuge activities. Fire management activities involving safety and defense of life and property take precedence over all other activities.
2. General wildland fire suppression strategy guidelines are presented in the Alaska Interagency Fire Management Plan.
3. Suppression action will be taken on all wildland fires not managed as wildland fires used for resource benefits (see section X). A full range of suppression actions is available, from surveillance to indirect attack to aggressive direct attack efforts to minimize acreage burned and protect identified resources. Appropriate suppression responses are based on identified values to be protected. A combination of actions may be appropriate on single fires. Appropriate suppression actions are listed below by response zone designation in order of priority.
 - a. Fires in Critical Management Option Zones. Fires which occur in critical management option zones take priority over fires in all other zones and are of the highest priority with regard to allocation of suppression resources. Suppression action in these zones takes precedence over all other Refuge activities. Aggressive suppression action is continued until the fire is declared out. Minimizing acreage burned is a management priority.

b. Fires in Full Management Option Zones. Aggressive suppression action is generally continued until the fire is declared out. Minimizing acreage burned is a management priority.

c. Fires in Modified Management Option Zones. Minimizing acreage is NOT a management priority. There may be constraints on the number of personnel or crews committed, or on the types of equipment allowed, or on cost, or on time to meet the strategic objective selected. Suppression action may utilize natural barriers and indirect attack tactics.

d. Fires in Limited Management Option Zones. Periodic surveillance of individual fires required; the frequency of surveillance is dependent upon the regional fire situation, weather trends, and past and anticipated fire behavior. As long as the individual fire remains confined within the limited management option zone, and as long as smoke from the fire does not create a safety hazard or health hazard, surveillance will be continued until the fire is declared out. If the fire threatens to escape confinement, more aggressive action will be taken to mitigate the threat.

B. Constraints to Specific Strategies.

1. The use of bulldozers, all terrain vehicles, and fire line explosives for emergency fire suppression operations and prescribed fire operations will only be permitted if authorized by the Refuge Manager on a case-by-case basis.
2. Constraints are generally less restrictive on fires in critical response zones than in other lower priority zones.
3. See minimum impact suppression guidelines within the Refuge Dispatch Plan (Appendix, Exhibit A).
4. Restrictions may be placed on suppression aircraft flyover altitudes of certain waterfowl and raptor nesting areas depending upon time of year and amount of flyovers required.

C. Factors Governing Selection of Strategies.

1. Justification for presuppression and suppression protection strategies are based on the cost effectiveness and safety of protecting the values at risk. The cost of implementing a specific strategy should generally be the lowest cost plus loss alternative.
2. Justification for fire management strategies for resource enhancement are based on the cost effectiveness of achieving the resource management objective(s) identified in the Refuge CCP.

VIII. FIRE MANAGEMENT UNITS.

The Refuge is divided into four fire management units--the Tetlin Flats, Cheslina, South Central and Wellesley Units. Area boundaries are based on identifiable geographical landmarks, suppression response categories, and habitat considerations. Fire Management Units (FMUs) are depicted in Figure 5. Resource management objectives and habitat modification alternatives are listed by unit in Table 16.

A. Fire Management Unit Descriptions.

1. The Tetlin Flats Unit. This unit is surrounded by private land. It is located along the Tanana River downstream (northwest) of the junction of the Nabesna and Chisana Rivers. It is mostly flat, on the Tanana River floodplain, and contains some of the most productive wetlands and waterfowl habitat on the Refuge.

This unit has a relatively low occurrence of fires. To date, fires that have occurred in this unit have been suppressed. In 1992, the suppression response designation for much of the unit was changed from full to modified response to better align suppression strategy with resource management objectives for the unit.

The area is utilized by subsistence users for trapping, hunting, berry picking and fishing. However, access is difficult, so the amount of use is light. This unit is surrounded by Northway Native Corporation land.

2. The Cheslina Unit includes all Refuge lands south of the junction of the Nabesna and Cheslina Rivers and west of the Nabesna River. This unit is composed mostly of rugged upland habitat. The western boundary of this unit is Tetlin Native Corporation land.

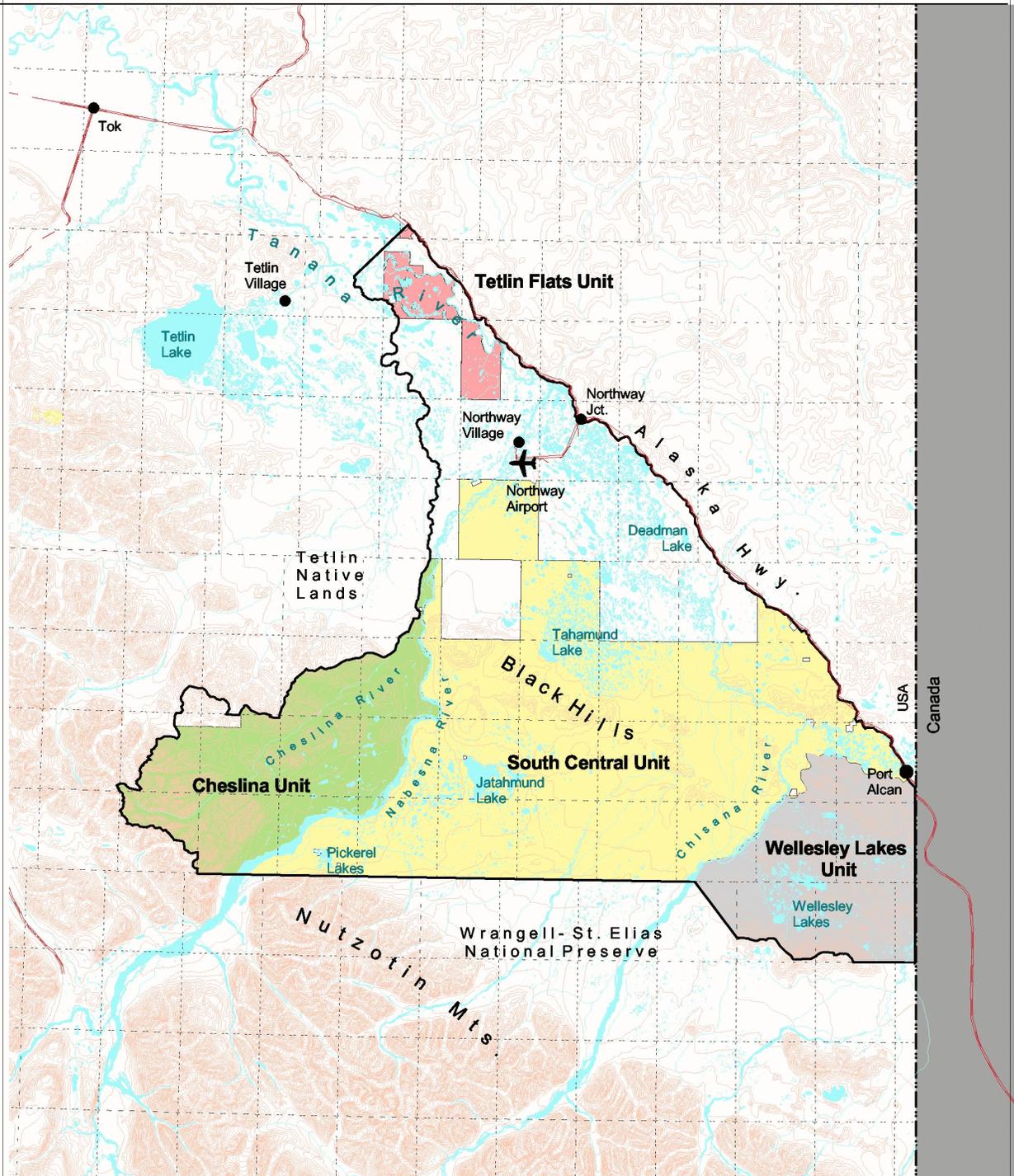
3. The South Central Unit includes all Refuge lands south of the junction of the Nabesna and Chisana Rivers, bounded on the west by the Nabesna River and on the east by the Chisana River. This unit includes wetlands on the north end, the Black Hills in the middle of the unit, and the southern plateau. The southern boundary of this unit is Wrangell-St. Elias Preserve. The village of Northway and Northway Native Corporation lands lie within this unit.

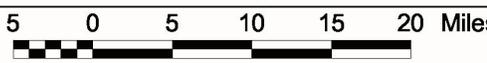
4. The Wellesley Unit lies south of Gardiner Creek between the Alaska Highway and Canadian Border on the east and the Chisana River on the west. The southern boundary of this unit is Wrangell-St. Elias Preserve. This unit includes vegetated sand dunes, riparian and wetland habitat along the Chisana River and upland habitat on ridges above Mirror Creek, Scottie/Desper Creeks and Wellesley Creek. The small settlement of Port Alcan lies directly east on the Canadian border.

Table 16. Resource Management Objectives and Habitat Modification Alternatives By FMU.

UNIT	RESOURCE MANAGEMENT OBJECTIVES	MANAGEMENT LEVEL AND SUPPRESSION RESPONSE	HABITAT MODIFICATION ALTERNATIVES	WILDLAND FIRE MANAGED FOR RESOURCE BENEFIT
TETLIN FLATS	Enhance wildlife habitat and promote ecological diversity.	Moderate management. Modified (40%) and full (60%) suppression response.	Mechanical manipulation. Prescribed fire.	Only with concurrence of adjacent landowners.
CHESLINA	Enhance wildlife habitat and promote ecological diversity.	Minimal management. Limited suppression response.	Prescribed fire.	Yes.
SOUTH CENTRAL	Enhance wildlife habitat and promote ecological diversity. Develop a protective fuel break buffer utilizing prescribed fire and constructed fire breaks on northern and eastern end.	Intensive (5%), moderate (25%) and minimal (70%) management. Modified (80%) and limited (20%) suppression response.	Mechanical manipulation in moderate and intensive management areas only. Prescribed fire.	Yes.
WELLESLEY LAKES	Enhance wildlife habitat and promote ecological diversity.	Minimal management. Limited suppression response.	Prescribed fire.	Yes.

Figure 5. Tetlin NWR Designated Fire Management Units



Unit	Acres	Map Location	U.S. Fish and Wildlife Service Tetlin National Wildlife Refuge Fire Management
Tetlin Flats	21,503		  UTM NAD 27 Zone 7 
Cheslina	151,126		
Wellesley Lakes	119,553		
South Central	434,561		

Plot date: August 2, 2001 g:\geodata\projects\tnwr\projects\firemgmt\firemgmtplan.apr

IX. FIRE MANAGEMENT AND RESPONSIBILITIES.

A. Refuge Fire Management Team Responsibilities. There are three dedicated fire management program positions on the Refuge staff. The Fire Management Officer is permanent full time. One Forestry Technician-Fire position is career seasonal and a second is temporary seasonal. Incumbents are active participants in prescribed fire management, wildland fire suppression and managed wildland fire activities, both on and off the Refuge. The Refuge fire management staff have the capability of conducting prescribed burns of low to moderate complexity on the Refuge without outside assistance. Prescribed burns of high complexity may require assistance from other agencies. The Refuge fire management staff actively participate in local fire suppression assignments. They are also available for regional and national callout during high fire occurrence periods. Availability of any Refuge employee is based in part on decision criteria for individual preparedness levels listed in the Refuge Preparedness Plan (Appendix, Exhibit B). In addition to the dedicated fire management program staff, a Refuge goal will be for two staff members to have basic qualifications to participate in on-line prescribed fire, wildland fire suppression and managed wildland fire activities.

Emergency Firefighting Crews based in local Native villages and resources from the Tok Area Department of Forestry are also available to respond to fires on the refuge.

B. Refuge Fire Management Team Members and Qualifications. Individuals and qualifications can change annually and are listed in the Dispatch Plan (Appendix, Exhibit A) portion of the Annual Refuge Fire Management Plan Supplement. The Annual Refuge Fire Management Plan Supplement includes individual annual prescribed burn plans, the Refuge Dispatch Plan, and the Refuge Preparedness Plan. Target National Wildfire Coordinating Group (NWCG) fire qualifications are listed in Table 17.

Table 17. Target NWCG Fire Qualifications for Tetlin NWR Staff.

Staff Position	Target Qualifications
Fire Management Officer	Strike Team Leader-Crew or Task Force Leader Burn Boss 2-Prescribed Fire
Forestry Technician GS-7 (Fire)	Single Resource Boss--Crew Ignition Specialist--Prescribed Fire Burn Boss 3--Prescribed Fire
Forestry Technician GS-5 (Fire)	Firefighter Type I
2 additional Refuge Staff	Firefighter Type II

C. Responsibility for Decision Criteria Validation. The Refuge Preparedness Plan clearly delineates the decision criteria process and responsibilities (Appendix, Exhibit B). The Fire Management Officer is responsible for preparing a Refuge Fire Activity Assessment when indicated by the Refuge Preparedness Plan. This assessment is provided to the Refuge Manager and the Regional Fire Management Coordinator. Based on the activity assessment, fire situation analysis information, and regional preparedness level information provided by the Fire Management Officer, a certification/validation form is signed daily by the Refuge Manager or acting Refuge Manager whenever a prescribed fire or wildland fire managed for resource benefit is in progress on the Refuge. This revalidates the appropriate management response, and provides certification in writing that the managed fire is within prescription, has adequate forces to keep it in prescription, and that adequate contingency suppression forces are available.

D. Interagency Coordination. Interagency coordination is critical for successful implementation of the Refuge fire management program, particularly in light of the fire suppression authorities provided for in Alaska as specified in the Departmental Manual (620 DM Chapter 2). See Section XVII for more specific information.

Cooperative agreements have been established between the U.S. Fish and Wildlife Service, the Bureau of Land Management, and State of Alaska in order to facilitate interagency wildland fire management. The agreements are primarily used to specify authorizations and reimbursement procedures for suppression services provided between agencies. A local agreement between the Refuge and Tok Area DOF provides the mechanism and funding requirements to allow certain Refuge resources to be utilized by the State for fire management activities and State resources to be utilized on the Refuge for prescribed fire activities. The Refuge allows the State to utilize the refuge radio system for emergency fire suppression activities when the State communication system cannot provide coverage and the Refuge system can. The Refuge fire management staff supplements suppression services provided by the State of Alaska by performing much of the surveillance required on managed and unwanted wildland fires ongoing on the Refuge, and provides on-site agency representation on extended attack fires. The Refuge fire engine does have local initial attack capability.

Tetlin NWR also has a memorandum of understanding which allows the Tok Area Office of the State Division of Forestry to utilize the Refuge radio communication system on an emergency short term basis for fire suppression operations which occur within coverage of the Refuge system and out of the coverage area for the State system.

E. Normal Unit Strength. The Refuge maintains a cache of fire equipment for use on wildland fire suppression, fire use, prescribed fire, and Wildland Urban Interface hazard reduction activities. The Normal Unit Strength (Appendix, Exhibit A, Refuge Dispatch Plan) delineates minimum numbers of items maintained in the cache and available for use in the local area in support of those activities.

X. WILDLAND FIRE MANAGEMENT PROGRAM.

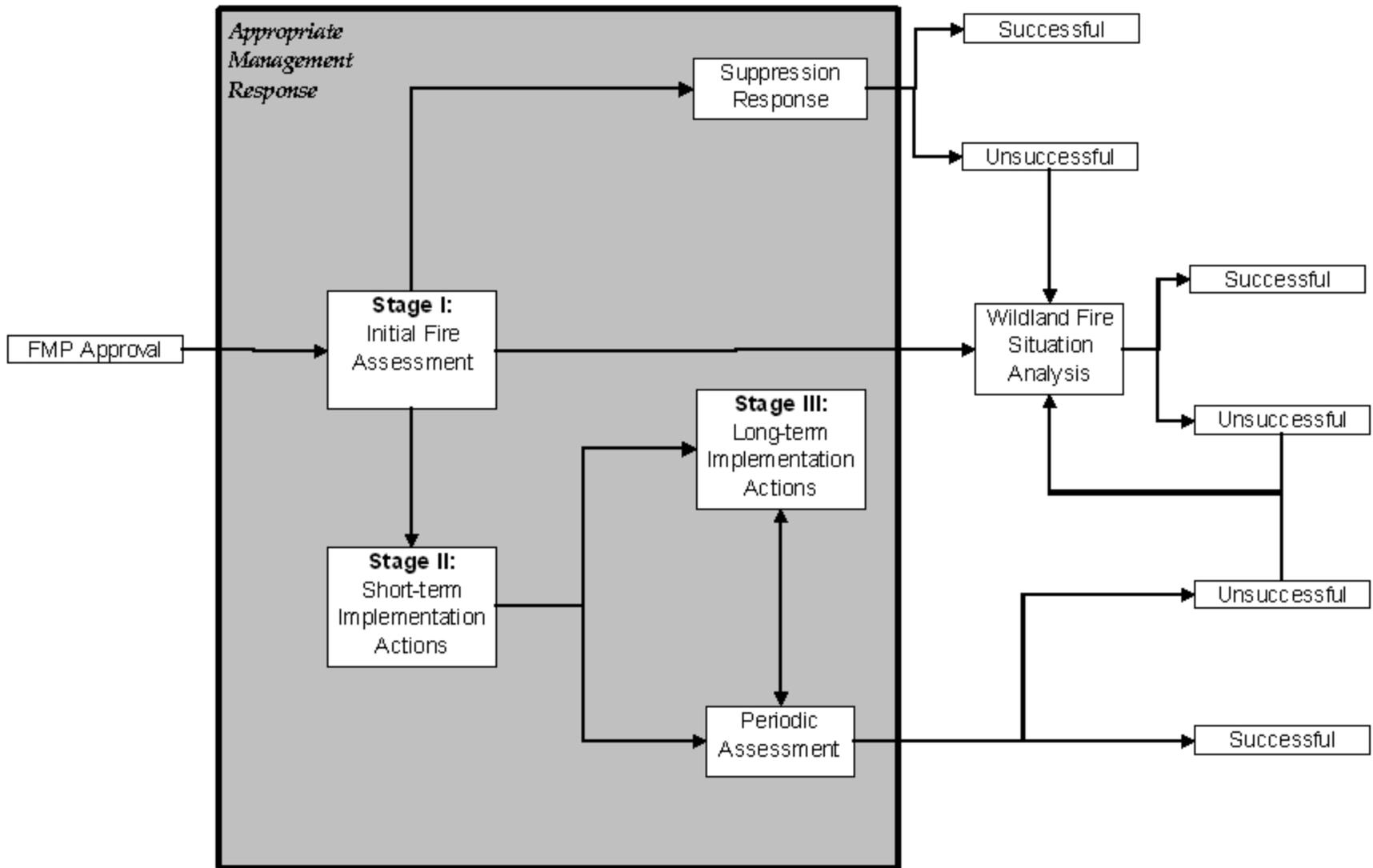
Wildland fires are any lightning-caused or human-caused fires that occur on the Refuge that are not designated as prescribed fires in an approved prescribed fire plan. Appropriate management action must be taken on all wildland fires (Figure 6). The Refuge Manager is responsible for all fire management activities on the Refuge, including wildland fire suppression, wildland fire managed for resource benefit and prescribed fire.

A. Wildland Fire Suppression

1. Suppression Authority and Planning. Prior to passage of ANILCA in 1980, the Bureau of Land Management functioned as caretaker for most of the federal land in Alaska. Fire suppression was included as part of this responsibility. As a result, BLM developed an effective fire suppression organization in Alaska. When other Department of the Interior land-managing agencies came into the picture as a result of ANILCA, it was decided at the departmental level that BLM would provide fire suppression services for all Interior agencies in Alaska. Thus, the Alaska Fire Service (AFS) was formed by BLM to specifically serve the suppression needs of all Interior agencies in Alaska. The intention of this "fire department" approach was to avoid unnecessary duplication of scarce fire suppression resources, increase efficiency and ultimately save taxpayer dollars. Thus, authority has been delegated to the BLM Alaska Fire Service to perform suppression services for FWS on refuge lands in Alaska (620 DM Chapter 2). 620 DM 2.4 states "BLM is authorized to provide safe, cost-effective emergency wildland fire suppression services in support of land, natural and cultural resource management plans on Department of the Interior administered land... BLM will execute these services within the framework of approved fire management plans or within the mutually agreed upon standards established by the respective land manager/owners." 620 DM 2.4.A states "Nothing herein relieves agency administrators in the Interior bureaus of the management responsibility and accountability for activities occurring on their respective lands.

Each agency is responsible for administering their own fire management program. 620 DM 2.4.C. states "Each bureau will continue to use its delegated authority for application of wildland fire management activities such as planning, education and prevention, use of prescribed fire, establishing emergency suppression strategies, and setting emergency suppression priorities for the wildland fire suppression organization on respective bureau lands. In the Fish and Wildlife Service, the Refuge Manager retains overall responsibility for fire management activities on the Refuge. The Regional Director retains overall responsibility for fire management activities on FWS lands in Region 7. AFS provides suppression services which must conform to fire management guidelines specified by each refuge through the Refuge Fire Management Plan and the Alaska Interagency Fire Management Plan (amended October, 1998).

Figure 6. Appropriate Management Response for Wildland Fire



The State of Alaska Division of Forestry is responsible for providing suppression services and protection for State lands. To avoid undue duplication of facilities and consolidate geographical areas of suppression responsibility statewide, AFS and the Alaska State Division of Forestry have entered into an agreement which allows AFS to provide suppression services on certain State lands in exchange for the State providing suppression services on certain federal lands. Tetlin National Wildlife Refuge falls within the scope of this agreement. Thus, the State of Alaska Division of Forestry Tok Area Office actually provides suppression services on Tetlin NWR, as an agent of the Alaska Fire Service. Support services are available from the AFS. The State is reimbursed annually by the Federal Government for services provided on Federal lands. The responsibility for compliance and performance of the state within the scope of this agreement remains with BLM Alaska Fire Service.

The Refuge fire management staff takes an active role in suppression activities on the Refuge in cooperation and coordination with services provided by Tok Area Office of the State of Alaska Division of Forestry.

Guidelines for determining appropriate suppression action are provided in the Alaska Interagency Wildland Fire Management Plan (AIWFMP). This plan was developed indirectly as a result of ANILCA. One provision of ANILCA directed formation of the Alaska Land Use Council (ALUC). One of the recommendations that came forth from that group was to create the Alaska Interagency Fire Management Council to organize and coordinate interagency wildland fire management planning for the 220 million fire-prone acres in the State. Between 1982 and 1986, thirteen interagency fire management plans were written by local participants from each agency involved, which covered all of this fire-prone acreage. The universal purpose of these fire suppression-oriented plans was to "provide an opportunity through cooperative planning for land managers/owners within the planning area to accomplish their fire-related land-use objectives in the most cost effective manner." The Fortymile Interagency Fire Management Plan was one of these thirteen plans, and included Tetlin National Wildlife Refuge as a primary cooperator. The individual plans have since been consolidated into one cohesive Alaska Interagency Wildland Fire Management Plan, which contains the common elements of the 13 approved area plans. Area specific support documentation is retained in the original documents.

The Alaska Interagency Wildland Fire Management Plan provides for a range of suppression responses to wildland fire which results in protection for human life and property, protection for other identified resources and development, balances suppression costs with values at risk, and is compatible with Refuge resource management objectives. The necessity and importance of protecting developed areas and other areas with high resource values areas is actually enhanced, while the natural occurrence of wildland fire in the ecosystem in many remote areas of the ecosystem is maintained with a cost effective and minimal amount of intervention.

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

2. Suppression Response Four wildland fire management options are established in the Alaska Interagency Wildland Fire Management Plan.

a. The Critical management option requires aggressive suppression for all fires within this option. Fires in zones that are designated Critical threaten human life, inhabited property and physical developments.

b. The Full management option requires aggressive suppression of all fires within the option, but at a lower priority than the Critical management option. Fires in zones that are designated Full threaten high resource values and cultural and historical sites.

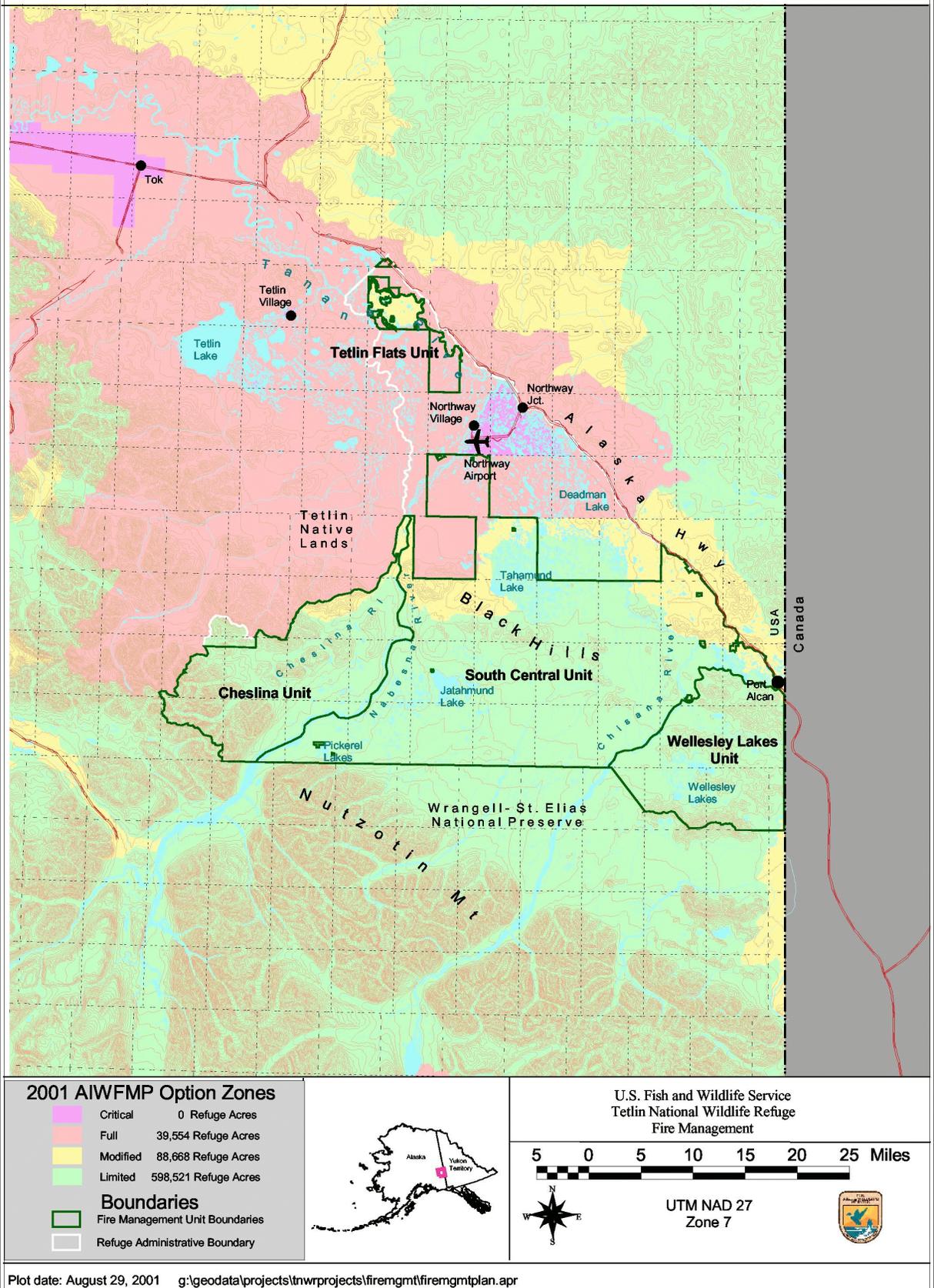
c. The Modified management option requires containment action during the peak of the fire season and a monitoring response after a designated date in the latter stages of the fire season, normally after July 10. The intent of the Modified management option is to reduce suppression costs and provide opportunities for wildland fire to help achieve land and resource management objectives, yet minimize the possibility of fires becoming big enough to burn into Full or Critical management option zones.

d. The Limited management option requires only a surveillance response as long as fires in zones within this designation do not threaten to escape into higher priority zones; if a threat exists, a containment response can be initiated to keep fires from burning into higher priority zones. The intent of the Limited management option is to reduce the expenditure of suppression funds where values at risk do not warrant the expense of aggressive suppression action and provide opportunities for wildland fire to help achieve land and resource management objectives. Operational control of suppression action on Limited management option wildland fires has been delegated to the Alaska Fire Service (and through cooperative agreement by the Alaska Fire Service to the State of Alaska in the area encompassing the Refuge) through 620 DM Chapter 2.

There is an annual opportunity to make adjustments to suppression response zone boundaries, with a deadline of March 15 to get maps digitized for incorporation into the Alaska Initial Attack Management System map database. Temporary adjustments to suppression response zone boundaries can be made at the request of a land manager, or as mentioned earlier, on a larger scale by a consensus of the Multi-Agency Coordinating Group.

A map showing the 2001 AIWFMP Option Zones(Suppression Response Zones) is presented in Figure 7.

Figure 7. 2001 Alaska Interagency Wildland Fire Management Plan Option Zones on the Tetlin NWR



3. Fire Season Description. Fires can occur on Tetlin National Wildlife Refuge between late April and mid September. Within this time frame, the seasonal fire cycle for the area which includes Tetlin National Wildlife Refuge generally consists of four micro seasons or phases. The occurrence of these phases varies with changing weather patterns and plant phenology. These are general trends, not totally predictable annual events.

The first phase begins in late April or early May when snow cover disappears, and ends in late May or early June when greenup begins. During this transition period from 100% winter-cured fuels to greenup, fires are generally man-caused. These fires usually burn with low intensity due in part to high relative humidity recoveries at night, moderate daytime temperatures, and high soil and duff moisture. However, wind and low humidity can combine to produce higher intensity fires. Black spruce may be moisture distressed and have a relatively low live fuel moisture at this time of year, promoting active crown consumption. If spring fires are not suppressed or adequately monitored, they can smolder through this period and flare up later in the season when fuels are dry and cause problems.

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

The final phase occurs from the beginning of August through early September. Lightning activity is rare and most of the fire starts are man-caused, often related to hunting, fishing and other subsistence or recreational activities. Fires starting during this phase normally burn with lower intensities, due to increased humidity recovery at night. Problems from fires starting during this phase are infrequent, and are generally associated with wind events.

4. Ecological Impacts of Fire Suppression. Effective fire suppression has not been instituted on the Refuge for a long enough time, nor has there been a significant enough amount of fire starts during that time to determine ecological impacts of fire exclusion. Hazardous fuel buildup has occurred in some areas due to slow decomposition of organic matter and the general lack of fire occurrence, but not as a result of fire suppression. With adoption of the Alaska Interagency Wildland Fire Management Plan, exclusion of fire is not a management option being utilized on a significant portion of the Refuge.

There are documented impacts on the Refuge resulting from suppression activities on specific fires. The greatest potential is for creation of erosion problems and permafrost thaw from line construction activities. This potential is prevalent throughout the Interior ecosystem unit. Minimum impact suppression guidelines (Appendix, Exhibit A, Tetlin NWR Dispatch Plan) will be used within the Refuge during suppression activities unless implementation of those activities jeopardize the safety of firefighters or the public.

5. Economic Importance. Participation in fire management activities is an important source of income for local residents, many of whom have very limited job opportunities. Most of this participation is connected with organized village Emergency Firefighting (EFF) Crews involved in the suppression of large fires. EFF crews are trained and available from the villages of Northway, Tanacross, Tetlin, Mentasta, Dot Lake and Tok. There are opportunities for village crew participation in other aspects of fire management, notably pre-suppression work constructing fire breaks to reduce fire hazard around developed areas and as members of holding and lighting crews assigned to prescribed burn operations and containment actions on wildland fires managed for resource benefit. Tetlin NWR places a high priority on involving local crews in the Refuge fire management program.

Potentially negative economic impacts from large catastrophic wildland fires may include destruction of commercial quality white spruce along river courses. However, there are no significant commercial-grade quantities of white spruce on the Refuge, and fire occurrence is infrequent in the areas where very small quantities of commercial-grade white spruce do occur. Black spruce may have economic potential as a source of ethanol. The Tetlin Village Council is currently investigating this potential on their own land.

6. Refuge Management Decision Impacts on Fire Management. Over 80% of Refuge lands are in the Limited management option. The alternative approach of aggressively suppressing all wildland fires was practiced in the area encompassing Tetlin National Wildlife Refuge from 1959 until 1979. This approach was not only expensive, but conflicted with the Refuge management objective of maintaining a natural diversity of wildlife and wildlife habitat as mandated in ANILCA.

Special use permitted cabins on the Refuge will be provided Full protection from wildland fire regardless of the wildland fire management option designated on surrounding lands, to the extent that the safety of assigned suppression forces is not compromised.

7. Fire Suppression Guidelines.

a. Preferred methods of suppression. Minimum impact suppression techniques (Appendix, Exhibit A-Tetlin NWR Dispatch Plan) will be implemented on all fires within the Refuge,

except where those practices jeopardize firefighter or public safety. For fires requiring containment in Limited and Modified action areas, strategies which utilize natural barriers and indirect attack, and efforts which are timed to take advantage of breaks in the weather are preferred. Innovative approaches and adoption of techniques to foster cost effective fire suppression are encouraged.

In compliance with the "light hand on the land" concept, suppression methods which minimize the potential for environmental damage are preferred in all areas. In other words, acreage burned may be increased, but costs of suppression can be brought down to a more appropriate level for the values at risk. For example, indirect attack on larger fires utilizing natural barriers is an effective strategy that can allow fires to be suppressed on the suppression force's terms rather than the fire's terms. The timing of suppression force deployment and substantial increases in commitments on problem fires can be correlated with changes in the weather affecting the fires in order to maximize effectiveness.

b. Suppression Restrictions. The use of dozers, all-terrain vehicles and fire line explosives will only be permitted if authorized by the Refuge Manager on a case-by-case basis. This equipment will normally not be permitted to be used except in high priority situations involved with the protection of life and property.

On large or complex manned fires, a resource line officer will be assigned by the Refuge to the fire to provide input to suppression forces to ensure Refuge management objectives, concerns and restrictions can be incorporated into suppression operations and rehabilitation plans where appropriate.

c. Surveillance Requirements. Fires receiving a modified or limited response that do not have suppression forces assigned on the ground will have surveillance performed regularly. Surveillance will normally be performed via aerial flyover. Refuge fire monitors may provide on-the-ground monitoring on large limited response fires. A fire surveillance report will be completed each time a specific fire is monitored. A perimeter map will be initially prepared to accompany the report, and subsequent maps will be prepared whenever there has been significant changes in fire size. Video footage is very useful for mapping and documentation purposes. Global Positioning System units which help supplement Refuge Geographic Information Systems, as well as digital cameras will also be used to document wildland fire activity. The Refuge FMO may take a proactive role in surveillance. Surveillance schedules and information will be routinely shared between the Refuge and suppression agencies. Close cooperation is essential to avoid duplicate missions. If surveillance is performed by the Refuge, a copy of the report will be provided to Tok Area Forestry as soon as possible following the flight. If surveillance is performed by Tok Area Forestry, a copy of the report will be provided to the Refuge as soon as possible after the flight.

d. Rehabilitation. Burned area emergency stabilization and rehabilitation (ESR) activities are an integral part of wildland fire incidents. Department and Service burned area emergency stabilization and rehabilitation policy is found in 620 DM 3 and 095 FW 3.9. Supplemental funding guidance is found in Fire Management Handbook section 1.6 subactivity 9262.

Emergency stabilization is the use of appropriate emergency stabilization techniques in order to protect public safety and stabilize and prevent further degradation of cultural and natural resources in the perimeter of the burned area and downstream impact areas from erosion and invasion of undesirable species. Rehabilitation is the use of appropriate rehabilitation techniques to improve natural resources as stipulated in approved refuge management plans and the repair or replacement of minor facilities damaged by fire.

The Refuge manager is responsible for ESR Plan development. This may be done by Tetlin NWR personnel or by assembling an ESR team to conduct fire damage assessments and begin plan development. Because of the emergency nature of the fire event, the ESR plan must be developed expeditiously. The ESR Plan is tiered to the Refuge CCP, Fire Management Plan, and Preparedness Plan. Development of ESR Plan objectives is guided by resource management objectives, general management practices, and constraints identified in the Refuge CCP, FMP and other step-down plans.

The rehabilitation section of the ESR Plan is not considered an emergency, and is developed as other refuge land use plans. Depending on the complexity of the rehabilitation, the rehabilitation section of the ESR Plan may require an interdisciplinary team approach. However, existing approved refuge management plans should have much of the information needs for development of the rehabilitation section of the ESR Plan.

Both sections of the plan must comply with the Service NEPA process. Two Service Categorical Exclusions relate directly to fire ESR Plan development:

- Fire management activities, including prevention and restoration measures, when conducted in accordance with departmental and Service procedures
- The reintroduction or supplementation (e.g. stocking) of native, formerly native, or established species into suitable habitat within their historic or established range, where no or negligible environmental disturbances are anticipated.

A Finding of No Significant Impact (FONSI) or Decision Record is required for all ESR Plans.

The Refuge Manager and Regional Director will approve all ESR Plans as meeting resource management objectives. The Regional Fire Management Coordinator will concur that the ESR Plan fits the technical definition for use of Emergency Rehabilitation funds. ESR Plans obligating more than \$500,000 will be reviewed and approved at the Washington Office by the Chief of the National Wildlife Refuge System. ESR Plan development standards and procedures are found in section 5.3 of the FWS Fire Management Handbook.

The Tetlin NWR and the Region will evaluate the effectiveness of their ESR activities and use of Emergency Rehabilitation funds at a specified interval, preferably at least once every five years. All Refuge ESR activities will be evaluated for compliance with Service policy through individual incident or programmatic reviews.

e. Type I and Type II Incidents. When Type I and Type II fires occur on the Refuge, the Refuge staff will take an active role in providing direction to the local suppression organization and incident commander. Refuge staff (primarily the Refuge FMO) will prepare the Wildland Fire Situation Analysis (WFSA)(Appendix,Exhibit C) with input from the local suppression agency. The WFSA should have sufficient detail in development of the alternatives to allow a determination to be readily made on the level of organizational management needed (Type I, Type II, Type III). The Refuge Manager will select a strategic alternative. Refuge staff, along with relevant suppression agencies, will have input into the delegation of authority, which authorizes the Incident Command team to undertake suppression activities on the Refuge and provides guidance and constraints on the suppression effort specific to the fire at hand. The WFSA will be re-validated periodically by the Refuge Manager or designate, local suppression agency, FMO and Incident Commander to ensure that the strategic objective selected is still appropriate. Refuge staff will provide strategic direction, not tactical supervision for the suppression team. Direct management of the Incident Command Team is provided by the local suppression organization.

Type I and II Incident Management Teams ordered for and/or assigned to incidents at Tetlin NWR will operate under a written Limited Delegation of Authority, prepared by the Refuge FMO and signed by the Refuge Manager or their designee. The Limited Delegation of Authority will specify pertinent priorities, concerns, and constraints for the incident in progress and will be treated as Refuge policy until the conclusion of the incident or until the Refuge Manager's amendment of the original delegation statement through a subsequent signed statement.

All Type I and Type II incidents occurring on the Refuge will have a Refuge Manager's representative designated and assigned by the Refuge Manager to provide and maintain a conduit of

communication between the incident command team and the Refuge Manager, as well as between the local suppression agency and the Refuge Manager. The Refuge Manager's representative will also participate in incident command team debriefings that are normally scheduled when the team is released from the incident. The Refuge FMO will generally function as the Refuge Manager's representative, but in the case of multiple incidents, there may be other staff assigned as well.

8. Completion of Records and Reports. The general pathway for documentation of wildland fire suppression incidents is shown in Table 18. For each suppression incident the Tetlin NWR Fire Management Officer will be responsible for the completion of some or all of the following items, as indicated.

a. Wildland Fire Implementation Plan. The FMO will ensure that a Stage I Wildland Fire Implementation Plan (Stage I WFIP, available in the Refuge FMO office and at the website "<http://fire.r9.fws.gov/fm/policy/HANDBOOK>" is enacted for every wildland fire at the refuge. The fire situation report information for the Stage I WFIP can be provided by the Tok Area Division of Forestry Dispatch Office Fire Surveillance form. The Refuge FMO will complete the Decision Criteria Checklist and initial Go-No-Go decision documentation. Only the most complex fires being managed for resource benefits will require completion of all parts of a WFIP (See section X. B. for further discussion of the WFIP)

b. Wildland Fire Situation Analysis. Extended action occurs when a fire has not been contained or controlled by the initial action forces, usually within the first burning period, and continues either until transition to a higher level incident management team is completed or until the fire has been contained or controlled. Extended action requires a Wildland Fire Situation Analysis (WFSA) to guide the reevaluation of fire management strategies. (Appendix, Exhibit C).

The Wildland Fire Situation Analysis (WFSA) is the decision-making process used by the Refuge Manager to analyze an escalating wildland fire management situation and to document decisions. A WFSA must be prepared prior to deployment of extended attack forces. The Refuge Manager uses the WFSA to explain the situation, list management constraints and objectives, compare multiple strategic wildland fire management alternatives, evaluate expected effects of alternatives, select the preferred alternative, and above all, document the resulting decision. Preparation of the WFSA is triggered in several ways, including the occurrence of fire behavior beyond the capabilities of suppression actions or of prescribed fire operations.

Table 18. Wildland Fire Implementation Plan Requirements and Timeframes

WFIP Stage	Planning and Assessment Element	Requirement Status*			Maximum Completion Time Frame and Responsible Party
		Initial Attack	Other Suppression oriented appropriate management response	Fire use actions	
WFIP Stage I: Initial Fire Assessment	Fire Situation	1	1	1	As soon as possible by Tok Area DOF
	Decision Criteria Checklist (Initial GO-NO-GO Decision)	3	1	1	2 hours after first fire detection by Refuge FMO or designate
WFIP Stage II: Short-term Implementation Action	Short-term Fire Behavior Predictions and Risk Assessment	3	1	1	24 hours after Stage I completion by Refuge FMO or designate
	Short-term Implementation Actions	2	1	1	
	Complexity Analysis	3	1	1	
	Stage III Need Assessment Chart	NA	1	1	
WFIP Stage III: Long-term Implementation Actions	MMA Determination	3	4	4	Within 24 hours after Stage II or Periodic Fire Assessment indicates need by Refuge FMO or designate
	Fire Behavior Prediction	3	4	4	
	Long-term Risk Assessment	3	4	4	
	Long-term Implementation Actions	3	4	4	
Periodic Fire Assessment	Part 1: Re-validation	NA	1	1	On assigned frequency by Refuge FMO or designate
	Part 2: Stage III Need Assessment Chart	NA	1	1	
WFA		5	5	6	Before implementing new strategy by Refuge Manager, Refuge FMO or designate, and Tok Area DOF

* Requirement Status Key:	
1	mandatory
2	mandatory, but can be planned
3	optional
4	completed if Stage II or Periodic Fire Assessment, Part 2 indicates need
5	completed if fire exceeds management capabilities
6	completed if Periodic Fire Assessment, Part 1 indicates need

The recently developed WFSA can, in selected situations, be used to analyze alternatives aimed simultaneously at both resource benefit *and* protection.

The WFSA consists of seven sections, including a daily assessment sheet. Various sections require the signature of the Refuge Manager or the Incident Commander; the Refuge Manager, however, is ultimately responsible for completion of the WFSA.

c. Fire Reports. On Refuge incidents an initial fire report will be prepared by the Tok Area Division of Forestry and forwarded to the Alaska Interagency Coordination Center; a copy of this fire report will then be forwarded to the Regional Fire Coordinator and the Refuge and then entered by the Refuge FMO into the Department of the Interior Shared Applications Computer System (SACS). The following items are pertinent to the production of the fire report; the FMO will ensure that these items are retained and filed at the Tetlin NWR fire management office in Tok.

- Fire numbers
- Copy of WFIP (all stages)
- Copy of WFSA (for unsuccessful initial attack or fire operation)
- Resource order forms (NFES 1470)
- Equipment rental or purchase receipts
- Accident and/or injury reports
- Personnel lists (including Emergency timeslips)
- All weather data reports and records
- Situation maps
- Rehabilitation Plan
- Incident Action Plans

9. Risks Associated With AIWFMP Suppression Options. The options designated in the Alaska Interagency Fire Management Plan help to mitigate the possibility of over committing suppression forces to lower priority areas which could adversely impact response and availability of forces for fires in higher priority areas.

Fires generally become problems when they directly threaten life and property or valuable resources, or when smoke from them compromises the safety of suppression forces committed to other fires or the safety of the general public.

There are risks associated with designating modified and limited management option zones. In modified management option zones there is a risk that fires occurring after the designated conversion date to a monitoring response will become problems. Modified management option zones may not provide adequate buffers to full management option zones if fires exhibit extreme behavior.

If fires in limited management option zones do not have adequate surveillance performed, they may become major problems before an effective response can be made. Fires with a surveillance-only response

can cause smoke problems which can impact the ability to detect and suppress fires in higher priority areas. Once a fire is allowed to get big, there are fewer management alternatives for containing the fire should it become a problem. If aggressive suppression becomes necessary, adequate suppression forces to staff large fires in limited response areas may not be readily available. Suppression efforts on large, hot fires are usually ineffective without favorable changes in weather conditions.

Many management decisions are made regarding modified and limited management options based on predicted weather. The effectiveness of these decisions can be compromised by inaccurate weather predictions or unpredicted changes. Keys to minimizing risks associated with limited and modified management options are effective surveillance, obtaining representative weather conditions at the fire sites to accurately predict fire behavior, obtaining accurate weather forecasts, development of realistic contingency plans in advance, confirmed availability of suppression forces for contingencies, and refinement of management option zone boundaries annually based on experiences, trends and results.

Risk assessment charts have been prepared for each fire management unit on the Refuge and are presented in Figure 8. These charts assign a risk rating of low, moderate, high, very high, or extreme to 14 day blocks of the fire season based on fire danger (keyed toward drought conditions) as characterized by Canadian Forest Fire Danger Rating System (CFFDRS) Buildup Index values of the nearest manned or automatic fire weather station during that period. These charts give the Refuge Manager a basic tool to ascertain the risk of NOT selecting the most aggressive suppression action alternative on a wildland fire. For instance, if a wildland fire occurred in early June in a limited management option zone in the Cheslina Unit and the BUI was in the very high category, the risk would be high that the fire would require a higher level of response later in the season if surveillance was the initial suppression response.

10. Determination of Validity. Certain conditions must be met for surveillance responses to be valid on new fires in limited and modified suppression management option zones. These conditions are delineated in the Refuge Preparedness Plan. (Appendix, Exhibit B)

If any of these conditions cannot be met, initial attack will be taken on new fires in the unit. A WFSA may be prepared to determine the appropriate action to be taken.

11. Coordination With Adjacent Landowners. There are substantial inholdings within the Refuge boundaries. Landowners include:

- DOYON- a native regional corporation
- AHTNA- a native regional corporation
- Northway Natives- a native village corporation
- native allotment landholders
- private landholders along the Alcan Highway, the Northway Road and in and adjacent to the village of Northway
- the State of Alaska
- the Federal Aviation Administration

Figure 8 Risk Assessment Charts for Fire Management Units on Tetlin NWR.

TETLIN FLATS UNIT

(Northway FSS Manual Weather Station)

*Drought Rating	5/15-5/30	6/1-6/15	6/16-6/30	7/1-7/15	7/16-7/30	8/1-8/15	8/15-8/30	9/1->
LOW	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue
MODERATE	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue
HIGH	Red	Red	Yellow	Yellow	Blue	Blue	Blue	Blue
VERY HIGH	Red	Red	Red	Red	Yellow	Yellow	Blue	Blue
EXTREME	Red	Red	Red	Red	Red	Yellow	Yellow	Blue

CHESUNA UNIT

(TET Remote Automatic Weather Station)

*Drought Rating	5/15-5/30	6/1-6/15	6/16-6/30	7/1-7/15	7/16-7/30	8/1-8/15	8/15-8/30	9/1->
LOW	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
MODERATE	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
HIGH	Blue	Yellow	Blue	Blue	Blue	Blue	Blue	Blue
VERY HIGH	Yellow	Red	Yellow	Blue	Blue	Blue	Blue	Blue
EXTREME	Red	Red	Red	Yellow	Yellow	Blue	Blue	Blue

SOUTHCENTRAL UNIT

(TET Remote Automatic Weather Station)

*Drought Rating	5/15-5/30	6/1-6/15	6/16-6/30	7/1-7/15	7/16-7/30	8/1-8/15	8/15-8/30	9/1->
LOW	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
MODERATE	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue
HIGH	Yellow	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue
VERY HIGH	Red	Red	Red	Yellow	Blue	Blue	Blue	Blue
EXTREME	Red	Red	Red	Red	Yellow	Yellow	Blue	Blue

WELLESLEY UNIT

(TWR Remote Automatic Weather Station)

*Drought Rating	5/15-5/30	6/1-6/15	6/16-6/30	7/1-7/15	7/16-7/30	8/1-8/15	8/15-8/30	9/1->
LOW	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
MODERATE	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue	Blue
HIGH	Yellow	Yellow	Yellow	Yellow	Blue	Blue	Blue	Blue
VERY HIGH	Red	Red	Red	Yellow	Yellow	Blue	Blue	Blue
EXTREME	Red	Red	Red	Red	Yellow	Yellow	Yellow	Blue

RISK CATEGORIES

 LOW

DROUGHT ADJECTIVE RATINGS

LOW	BUI < 70
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Primary adjacent landowners include:

- Tetlin Corporation- a native village corporation
- the State of Alaska
- the National Park Service

The Refuge places a high priority on informing adjacent landowners and inholding owners of the Refuge fire situation. In fact, strategy decisions regarding fires which threaten to encroach onto adjacent landowner lands must take into account those landowner concerns and priorities.

12. Prevention. Since 1959, approximately 60% of the fires that have occurred on lands that are now under Tetlin National Wildlife Refuge management have been human-caused. Recreational and subsistence users of the Refuge accounted for most of these human-caused starts. There is a marked concentration of fire starts along the Alcan Highway and in proximity to populated portions of the Refuge around Northway.

Prevention of human-caused fires and techniques to protect dwellings from the threat of wildland fire are topics that are emphasized and promoted in local community education provided by the Refuge.

The Refuge prepares a news release annually that outlines Refuge fire management activities planned for the upcoming season. A prevention message regarding human-caused fires is also included in the press release. The Refuge works closely with the Tok Area Office of the State Division of Forestry disseminating prevention, protection, "Firewise" program defensible space and wildland interface fire information to the public. Wildland fire prevention activities are within the scope of broader Refuge fire management outreach activities.

Prevention analyses should be completed periodically in cooperation with the State Division of Forestry to identify problem areas, the nature of human causes in those areas, and effective actions which can be taken to reduce human-caused starts in those areas. Prevention activities will also be accomplished in concert with regional interagency prevention initiatives and agreements and as a part of hazard reduction projects in local communities.

13. Detection. Detection activities on the refuge are considered part of the suppression operation, and thus are provided for the most part by the State of Alaska as a cooperator with BLM Alaska Fire Service. Visual fire detection is provided by fixed wing aircraft. A lightning detection system is also in place which plots lightning ground strikes. Because of the frequency of flights on the Refuge in support of Refuge activities, new fire starts on and off the Refuge are occasionally detected and reported to the local suppression agency. Supplemental detection is provided by Refuge fixed wing aircraft and Refuge personnel as requested. There are often opportunities for detection support to be provided for specific areas during other Refuge flying operations. Close communication between the Refuge and Tok Area Forestry is essential to accomplish detection support.

14. Radio Communication. Refer to the Refuge Dispatch Plan (Appendix, Exhibit A). Tetlin NWR has a reliable UHF Base/UHF-VHF Base Link/VHF Repeater radio system which provides coverage from the Tok area and Refuge headquarters to 90% of the Refuge. The Refuge has all handheld and mobile radio units programmed with Refuge operations frequencies as well as frequencies designated for use by suppression forces. All Refuge radios have radio telephone interface capability. The Refuge also has three portable UHF radios installed in Refuge housing (Refuge Manager, Assistant Refuge Manager, and Fire Management Officer) for operational and emergency after hours radio access by field personnel direct to the Refuge staff.

Access to the Refuge radio system is permitted for Tok Area Forestry for emergency short term fire suppression purposes as specified in an annual memorandum of understanding that is incorporated into the Annual Refuge Fire Management Plan Supplement.

Currently, the Refuge is upgrading its radio cache to accommodate narrow band and digital equipment. A plan is under development to modify the Refuge repeater system in order to improve its performance.

15. Electronic Data Processing. Tetlin National Wildlife Refuge has two desktop computers dedicated for Fire Management Program use. These computers are used to access the Alaska Initial Attack Management System (AIAMS), to obtain weather data from Remote Automatic Weather Stations (RAWS), drought indices information by station, lightning occurrence information by area, ownership information and response level information by fire location, and electronic mail. The computer is also utilized to access the FWS Fire Management Information System to input Wildland Fire and Prescribed Fire Reports, provide and obtain Refuge fire program budget information via SACS, and maintain fire management training records. Archived weather information for Refuge RAWS is stored in the national Weather Information Management System computer network that can be accessed from Refuge computers. The Refuge computer network provides tools and data essential to fire management. Available hardware and software are listed in the Tetlin NWR Dispatch Plan. The Refuge maintains a GIS database with a wide variety of coverages that are useful for planning fire operations.

Currently, fire management staff use Global Positioning System (GPS) receivers and the Refuge airplane is equipped with a video port to aid with fire mapping and GIS layer production.

The Refuge fire management staff maintain two permanent Remote Automatic Weather Stations (RAWS) linked by satellite to AIAMS. The Refuge fire management staff also use and maintain a portable RAWS for prescribed fire and project fire applications. All three Refuge remote automatic weather stations have synthesized voice capability to provide close to real time weather observations that can be accessed from the base station, from the three Refuge residences mentioned or from any mobile or portable radio on the Refuge within range of the VHF repeater.

B. WILDLAND FIRE USE PROGRAM.

1. Overview. Federal and FWS policy requires that the following elements be in place before Wildland Fire Use is implemented:

- an approved Fire Management Plan;
- appropriate environmental/subsistence compliance;
- pre-established Fire Management Units (FMUs);
- prescription for implementation;
- management oversight.

As defined in the Department of the Interior's Department Manual, Part 620, Chapter 1, Section 1.3K, the above-mentioned prescription will be based on "safety, public health, environmental, geographic, administrative, social or legal considerations." Geography comprises the primary prescriptive variable at Tetlin NWR; FMUs consist of extensive tracts of fire-dependent ecosystems, with relatively low numbers of resources to be protected.

No human caused fires will be managed for resource benefit on the Refuge.

As specified in the Refuge CCP, the Refuge's resource management objectives include the preservation of fire within its natural role whenever safely possible. Naturally occurring fires that do not threaten life or property offer an opportunity for the accomplishment of this objective; accordingly, wildland fire use for resource management benefit may occur in each of the Refuge's Suppression Response Zones (SRZs) when pre-specified conditions are met. Within the Limited Protection Suppression Response Zone fire often poses little if any threat to sensitive or valued resources. Consequently, the detection of ignitions within this SRZ will automatically trigger wildland fire use unless the Agency Administrator specifies otherwise. Ignitions within Modified and Full Protection SRZs will trigger suppression actions; fire use, however, will remain available in these SRZ's as an alternative response upon the request of the Agency Administrator.

Wildland fire use for resource benefits is a Refuge-managed program. Naturally ignited fires play an important role in the Boreal Biome. The Refuge will retain the operational latitude to implement a wildland fire use program for resource benefits for the following reasons:

- Prescriptive criteria can be written and applied by knowledgeable Refuge fire management staff.
- Periodic confirmation that conditions remain within the prescription is provided by the Refuge fire management staff.
- Operational control is provided by Refuge fire management staff.
- Wildland fire use for resource benefit is a cost-effective and ecologically desirable method of restoring and maintaining wildland fire to its natural role in designated areas under an

- approved plan.
- Actions on wildland fires delineated by the Alaska Interagency Wildland Fire Management Plan such as surveillance, should not be construed as a substitute for a Refuge prescribed fire program or wildland fire use program.

Selection and formulation of all responses, including wildland fire use, will be accomplished through the production of a Wildland Fire Implementation Plan (WFIP) (available at the Refuge FMO office and at the website "<http://fire.r9.fws.gov/fm/policy/HANDBOOK>").

2. Objectives. The primary objective for wildland fire use at Tetlin NWR is to maintain the area's bio-diversity through the use of fire (including the naturally occurring spectrum of fire intensities and effects) while also ensuring the safety of life, property, and sensitive resources. Another important objective for fire use is the cost-effective reduction of hazard-fuel loads.

3. General Plan. Wildland fire use at Tetlin NWR is predicated upon the annual establishment and/or adjustment of appropriate boundaries and management options for the Refuge's FMUs. Each winter the Tetlin NWR Fire Management Officer meets with Wrangell- St. Elias Park/Preserve staff members and fire management personnel from the State Division of Forestry to re-evaluate the location and categorization of these units. Final authority for the adjustment of FMUs and/or management option zones within the Refuge rests with the Tetlin NWR Refuge Manager.

The AIWFMP options contained within this plan specify management actions, to be enacted by State Division of Forestry dispatch. Alternative actions, however, may be considered and/or selected by the Refuge Manager or designate on a case-by-case basis, as determined by current fuel, weather, and fire management conditions and as dictated by FWS policy and the Refuge FMP.

4. Responsibility for Initiation of Decision Process. FWS policy requires that strategies for all wildland fires on FWS lands be selected using the initial stage of the Wildland Fire Implementation Plan (WFIP), a standardized process for determining fire management responses and for documenting the resulting actions and outcomes. Ignitions occurring at the Refuge trigger actions, specified by AIWFMP option parameters and implemented by DOF dispatch (and/or the Incident Commander) on the authority of the AIWFMP and the Tetlin NWR Fire Management Plan. In the case of pre-planned actions the initial WFIP components are satisfied by State Division of Forestry dispatch through the recording of the ignition detection and subsequent determination of the incident location. The Refuge's FMU parameters also allow the implementation of *alternative* actions upon selection by the Refuge Manager; initial WFIP components for alternative actions are produced through the completion of a WFIP Stage I analysis.

Wildland fire use is the preferred action in the Refuge's Limited management option zone and will be implemented automatically by State Division of Forestry dispatch unless the Refuge Manager directs otherwise. Wildland fire use comprises an *alternative* action within the Modified (prior to conversion) and Full management option zones, and is available in these zones on condition of approval and documentation by the Refuge FMO and Refuge Manager through the completion of a WFIP Stage I analysis. Responsibility for completion of initial WFIP components is summarized in Table 18.

Information used to complete the WFIP Stage I Initial Fire Assessment is derived from initial fire reports obtained from Tok Area DOF dispatch. Refuge specific prescriptive criteria used to determine the initial Go-No-Go decision and revalidation of management response is listed in the Appendix, Exhibit E. WFIP components are further described in section 3.3.1 of the FWS Fire Management Handbook, available in the Refuge FMO office and on the on the Internet at <http://fire.r9.fws.gov/fm/policy/HANDBOOK>.

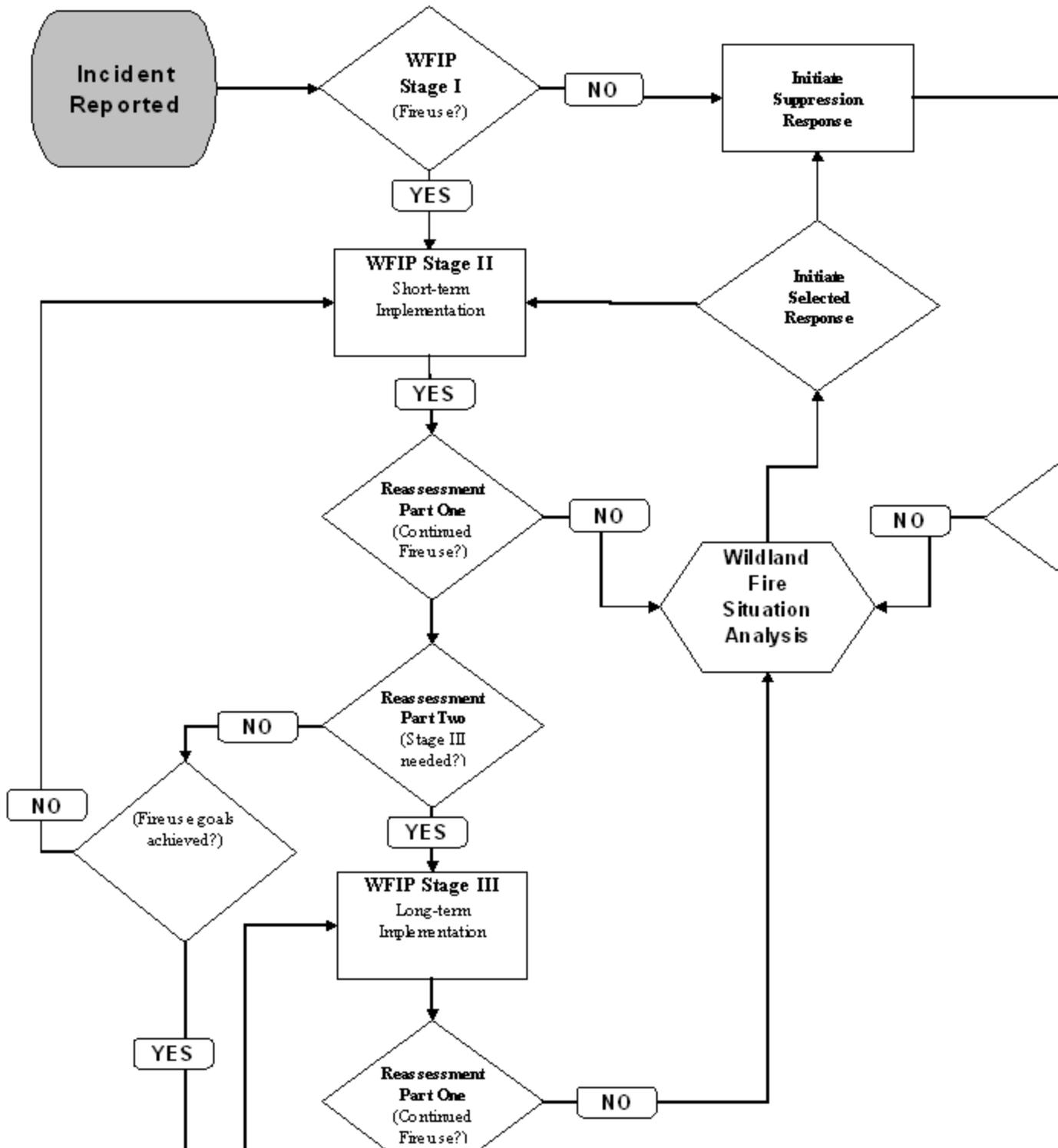
5. Incident-Specific Implementation Procedures for Wildland Fire Use.

a. Wildland Fire Implementation Plan. A Wildland Fire Implementation Plan (WFIP) will be prepared for all wildland fires. Completion of the Wildland Fire Implementation Plan may entail as many as three distinct stages, depending on the nature and complexity of the incident.

- Stage I of the WFIP is triggered by any wildland fire detection within the Refuge and consists of a fire situation report, decision criteria checklist, and a recommended response action (initial go-no-go decision). If the decision is to manage the fire for resource benefit, proceed to Stage II.
- Stage II of the WFIP provides managers with the information needed to continue managing an incident for resource benefit. Stage II entails the prediction of direction, intensity, and rate of fire spread, as well as the specification of necessary short-term actions. Stage II also involves the initiation of periodic re-assessment, including consideration of the incident's continued suitability for fire use as well as the possible need for long-term management actions. The Stage-II periodic re-assessment component may prompt the Refuge Manager to initiate WFIP Stage III.
- Stage III of the WFIP provides the necessary information and planning for the management of more complex instances of wildland fire for resource benefit. Stage III results in the definition of the ultimate acceptable geographic size of the fire, represented by the Maximum Manageable Area (MMA) and the planning and documentation of the actions needed to strengthen and defend the MMA.

The general implementation path for wildland fire use at Tetlin NWR is shown in Figure 9.

Figure 9. Implementation Path for Wildland Fire Use



b. Wildland Fire Situation Analysis. In the case of wildland fire use, a WFSA is produced when the Refuge Manager determines through periodic reassessment that management capability is inadequate to accomplish fire use objectives (see Figure 9 and refer to a more complete discussion of the WFSA in Section X A. 8. b.)

6. Staffing Requirements for Implementation of Wildland Fire Use.

Tetlin NWR has no specific requirements for the staffing of wildland fire use incidents. All personnel will be qualified by NWCG standards. Because of the relative scarcity of structures or other sensitive values within certain portions of the Refuge, fire use incidents may often be adequately managed through aerial surveillance every 7 to 10 days; other incidents may demand the continuous presence of monitors or fire behavior analysts. The Refuge FMO will make final staffing decisions (including the decision to use formalized Fire Use Management Teams) for all wildland fires managed for resource benefit. Step-up staffing and its relation to the number and type of wildland fires active on the Refuge will be discussed in the Annual Refuge Preparedness Plan. (Appendix, Exhibit B)

7. Monitoring for Fire Use Incidents. Assessment frequency for fire use incidents for the purpose of revalidation and initial Go-No-Go decision will be determined by the Refuge FMO according to Refuge specific prescriptive criteria listed in the Appendix, Exhibit E. Recommended assessment frequency in Alaska ranges from one to ten days.

Monitoring procedures at the Tetlin NWR will follow guidelines established by Refuge staff as well as the Alaska Fire Effects Working Group. Monitoring may include first, second order and long term fire effects, similar to monitoring criteria used on prescribed fires. Monitoring actions conducted at the Refuge specifically in support of fire use incidents will whenever possible include measurement of fuel moisture levels for subterranean fuels (as represented by the subterranean fuel models of the Canadian Forest Fire Danger Rating System, for instance) as well as for traditional fine and heavy fuel models.

The Tetlin NWR has submitted a proposal to develop a Boreal Ecoregion Land Management Research Demonstration (LMRD) site on Refuge lands where habitat protection and opportunities to model for restoration will be enhanced through research, education, and outreach. Implementation of the LMRD will include assessment of both natural and prescribed fire. The role of wildfire is little understood, but plays an integral role in nutrient recycling and landscape succession. Monitoring on fire use incidents may be designed to enhance goals generated by LMRD projects.

8. Funding/Fiscal Tracking. The Refuge FMO will work with the Regional FMC to remain current on funding sources and procedures and to ensure that appropriate budget accounts are utilized on Tetlin NWR incidents.

9. Permanent Project Records for Wildland Fire Use. The Fire Management Officer will ensure that a complete project record will be produced and retained for each wildland fire use incident at the Refuge. Each record will contain the following items:

- All approved planning documents guiding management options (e.g. WFIP and WFSAs components).
- Summary of monitoring activities, including monitoring schedule; individual monitoring reports and findings.
- Funding codes and cost accounting.
- Project maps.
- Other information as appropriate (e.g. photo points).

10. Information and Interpretation for Wildland Fire Use.

- When extended wildland fire use incidents are likely to be visible to visitors, Refuge personnel will prepare and distribute handouts and maps explaining the Tetlin NWR fire management program, the nature of the specific incident, and the desirability of preserving the area's natural fire regime.
- An attempt will be made to use fire use incident updates to educate all Refuge employees about local fire ecology and the Refuge's fire management objectives.
- When fire use incidents occur near frequently visited locations, interpreters or other Refuge employees will make periodic visits to answer questions.
- Alerting the public to the potential of fire use incidents will occur in the annual news article written by the Refuge FMO in spring.

11. Potential Impact of Wildland Fire Use Implementation. In managing the use of wildland fire for resource benefit, Tetlin NWR fire management staff will take into account both the short and long-term impacts of any such activity upon all facets of Refuge use, including subsistence activity. Although some local residents may have concerns about the impact of wildland fire upon subsistence hunting and/or trapping operations on the Refuge, the preservation of the area's fire regime is important to the long-term viability of the Refuge's plant and wildlife communities. Nonetheless, the Refuge Manager will in all cases consider the short-term impact of fire-use actions on subsistence activities. Managing wildland fires for resource benefit will not result in a significant increase in acres burned compared to the current implementation of the AIWFMP.

XI. PRESCRIBED FIRE PROGRAM.

A. Overview. Prescribed fire is an important habitat management tool on Tetlin National Wildlife Refuge. In many cases, it is the only cost effective and reliable means of habitat manipulation available. Prescribed burn plans are written by qualified Refuge staff members and approved in the Regional Office by the Regional Fire Management Coordinator, the Refuge Supervisor of Northern Alaska, and the Regional Chief of the National Wildlife Refuge System. Copies of approved burn plans are provided to local suppression agencies. Execution of prescribed burn plans are the operational responsibility and under the supervision of qualified Refuge fire management staff. Local suppression resources and qualified personnel from other refuges in the region may be utilized to supplement Refuge resources. A copy of the Refuge prescribed burn plan format is attached as Appendix, Exhibit D.

B. Objectives. Fire is used as a tool to accomplish resource management objectives. These objectives include, but are not limited to: enhancing wildlife and plant species and populations, reducing hazardous fuels, eliminating exotic/alien species, promoting biological diversity, preserving endangered species, and to accomplish basic maintenance needs such as disposal of vegetative waste and debris.

Examples of more specific Refuge objectives may include:

1. Increase vegetative growth and diversity by removing dead and decadent vegetative growth and recycling nutrients.
2. Reduction and removal of hazardous fuels that threaten adjacent communities (i.e. decadent and dead black spruce)
3. Create vegetation mosaics by altering successional stages of vegetation and by breaking up large monotypic stands of black spruce.
4. Provide opportunities for fire effects research.
5. Provide the public with interpretive opportunities to realize the effects of fire and role of fire on the refuge by developing displays at prescribed fire sites adjacent to public use areas.
6. Increase production of forage utilized by big game species.
7. Increase new shoot production of graminoids and remove dead herbaceous growth along marsh margins to enhance known waterfowl nesting habitat.
8. Restore fire at appropriate intensities to its natural role in the ecosystem.

C. Specific Prescribed Fire Objectives, Constraints and Alternatives by Unit

Table 19 below briefly describes land use objectives, fire management constraints and acceptable alternatives relating to each fire management unit on the Refuge.

Table 19. Objectives, Constraints and Alternatives For the Refuge Prescribed Fire Program By Fire Management Unit.

<u>FIRE MANAGEMENT UNIT</u>	<u>LAND USE OBJECTIVE USING PRESCRIBED FIRE</u>	<u>FIRE MANAGEMENT CONSTRAINTS</u>	<u>ACCEPTABLE ALTERNATIVES</u>
<u>Tetlin Flats</u>	enhance wildlife (esp waterfowl) habitat promote ecological diversity reduce hazardous fuels	private land surrounding unit proximity to populated areas	-none without cooperation of adjacent landowners
<u>Cheslina</u>	enhance wildlife habitat and promote ecological diversity reduce hazardous fuels	no ATV's protection of permitted cabins, mining claims	-wildland fire managed for resource benefit
<u>South Central</u>	enhance wildlife (esp waterfowl) habitat promote ecological diversity develop a protective buffer for private lands to the north through the construction of pre-fire fuel breaks and use of prescribed fire	no ATV's protection of inholdings and permitted cabins	-mechanical hazard reduction by hand is an alternative in accessible areas for blackline and fire break construction -wildland fire managed for resource benefit
<u>Wellesley</u>	enhance wildlife habitat promote ecological diversity eliminate hazardous fuels buildups provide interpretive opportunities reduce hazardous fuels	intense management along highway allowed protection of critical sites, allotments and permitted cabins no ATV's	-mechanical manipulation is a conditional alternative along the highway -wildland fire use

D. Monitoring and Evaluation. Fuel moistures, weather and other appropriate prescription variables will be monitored pre-burn to ensure that desired conditions are met before initiating the burn.

All prescribed burns must have measurable objectives. Monitoring will be done to document and verify that the stated objectives have been met and to refine the burn prescription. Both first and second order fire effects will be measured. The Refuge will be guided by regional monitoring standards as well as the USFWS Fire Effects Monitoring Reference Guide (<http://fire.r9.fws.gov/ifcc/monitor>) when designing, implementing and refining monitoring protocols. Coordination with Refuge biologists will be imperative for implementing a monitoring program. A plan for monitoring long term fire effects will be written for the Refuge and included as an addendum to the FMP.

Primary fire behavior and environmental conditions that may need to be measured periodically during prescribed fire operations are listed in Table 20 below.

Table 20. Measured Fire Behavior and Environmental Conditions.

Fire Behavior Measurements and Observations	Environmental Conditions
Rate of spread Flamelength Flaming zone depth Hours of active flaming/day	Temperature Relative humidity Midflame wind speed and direction Estimate of atmospheric mixing, stability Direction of smoke transport Cloud cover State of the weather Fuel Moisture Duff Moisture

_____ Measurements should be obtained and recorded on a regular basis during the active phase of the burn as specified in the burn plan.

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

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

_____ E. Prescriptions. Prescriptions for prescribed burns are not generic, and detailed prescriptions for all conceivable applications and sites for prescribed fire cannot be presented in this Refuge Fire Management Plan. A detailed prescription is developed as a key part of each individual prescribed burn plan, which is directly oriented toward attaining the specific objectives of a specific burn on a specific site. However, some general guidelines on prescriptions and fire behavior can be made and are presented below.

_____ Generally, prescriptions should be written for prescribed burns which present a window of easily measured environmental conditions and time frames within which the burn is allowed to proceed. A fire burning within these parameters

can be reasonably expected to achieve the stated objectives in the burn plan without presenting a risk to adjacent resources. Long term trends such as extended drought conditions (which may result in very low duff moisture) and 1000 hour fuel moisture (in fuels greater than 8 inches in diameter) may not be represented by utilizing these parameters, and may need to be evaluated by other means.

Basic vegetation types found on the Refuge which may be targeted for prescribed burning are black spruce forest, white spruce forest, broadleaf forest, shrublands, and graminoids. Fuel models applicable to these basic fuel types which can be used to make fire behavior predictions for prescription development have already been discussed. Custom fuel models can be developed for more accurate predictions as pre-fire fuels data is collected and correlated with fire behavior measurements obtained during burning operations.

1. Fire Behavior Parameters. Fireline intensity, the measure or estimate of the heat released per unit of time for each unit of length of fire edge (BTUs/foot/second) can be correlated to the likelihood of success in controlling a prescribed fire should it need to be extinguished. Fires burning above an intensity level of 100 BTUs/ft/sec may be difficult or impossible for hand forces to control using direct attack. Lower intensity fires (< 100 BTUs/ft/sec) produce enough heat to kill spruce, yet will not destroy the root systems of herbaceous plants and deciduous shrubs and trees if duff moisture is at an adequate level. Consequently, regeneration is much more rapid than when high intensity fires destroy all vegetation down to mineral soil. The degree to which root systems are destroyed is affected by duff moisture and duration of exposure to the flaming front. In some cases, high intensity fires are desirable, and special prescriptions may be developed when this is an objective of a prescribed burn. However, high intensity fires require extra precautions, which may include construction of fire breaks, utilization of substantial natural barriers, and selection of sites which afford greater buffers to adjacent resources (maximum allowable perimeter compared to core ignition area).

2. Environmental Parameters. Specific environmental parameters are listed in the individual prescribed burn plans in the Annual Refuge Fire Management Plan Supplement.

3. Measurement of Drought Effects. There have been problems using the National Fire Danger Rating System (NFDRS) in Alaska due to incomplete or missing weather data for large areas and questionable accuracy in applying fuel types indicated for Alaska fuels. Consequently, the use of indices generated with NFDRS archived weather data has been of very limited utility to this point. The utility of using the NFDRS as a drought predictor in Alaska will improve as the amount of archived NFDRS data increases. Drought Indices have been developed in Canada for specific application to fuel types found in Alaska. The Refuge currently utilizes the Canadian Drought Index (CDI) System to track drought conditions on the Refuge and incorporate those conditions into the fire management planning process. The buildup index (BUI) generated in the CDI system is a useful indicator of drying trends in the middle to deep portions of the organic layer of ground fuels and can help ascertain drought conditions. The BUI combines a Drought Code (DC) value and Duff Moisture Code

(DMC) value (weighted toward the DMC), both of which are measures of subsurface drying of organic fuels. These codes and the Fine Fuel Moisture Code (FFMC) are started up each spring 3 days after the snowfree date for each manual and remote automatic weather station. The Refuge Preparedness Plan incorporates regional fire activity and the local BUI into Refuge preparedness levels which determine whether prescribed burns can be initiated or continued. These preparedness levels are not an indicator of fire danger, but rather are used as trigger points in managing prescribed fires and fires managed for resource benefit. Values the Refuge uses as trigger points presently come from historical values used throughout the region by many fire management organizations. Those trigger points may be changed according to findings from future seasonal risk analysis using FIREFAMILY PLUS and Refuge historical weather, comparing historical fire activity levels and fire weather indices, both Canadian and NFDRS. (See Preparedness Plan Appendix, Exhibit B).

4. General Prescribed Fire Goals. The Tetlin NWR has submitted a proposal to develop a Boreal Ecoregion Land Management Research Demonstration (LMRD) site on Refuge lands where habitat protection and opportunities to model for restoration will be enhanced through research, education, and outreach. Prescribed fire goals on the Refuge may be generated from specific research needs developed through LMRD projects. More than 30 Native villages exist across the interior of Alaska representing a unique “wildland urban interface.” These at risk communities are ideal study sites for pre and post fuel hazard reduction and prescribed fire monitoring of the wildland urban interface.

Current examples of general prescribed fire goals for basic fuel types occurring on the Refuge are presented below. Site-specific objectives for specific situations will be designed in consultation with the Refuge biology staff.

a. Graminoids: burn with low intensity to remove dead thatch and leave most of the root systems intact.

b. Shrublands: burn with low to moderate intensity to remove dead downed fuels and litter and promote regeneration of preferred browse species.

c. Broadleaf and Mixed Forest: burn with low to moderate intensity to consume dead downed fuels and litter and allow regeneration of preferred browse species.

d. Black Spruce: burn with moderate to high intensity to kill most of the live trees and consume dead downed fuels.

5. Phenologic Parameters.

a. Pre-greenup: In the black spruce fuel type, an early burn (April to mid-May) may be desirable where ground fuels are still relatively moist which will limit spread, or on exposed sites where the snow has melted earlier than on adjacent sites. Normally, the only sites that will burn early are those with a high percentage of grass component. Cured graminoids along marsh margins can be burned in April or early May prior to breakup, if snow accumulation from the winter is low and enough thawing has occurred to clear the open areas of snow. Southerly exposed broadleaf and shrubland sites can sometimes be burned from April to mid-May to remove leaf litter and dead downed material while there is still snow in adjacent spruce fuels on other aspects to limit spread.

b. Greenup through maturation: Prescribed burn activities between early June and mid-July will be scheduled with caution. This is the peak of the fire season. Fires can quickly become difficult to control because of weather and fuel conditions, and the participation of suppression forces cannot always be guaranteed due to initial attack responsibilities. Prescribed fires initiated during the pre-greenup period can cause problems if they are allowed to burn into this peak burning period. The availability of contingency suppression forces during this time period is often limited because of suppression activity.

c. Maturation: A very feasible time to burn in black spruce fuel types is from mid-July to early September depending upon weather conditions and drought trends. Risks of problems occurring are reduced when end of fire season weather trends are imminent. Marsh margins can be burned after waterfowl broods have hatched and grasses have cured, usually in the time frame between early July and early August. This is often the best time period to burn shrubland and broadleaf forest sites if the summer has been somewhat dry.

F. Debris Disposal. Fire can be used to dispose of wildland fuels generated by maintenance and fire hazard reduction activities, removal of hazardous trees, or construction activities. All such debris disposal projects will be reviewed for complexity by the Refuge FMO. Low complexity debris disposal projects will be addressed in one Prescribed Fire Burn Plan which may be used for multiple years of debris disposal.

Contracts involving the generation and disposal of fuels, will be developed and conducted in coordination and consultation with the Refuge FMO. All contracts/projects which produce vegetative debris will specify when and how to dispose of the material. If fire is a potential disposal method, the Refuge FMO, Regional Fire Management Coordinator, or Wildland Urban Interface Project Coordinator must review and approve the contract stipulations related to debris burning. The project/contract must include funding for planning and conducting the debris burning and identify the responsible qualified individual(s).

G. Prescribed Fire Review

1. Planning Review. All new or previously developed prescribed fire plans should be subject to the established regional review process during the scheduled year of implementation including a new signature page for previously developed plans. Prescribed fire plan review should be based on the prescribed fire complexity analysis (Appendix, Exhibit D–Tetlin NWR Prescribed Fire Plan). At a minimum:

- Low or moderate complexity prescribed fires should be reviewed by a NWCG Prescribed Fire Burn Boss Type 2
- High complexity prescribed fires should be reviewed by a NWCG Fire Burn Boss Type I.
- For prescribed fires involving aviation operations, the appropriate NWCG Prescribed Burn Boss reviewing the plan should also have prescribed fire operational aviation experience.

A NWCG Prescribed Fire Burn Boss qualified at the appropriate level must either write the Prescribed Fire Plan, or provide technical review. If the Prescribed Fire Plan was developed by a NWCG Prescribed Fire Burn Boss qualified at the appropriate level, the technical review can be by a previously qualified NWCG Prescribed Fire Burn Boss at the appropriate level.

2. Operational Review. The Refuge Manager or designated representative will certify in writing, daily (including weekends and holidays) for all prescribed fires not contained in the first burning period that:

- The prescribed fire is within prescription and is expected to remain in prescription for the next 24 hours
- Adequate funds are available to manage the prescribed fire
- Sufficient fire management resources have been assigned or committed to manage the prescribed fire and implement the approved suppression alternative.

3. Reclassification Review. All prescribed fires that are reclassified as unwanted wildland fires will be reviewed by the Refuge Manager or designated representative. This review may be included as part of a regional or national level review if necessary. The purpose of the review is to determine why and under what circumstances a prescribed fire had to be reclassified. It will identify the circumstances leading to the reclassification of the fire, what actions were taken after reclassification, and possible future actions that need to be taken to avoid similar situations.

H. Suppression Criteria. Prescribed fires in the Refuge will be suppressed if they threaten:

- Human life and safety
- Cultural resources or physical facilities of the Refuge
- To have a negative impact on threatened or endangered species
- To escape from predetermined units or from the Refuge, except where interagency agreements provide for certain fires to cross such boundaries
- To exceed prescription and/or cannot be successfully managed under the existing prescribed fire plan

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

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

- personnel requirements
- locations
- cost limits
- time constraints

Once a prescribed fire is declared an unwanted wildland fire, a Wildland Fire Situation Analysis will be completed to determine the appropriate management action to be taken.

XII. AIR QUALITY AND SMOKE MANAGEMENT GUIDELINES

All fire management actions at Tetlin NWR will be conducted in full compliance with local, state, and interstate air pollution control regulations as required by the Clean Air Act, 42 U.S.C. 7418. The Alaska Department of Environmental Conservation issues open burning permits for prescribed burning.

The following parameters have been specified by the Alaska Department of Environmental Conservation as conditions to an annual open burning permit granted to Tetlin NWR which are applicable to all prescribed burns:

- Materials burned are limited to natural vegetation.
- Avoid incomplete combustion as evidenced by the presence of black smoke. Provide for optimum burning efficiency.
- Burning must not be conducted when smoke will have an adverse impact on people or residents. If smoke drifts within 300 feet of an inhabited residence a high volume air quality sampler must be set up and operated. If particulates reach 150 micrograms per cubic meter, ignition must cease and smoke abatement must begin.
- Prior notification must be given to the Alaska State Troopers, U.S. Customs, adjacent landowners, FAA-Northway and Alaska Division of Forestry. The motoring public must also be alerted if the prescribed burn is proximal to public roads.

- The open burn permit is granted on either an individual or annual calendar year basis and must be re-applied for subsequent to each approval period. A report must be submitted at the end of each approval period to DEC specifying dates and acreage of all prescribed burns that occurred during that period on the Refuge.

Smoke production software such as SASEM (A Simple Approach Smoke Estimation Model) may be used to predict the amount of smoke produced and column trajectory. During all prescribed fire activities, smoke will be monitored for trajectory, mixing height and impact to overall air quality.

XIII. FIRE RESEARCH AND MONITORING

Interagency studies, investigations and research are encouraged on any fire management activities planned on the Refuge, as long as they do not adversely impact on-site fire management operations or management objectives. Gathering of traditional knowledge about Refuge resources should include information on the historic use of fire by local Alaska Native people.

The Tetlin NWR has submitted a proposal to develop a Boreal Ecoregion Land Management Research Demonstration (LMRD) site on Refuge lands where habitat protection and opportunities to model for restoration will be enhanced through research, education, and outreach. Prescribed fire goals on the Refuge may be generated from specific research needs developed through LMRD projects. More than 30 Native villages exist across the interior of Alaska representing a unique “wildland urban interface.” These at risk communities are ideal study sites for pre and post fuel hazard reduction and prescribed fire monitoring of the wildland urban interface.

Implementation of the LMRD will also include assessment of wildland fires managed for resource benefit (lightning fires). The role of wildfire is little understood, but plays an integral role in nutrient recycling and landscape succession. Monitoring on fire use incidents may be designed to enhance goals generated by LMRD projects.

The Refuge may pursue research under the auspices of the Joint Fire Science Program, a partnership of six federal wildland management and research agencies with a need to address problems associated with accumulating wildland fuels on lands administered by the partners.

The force of fire is an integral component of the Refuge’s wildlife and plant communities. Accordingly, the Refuge will develop and implement a monitoring program that will help managers better understand the relationship between fire and other components of the areas ecosystem. Goals for present and future monitoring practices may include and are not limited to:

- Facilitating the prediction of fire behavior and effects through establishment of vegetation plots on prescribed burns and wildland fires managed for resource benefit.
- Facilitating and calibrating the prediction of fire behavior through monitoring fire weather during wildland fire incidents and correlating predictions of fire behavior models with actual observed fire behavior.

- Creating and updating fuels maps.
- Refining the applicability and effectiveness of the Canadian Forest Fire Danger Rating System to Tetlin NWR monitoring operations
- Determining the effects of fire on known archeological sites and cultural landscapes
- Utilizing RAWs (Remote Area Weather Station) sites to determine duff moisture content during fire season to better predict fire intensity
- Determining the cumulative effects of fire on subsistence activities
- Facilitating knowledge of the effects of fire hazard reduction actions by setting up monitoring plots at the site of these activities.

XIV. PUBLIC AND FIREFIGHTER SAFETY

Public and firefighter safety is a critical concern in all aspects of the Refuge fire management program. Notification of the public is an initial step whenever fire suppression or prescribed fire activities are expected to occur. Safety of the public and fire management personnel takes precedence over all activities on the Refuge. Fire management safety concerns include threats posed by fire and smoke to visitors, local residents, employees, inholders and wildland firefighters.

A. Firefighter Safety. All personnel engaged in fire management activities within the Refuge will remain aware of the Standard Fire Orders and “situations that shout watch out”; each employee will work to ensure constant implementation of LCES (effective use of lookouts, communication, escape routes, and safety zones).

B. Public Safety. Refuge staff will inform all visitors of any known wildland fire activity within the Refuge, and signs will be posted on nearby roads and departure points if smoke produced during wildland and prescribed fire creates a safety concern. The Refuge Manager may initiate a temporary closure of some or all of the Refuge if large or erratic fire behavior endangers visitor and employee safety to a significant degree.

When a wildland fire occurs on the Refuge, the area in which the fire occurs will be canvassed for public users. If any are found, they will be contacted and advised of the hazard or danger. If a wildland fire occurs near an inholding the landowner will be advised of the situation. If a wildland fire occurs near the road system, the Alaska State Troopers will be notified. Smoke hazard warning signs will be posted on the Alaska Highway if smoke from wildland fires reduces or is expected to reduce visibility below 1/4 mile. Road closure, if deemed necessary, will be administered by the Alaska State Troopers. The Refuge staff will cooperate closely with the State Division of Forestry and Alaska State Troopers in communicating and coordinating public notification and other emergency action.

Notification lists are provided in all prescribed fire plans for prescribed burns on the Refuge. Prior to ignition, all adjacent landowners and key public agencies in the area will be notified. If the burn planned is in proximity to the Alaska Highway, smoke hazard warning signs will be posted during the ignition operation and when smoke has the potential to reduce visibility below 1/4 mile.

Public health related to smoke exposure is an important concern to the Refuge. If smoke from Refuge fire activities presents a significant health hazard, the Refuge staff will take an active role in assisting the Alaska State Troopers and State Division of Forestry in evacuating citizens who wish to be transported to an area outside of the hazardous particulate level area.

C. Evacuation procedures. The Alaska Wildland Fire Coordinating Group has developed a set of standard procedures and forms for the evacuation of personnel and/or public due to risks posed by fire and/or smoke. Either the Refuge Manager or designated representative may request that the Alaska Division of Forestry implement these evacuation procedures for the Refuge or for adjacent communities. Evacuation Plan forms will be available in the Refuge FMO office.

XV. FIRE MANAGEMENT EDUCATION

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

- Communicating information on the role of fire in the boreal forest. The Fire Information and Resource Education Program includes prepared teacher packets (The Role of Fire In Alaska Curriculum) emphasizing the important role natural and prescribed fires play on the Refuge with particular regard to wildlife habitat enhancement. The packets include reference material and classroom activities for various grade levels. Fire effects field kits which include learning aids to supplement the curriculum are also available to be checked out.
- The Fire Management Slide Show and portable Fire Management Program display are used to provide information to the public. The Fire Management Program display is set up at the Tetlin National Wildlife Refuge Visitor Center, but is portable and can be taken to meetings or put on display elsewhere. There is also a permanent interagency fire management display at the Alaska Public Lands Information Center in Tok.
- Dispensing information on the Refuge and Service fire management program and educating the public on the role of fire in Alaska by the Refuge visitor center staff.
- Fire effects transects have been established on the Tok River Fire specifically for environmental education purposes, and provide an excellent outdoor laboratory for schoolchildren.

- There are two interpretive displays on fire management at a pullout at Milepost 1243 along the Alaska Highway. Adjacent to the displays a small prescribed burn and a trail with interpretive signs highlighting fire behavior and fire effects in the boreal forest is planned.
- Maintaining a library of fire education materials on the Refuge
- Supporting the Globe Protocol learning initiative
- Supporting local and national interagency fire prevention efforts by participating in local carnivals and fire prevention meetings (i.e. Firewise)
- Facilitating the attendance of Refuge fire management and public education personnel at fire education and scientific conferences

XVI. FIRE CRITIQUES AND ANNUAL PLAN REVIEW.

The Refuge Fire Management Plan is updated periodically--at a minimum of every five years.

The Annual Refuge Fire Management Plan Supplement is prepared annually, with a deadline of April 30 to allow for adequate time for approval and review of individual prescribed burn plans prior to the fire season. The Annual Supplement includes the Refuge Dispatch Plan, the Refuge Preparedness Plan, and individual prescribed burn plans.

Refuge fire management option zone boundaries are reviewed annually. Any changes in options or boundaries are submitted to the appropriate suppression agency (in this case Tok Area Division of Forestry) by a pre-determined date in spring of each year to allow for timely incorporation into the master fire suppression atlas by the Alaska Fire Service for the upcoming fire season.

All Type I and Type II fires which occur on the Refuge will have critiques scheduled prior to demobilization of the overhead team. Critiques will be attended by key overhead team members, the Refuge Manager or designate, and representatives from Tok Area Division of Forestry. Other individuals may be requested to attend depending upon the complexity of the incident. Critiques on other fires may be scheduled if problems or events occur which warrant scheduling a critique.

XVII. CONSULTATION AND COORDINATION.

Consultation and coordination with all neighboring political and governmental entities is essential for all fire management activities which occur on the Refuge.

Close coordination will occur with DOYON regional Native corporation, Tetlin and Northway Village Councils during planning, implementation, and monitoring of prescribed fires, managed wildland fires, and unwanted wildland fires on the Refuge. In addition, the Refuge is the lead agency for planning and coordinating wildland urban interface hazard reduction projects for Northway Village.

A meeting is scheduled every spring with Tok Area Division of Forestry to discuss Refuge fire management activities planned for the upcoming fire season, and to critique the previous season's activities. This meeting's agenda includes:

- reviewing of the Annual Refuge Fire Management Plan Supplement
- addressing memorandums of understanding and cooperative agreements
- discussing Refuge equipment and personnel available for suppression activities
- reviewing suppression response standard operating procedures
- familiarization with each agency's concerns and issues

Coordination with Wrangell-St. Elias National Park and Preserve and with Yukon Fire Management personnel is essential because of their shared common boundaries with the Refuge. Coordination will be critical if fires are managed for resource benefit near the eastern or southern Refuge boundary. An international agreement between the U.S. Department of the Interior and the Canadian government allows for cooperative detection and suppression of fires within a ten mile buffer zone on either side of the Alaska and Yukon Territory boundary.

Regular contact is made with the FWS Regional Fire Management Coordinator throughout the year to provide information on Refuge fire management activities and needs, and to obtain support to accomplish planned activities. The Regional Fire Management Coordinator reviews the Annual Fire Management Plan Supplement prepared by the Refuge. An annual Fire Management Accomplishment Report is prepared by the Refuge FMO to keep the Regional Fire Management Coordinator updated on all Refuge fire management activities.

XIX. APPENDIX.

- Exhibit A. Tetlin NWR Dispatch Plan 2001
- Exhibit B. Tetlin NWR Preparedness Plan 2001
- Exhibit C. Wildland Fire Situation Analysis Template
- Exhibit D. Tetlin NWR Prescribed Burn Plan Template
- Exhibit E. Prescriptive Criteria for Wildland Fires Managed for Resource Benefit
- Exhibit F. References

**TETLIN NATIONAL WILDLIFE REFUGE
DISPATCH PLAN**

2001 FIRE SEASON

Prepared By: _____ Date: _____
Fire Management Officer

Approved By: _____ Date: _____
Refuge Manager

I. Wildland Fire

A. Interagency Agreements

Bureau of Land Management, Alaska Fire Service (AFS) has been delegated authority to provide fire suppression services for U.S. Department of Interior (USDI) land in Alaska per 910 DM Chapter 3. AFS has entered into a cooperative agreement with the State of Alaska, Department of Natural Resources, Division of Forestry (DOF) whereby DOF provides suppression services on USDI land in the Fortymile Area, including the Tetlin NWR. AFS still retains responsibility for insuring that adequate suppression and protection services are rendered to all federal land managers covered by this agreement. **The Tetlin NWR manager retains overall responsibility and accountability for the Refuge's fire management program.**

B. Reporting Wildland Fires

Reports of fires occurring on or near Tetlin NWR should be made directly to the DOF Tok Area (TAF) fire dispatcher (**883-5681**). A Refuge staff member receiving a fire report should record the caller's name and number and then transfer the call to Mary Kwart or Peter Butteri. If neither is available the following information should be recorded and the caller should be directed to contact TAF immediately.

1. Name, phone number, and calling location of person making report:

2. Date and time report is received: ___ / ___ / ___ ___ AM/PM

3. Date and time fire was observed: ___ / ___ / ___ ___ AM/PM

4. Immediate threats/hazards:

5. Estimated fire size, _____ acres.

6. Fire location (be as specific as possible):_

7. Topographical features (hillside, valley bottom, ridge top, etc.):

8. Fire behavior (i.e. smoldering, surface fire, torching trees, etc.):

9. Smoke color, direction of spread, and column description:

10. Anyone observed in the fire area or leaving the scene? (license #?)

11. Fuel type (spruce, brush, tundra, dump, etc): _____

12. Name of Tetlin staff member recording this report:

**RELAY THIS INFORMATION TO DIVISION of FORESTRY-TOK AREA FIRE
DISPATCHER AT 883-5681 AS SOON AS POSSIBLE!!**

A. Initial Attack

DOF will take appropriate initial attack suppression action on all reported fires occurring on the Refuge. The Refuge will be notified promptly,

however, **initial attack action that is in accordance with guidelines presented in the Alaska Interagency Wildland Fire Management Plan may be taken on a Refuge fire, prior to notification and approval by the Refuge Manager.** The level of the suppression action will be based on the fire's location, the response levels specified in the Alaska Interagency Wildland Fire Management Plan. This plan recognizes that wildland fire is a natural process necessary for the maintenance of Refuge resources and as such will be allowed to function in its natural role to the extent possible. The protection priorities for **every** suppression action will be:

- 1. Human life**
- 2. Natural/ cultural resources**

There may be cases in which the suppression agency or Refuge Manager may recommend that a specific fire in a specific location receive action that is contrary to guidelines presented in the Alaska Interagency Wildland Fire Management Plan. The recommendation may be based on but is not limited to the following criteria:

1. The threat or potential for a fire in a limited suppression zone to escape into a higher priority zone.
2. Threats to human life and property.
3. Serious health or visibility problems related to smoke from ongoing fires impacting public safety or detection capability.
4. Number of ongoing fires or acreage burned exceeding guidelines presented in the Tetlin Refuge's Fire Management Plan under which limited response is valid.

In the event an alternative action is recommended:

1. If the recommendation is initiated by the Refuge Manager, (s)he will contact the suppression agency and request that a specific action such as initial attack be taken. Oral requests will be followed up in writing, with an explanation or rationale of why, what and when the action needs to be taken.
2. If the suppression agency cannot or will not take the recommended action, or takes alternative action, the suppression agency will provide an explanation in writing as to why the action was not taken or why an alternative action was taken.
3. All written explanations or rationales will be incorporated as part of the official fire record.
4. If the recommendation is initiated by the suppression agency, the suppression agency will contact the Refuge Manager, and a request that a specific action be taken will be made.
5. If the Refuge Manager or any other contacts listed in the Refuge dispatch plan cannot be reached, the suppression agency may initiate the action. The suppression agency will continue efforts to contact the Refuge Manager or other staff members. Contact attempts will be documented.

6. The implemented action will continue or be terminated based on the decision of the Refuge Manager. An explanation of action taken will be provided by the suppression agency to the Refuge Manager.
7. If the Refuge Manager elects to disallow or terminate the recommended action, the Refuge Manager will provide a written explanation of the decision and the rationale for the decision to the suppression agency.

Alternative actions may include but are not limited to:

1. Initial attack of a specific fire in a limited response zone.
2. Indirect attack on a portion of a specific fire in a limited response zone to protect structures, to protect previously undetected high resource values, or to mitigate a real threat of the fire spreading onto adjacent public or private lands with a higher suppression response level.
3. Electing to not suppress a fire in a modified or full suppression response zone because of higher priorities.

The Multi-agency Command Group (MAC group) may reach decisions on a regional or national level that will supersede local suppression decisions.

A. Extended Action

The Fire Management Officer and TAF will prepare a Wildfire Situation Analysis (WFSA) whenever a suppression action beyond monitoring is taken beyond the first day of a fire's discovery. A strategy will be selected and approved by the Refuge Manager prior to taking extended action or committing additional resources.

B. Suppression/Rehabilitation Standards

The guidelines listed on the following page will be adhered to during fire operations on the Refuge:

Tetlin NWR Guidelines for Minimizing Suppression Impacts

FIRELINE CONSTRUCTION

1. Use natural barriers wherever possible.
2. Use wetline where it will be effective.
3. Construct sawline to minimum necessary width (trim ladder fuels near line for added effectiveness).
4. Reduce total line length whenever possible by bridging fingers and burning out.
5. Avoid using retardant or foam where run-off into water source is likely.
6. Avoid flooding ashpits on steep slopes or within 100 feet of stream banks and lakeshores.
7. Avoid trenching fireline wherever possible, especially in permafrost areas. If trenching is necessary do not exceed one foot trench width.
8. ATVs will only be used with prior Refuge approval.
9. Dozers, Fire Line Explosives will only be used if absolutely necessary, and then only with prior Refuge approval.
10. Consider using sprinkler systems and fire resistant wrap to protect cabins.
11. Cultural resources will be stabilized and protected from further degradation if determined to be appropriate by agency archaeologists.

HELISPOT CONSTRUCTION

1. Consider long-line use in lieu of helispot for gear delivery/retrieval.
2. Choose impact resistant sites whenever possible.
3. Construct helispot with irregular outlines whenever possible.
4. Construct helispots to meet safety and utility requirements with the least environmental impact possible.
 - TYPE II: 90' safety zone
 - TYPE III: 75' safety zone

CAMP CONSTRUCTION

1. Choose impact resistant sites whenever possible.
2. Construct latrine(s) for any camp to be used for multiple days.
3. Construct latrines 200' minimum from water sources.
4. Cut and roll back moss and duff from firepots. Keep layer intact for replacement.
5. Minimize clearing.
6. Avoid trenching campsites.

FIRELINE REHABILITATION

1. Rehabilitation efforts will be directed at mitigating suppression impacts.
2. Burned area rehabilitation may be considered, but must be approved by the Refuge Manager.
3. Flush cut stumps.
4. Scatter brush along fireline. Avoid large piles inside or outside the line.
5. Return moss to trenches.
6. Construct water bars on steep slopes where moss layer has been removed.
7. Remove all flagging, trash.

HELISPOT REHABILITATION

1. Flush cut and cover stumps with brush outside of pad area.
2. Scatter brush and disperse any large brush piles.
3. Remove all flagging and trash.

CAMP REHABILITATION

1. Restore campsites to as natural a condition as possible.
2. Extinguish campfires. Only replace moss mat if campfire is dead out and cold.
3. Scatter rocks, poles and firewood.
4. Fill latrines and replace moss.
5. Remove all equipment and gear.
6. Burn all trash or haul it out. **Do not** bury trash.
7. Police camp area and **check it** before crew departure.

VIII. Prescribed Fire

The Refuge maintains an active prescribed fire program. Most Refuge burns will be accomplished using Refuge resources, however, more complex burns may require use of equipment and personnel from other refuges and other agencies. Some situations may call for the use of local EFF crews to assist with burning. All burn plans will specify contingency resources from area suppression agencies. See individual burn plans for details.

IX. Refuge Fire Resources

A. Personnel

1. Availability

Refuge staff members may be made available for wildfire assignments and for regional prescribed fire assignments on a case-by-case basis. **Any requests for such participation will be directed through the Refuge Manager for approval.**

Priorities for involvement are:

1. Fires occurring on the Refuge
2. Fires occurring in the TAF response area
3. Fires occurring on other FWS lands in Alaska
4. Other fires occurring in Alaska
5. Fires occurring on FWS lands in lower 48
6. Other fires occurring in lower 48

Declared national fire emergencies may take priority over all but the first priority listed above.

Refuge personnel may also:

- be made available for local monitoring and detection assignments
- participate as resource advisors (agency representatives) to the incident commander on larger FWS fires
- be sent to fires on the Refuge (with the concurrence of the incident commander) to monitor fire behavior and weather conditions related to ongoing fuel model development work or other research.

2. Wildland Fire Qualifications

ICS qualifications as specified on individual red cards (pending passing annual physical fitness test) are listed below:

Mary Kwart	Situation Unit Leader Division/Group Supervisor Field Observer Incident Commander Type 3 Resource Unit Leader (TRAINEE) Operations Section Chief Type 2 (TRAINEE)
Peter Butteri	Crew Boss (Single Resource) Engine Boss (Single Resource) Helicopter Manager Field Observer Premo Aerial Ignition Device Operator Incident Commander Type 4 (TRAINEE) Helibase Manager Type 2 (TRAINEE) Strike Team Leader- Crews (TRAINEE)
Leonard Sanford	Crew Boss Engine Boss
Carl Lunderstadt	Firefighter Type 2 Firefighter Type 1 (TRAINEE)
Hank Timm	Firefighter Type 2
Keith Larson	Firefighter Type 2
Melinda Rallo	Status/Check-in Recorder (TRAINEE)
Aleta Lavender	Status/Check-in Recorder (TRAINEE)

3. Prescribed Fire Qualifications

Additional prescribed fire qualifications as specified on individual red cards (pending passing annual physical fitness test) are listed below:

Mary Kwart	Burn Boss Type 2 Prescribed Fire Manager Type 2 Burn Boss Type 1 (TRAINEE)
Peter Butteri	Burn Boss Type 3 Burn Boss Type 2 (TRAINEE) Ignition Specialist Prescribed Fire Monitor

B. Equipment

The normal unit strength (NUS) or minimum inventory of the Refuge fire cache is listed on the following page. In addition, the following Refuge equipment may be of use on fires:

- C-185 Float Plane (N70162)
- 16', 4 pax. River Boat w. 30 HP, 4 stroke, prop.
- 18', 5 pax. River Boat w. 90 HP, 4 stroke, jet
- Van, 12-Passenger Ford
- Pick-up Truck, ½ Ton, Chevy

This equipment may be made available for use on wildland fire suppression and prescribed fire assignments, **with approval of the Refuge Manager on a case-by-case basis.**

Priorities for use are:

1. Wildland fire and prescribed fire activities on the Refuge
2. Fire suppression activities in the local area
3. FWS fire management activities outside of the local area
4. Other agency fire management activities outside of the local area

Tetlin NWR Fire Cache Normal Unit Strength

DESCRIPTION	HUS	UNITS	DESCRIPTION	HUS	UNITS
AID IGNITION SPHERES (1 000 per box)	25	bx.	EARPLUGS	100	pr.
KIT, AERIAL IGNITION DEVICE, SN337-205 AF	1	kt.	GLOVES, FOREST WORKER, LARGE	8	pr.
KIT, NET CARGO 15' x 15' w/LL. & S/WIV.	1	kt.	GLOVES, FOREST WORKER, MEDIUM	8	pr.
BAG, SLEEPING - TOTAL	10	ea.	GLOVES, FOREST WORKER, SMALL	8	pr.
CANTEEN, 1 QT., PLASTIC	25	ea.	GOGGLES, SAND/WIND/DUST	10	ea.
FLY, TENT, 16'x24' NYLON FSS	1	ea.	GOGGLES, WIRE MESH, SAFETY	10	ea.
HEADLAMP	10	ea.	HELMET, SAFETY, HARDHAT	10	ea.
KIT, CAMP	1	kt.	JEANS, FIRE, 30" WAIST	4	pr.
MEALS, READY TO EAT (mre's)	3	cs.	JEANS, FIRE, 32" WAIST	4	pr.
PAD, SLEEPING	10	ea.	JEANS, FIRE, 34" WAIST	4	pr.
TENT - TOTAL	8	ea.	JEANS, FIRE, 36" WAIST	4	pr.
FUEL, UNLEADED, 5 GAL. CAN	1	cn.	JEANS, FIRE, 38" WAIST	4	pr.
FUEL, 24:1, 5 GAL. CAN	1	cn.	SHELTER, FIRE W/CASE & LINER	10	ea.
FUEL, 40:1, 5 GAL. CAN	1	cn.	SHIRT, FIRE, LARGE	5	ea.
FUSEES, CS	1	cs.	SHIRT, FIRE, MEDIUM	5	ea.
GAS, WHITE, 1 GAL. CAN	1	cn.	SHIRT, FIRE, SMALL	5	ea.
GLYCOL, 1 GAL.	1	gl.	SHIRT, FIRE, X-LARGE	5	ea.
FUEL, DRIPTORCH, 5 GAL. CAN	1	cn.	HOSE, WATER, SUCTION, 1.5"NH x 10'	2	ea.
ADAPTER, HOSE, 1"NH, FEMALE-FEMALE	2	ea.	PAIL, COLLAPSIBLE	2	ea.
ADAPTER, HOSE, 1"NH, MALE-MALE	2	ea.	PUMP, BACKPACK, OUTFIT, (FEDCO)	5	kt.
ADAPTER, HOSE, 1.5"NH, FEMALE-FEMALE	2	ea.	PUMP, PORTABLE, MK-26, PN710661	1	kt.
ADAPTER, HOSE, 1.5"NH, MALE-MALE	2	ea.	PUMP, PORTABLE, SHINDA WA, PN715336	1	kt.
CLAMP, HOSE	5	ea.	TANK, COLLAPSIBLE, 1200 GAL.	1	ea.
HOSE, WATER, COTTON, 1.5" X 50'	1	ln.	VALVE, FOOT, 1.5" W/STRAINER	2	ea.
HOSE, WATER, HOTLINE, 1" x 100'	15	ln.	WEATHER STATION, MICRO RAWS	1	kt.
HOSE, WATER, HOTLINE, 1.5" x 100'	15	ln.	EXTINGUISHER, FIRE, 8#, ABC	2	ea.
HOSE, WATER, SYNTHETIC 3/4" x 50'	15	ln.	GLOVES, EXAM, VINYL	24	pr.
INCREASER, HOSE, 1"NP-1.5"NH	1	ea.	KIT, BLOODBORNE PATHOGEN	12	kt.
INCREASER, HOSE, 3/4"NH-1"NP	1	ea.	KIT, FIRST-AID, CREW	2	kt.
IN-LINE T, 1"NP x 1"NP x 1"NP	2	ea.	KIT, FIRST-AID, POCKET, INDIVIDUAL	12	kt.
IN-LINE T, 1"NP x 1"NP x 3/4"NH	2	ea.	SHELTER, PRACTICE FIRE W/CASE & LINER	2	ea.
IN-LINE T, VALVED, 1.5"NH x 1.5"NH x 1"NP	2	ea.	SIGN, "SMOKE"	2	ea.
NOZZLE, PLASTIC, 1"	6	ea.	STAND, HIGHWAY SIGN	2	ea.
NOZZLE, PLASTIC, 1.5"	6	ea.	WAND, STOP/SLOW	2	ea.
NOZZLE, PLASTIC, FOAM 1"	4	ea.	CHAINSAW- STIHL 034 w/kit, PN714003	1	kt.
NOZZLE, TWIN TIP COMBO, 1"	2	ea.	BAG, TRASH	50	ea.
REDUCER, HOSE, 1"NP-3/4"NH	10	ea.	CLEANER, HAND, 1 LB.	1	cn.
REDUCER, HOSE, 1.5"NH-1"NP	20	ea.	CORD, EFF, ROLL	1	ro.
SHUT-OFF, BALL, 1"NP	2	ea.	CORD, NYLON, ROLL	1	ro.
SHUT-OFF, BALL, 1.5"NH	2	ea.	FIREFOAM CONCENTRATE, 5 GAL.	3	cn.
SHUT-OFF, BALL, 3/4"NH	4	ea.	FLAGGING, 1 X 100', ORANGE	4	ro.
WRENCH, SPANNER, PEG, 1"-1.5"	1	ea.	FLAGGING, BLACK/YELLOW	4	ro.
WRENCH, SPANNER, ROCKER LUG, 1"-1.5"	4	ea.	FLAGGING, LIME GREEN	4	ro.
WYE, 3/4"NH	4	ea.	FLAGGING, PINK	4	ro.
WYE, GATED, 1.5"NH	8	ea.	FLAGGING, YELLOW	4	ro.
WYE, GATED, 1"NP	4	ea.	BRUSHCUTTER (WOODSMAN'S PAL)	8	ea.
BAG, BURLAP 40"X26.5"	12	ea.	FILE, 10" MILL w. HANDLE	8	ea.
PACK, FIELD, FIREFIGHTER'S - TOTAL	10	ea.	PULASKI, WITH SHEATH	8	ea.
PACK, PERSONAL GEAR - TOTAL	10	ea.	SCALE, HANGING	1	ea.
PACKBOARD, PLYWOOD	2	ea.	SHOVEL W/SHEATH	8	ea.
PACKSACK, NYLON	2	ea.	TORCH, DRIP 1.25 GAL. CAPACITY	8	ea.
CHAPS, PROTECTIVE, REGULAR	2	pr.	SPRINKLERS, CABIN	4	ea.
BATTERIES, AA, CS. OF 144	1	cs.	WRAP, FIRE RESISTANT CABIN	2	ro.

V. Communication

A. Radios

The Refuge maintains one mountaintop VHF radio repeater located south of the Cheslina River and a UHF-VHF base station link located on Bitters Mt. A UHF base radio station is located at the Refuge headquarters in Tok. This system provides VHF coverage for most of the Refuge, and allows field communication with headquarters via the link.

The Refuge repeater frequency is monitored at Refuge Headquarters during normal working hours (8:00 A.M. to 5:00 P.M. Monday through Friday). After hours, the frequency may be monitored at three Refuge residences in Tok via hand held UHF radios and the Bitters link.

A radio/ telephone interface is installed at the base unit and may be accessed by radios equipped with a keypad. Currently, all Refuge hand held units, and all but three mobile units have radio/ telephone interface capability. In addition, current weather data from the Refuge's weather stations may be accessed via keypad-equipped radios.

The Refuge has authorized TAF to access the Refuge radio system for emergency fire suppression purposes. A phone line between Refuge headquarters and the TAF dispatch radio console allows TAF to monitor the Tetlin frequency and access it if necessary.

This use is subject to the following restrictions:

1. The authorization includes the following frequencies:
 - 172.450 (VHF)
 - 169.725 (VHF)
 - 411.625 (UHF)
 - 417.575 (UHF)
2. Use will be for temporary initial attack fire suppression activities only.
3. The Refuge will be notified of any use.
4. The radio/ telephone interface will only be used for emergency situations and NOT for routine calls or personal use.

Tetlin NWR VHF Radio Frequencies

2001

Channel	Purpose	Display	RX	TX	Tone	Repeater Name	Repeater Location
1	TNWR LOCAL	1 LOCAL	172.450	172.450	None	None	None
2	TNWR REPEATER	2 CHESL	172.450	169.725	107.2	Cheslina	62° 39.88' N x 142° 20.52' W
3	TNWR BASE LINK	3 BITT	169.725	172.450	107.2	Bitters Base Link	63° 14' 27" N x 142° 10' 23" W
4	TAF Fire Ops South (ch. 4)	TAF4MENT	159.255	154.755	141.3	Mentasta	
5	TAF Fire Ops East (ch. 5)	TAF5NWAY	151.325	159.330	141.3	TAF Northway	
6	USFS Air Guard	6 GUARD	168.625	168.625	None	None	None
7	TAF Fire Ops Tok (ch. 7)	TAF7NEU	151.280	159.345	141.3	TAF Neuberger Mtn.	63° 18' 26" N x 143° 30' 18" W
8	TAF Fire Ops West (ch.3)	TAF3DOT	151.295	159.300	141.3	TAF Dot Lake	
9	Tok Volunteer Fire Dept.	9TOKVFD	154.130	154.130	None	None	None
10	Alaska State Troopers	10 AST	155.250	155.250	None	None	None
11	NPS Wrangell- South of Slana	NPS COBB	166.300	168.225	100.0	NPS Cobb	62° 43' 39" N x 144° 11' 14" W
12	FWS Anchorage Rptr.	FWS ANCH	164.575	170.050	None	FWS Anchorage	
13	FWS Tactical	FWSTAC	170.100	170.100	None	None	None
14	TAF Fire Ops North (ch. 1)	TAF1FLY	151.265	159.270	141.3	TAF Fairplay	

Tetlin NWR UHF Frequencies

2001

RADIO	RX	TX	PURPOSE
TETLIN UHF BASE	417.575	411.625	Talks to Bitters
BITTERS REMOTE BASE LINK (UHF PORTION)	411.625	417.575	Talks to Base
RESIDENCE UHF HANDHELDS (CHANNEL 2) **	417.575	411.625	Talks to Bitters
RESIDENCE UHF HANDHELDS (CHANNEL 3)	411.625	417.575	Talks to Base

** Use Channel 2 on residence radios

Tetlin NWR Call Signs

TNWR HEADQUARTERS	TETLIN BASE
REFUGE C-185	N70162
REFUGE MANAGER	Tango ONE
DEPUTY REFUGE MGR.	Tango TWO
ASST. REFUGE MGR.	Tango THREE
SUPERVISORY BIOLOGIST	Tango FOUR
FIRE MGT. OFFICER	Tango FIVE
SUPERV. PARK RANGER	Tango SIX
CARPENTER	Tango SEVEN
PILOT	Tango EIGHT
WILDLIFE BIOLOGIST	Tango NINE
TRAINING INSTRUCTOR	Tango TEN
BIOLOGICAL TECH. (PERM.)	Tango ELEVEN
ADMINISTRATIVE TECH.	Tango TWELVE
FORESTRY TECH. (PERM.)	Tango THIRTEEN
R.I.T.	Tango FOURTEEN
INTERPRETIVE RANGER	Tango FIFTEEN
FORESTRY TECH. (SEAS.)	Tango SIXTEEN
YCC CREW LEADER	Tango SEVENTEEN
BIRD CREW	Bird Crew
SCAs	SCAs
VISITOR CENTER	Visitor Center
REFUGE FIRE ENGINE	ENGINE 601X
TOK FORESTRY OFFICE	Tok Forestry

Appropriate contacts for Tetlin NWR fire management decisions are listed below in priority order:

Tetlin National Wildlife Refuge

CONTACT	POSITION	OFFICE	MOBILE	AFTER HRS.
Mary Kwart	Fire Management Officer	883-5312		883-5026
Edward S. Merritt	Refuge Manager	883-5312		883-3889
(Vacant)	Deputy Refuge Manager	883-5312		
Peter Butteri	Forestry Technician	883-5312		883-2275
Carl Lunderstadt	Assistant Refuge Manager	883-5312		883-3461

USFWS Region 7- Anchorage, AK

CONTACT	POSITION	OFFICE	MOBILE	AFTER HRS.
Larry Vanderlinden	R-7 Fire Management Coordinator	(907) 786-3654	(907) 223-2529	(907) 346-2628
Jerry Stroebele	R-7 Refuge Supervisor, North	(907) 786-3555		(907) 349-6010
Todd Logan	R-7 Regional Chief (NWRS)	(907) 786-3667		
George Constantino	R-7 Chief, Division of Refuges	(907) 786-3357		(907) 338-2338

Other numbers where refuge staff may be contacted:

Visitor Center-Mile Post 1229 AK Hwy.				(907) 774-2245
Refuge Hangar				883-4042
Northway Seasonal Bunkhouse				(907) 778-2305
Tok Seasonal Bunkhouse				883-4619
Radio Telephone (telephone access to Refuge radio)				883-4010
Refuge FAX				883-5747
Refuge Employee E-mail				firstname_lastname @fws.gov

Bureau of Land Management, Alaska Fire Service, Ft. Wainwright, AK

POSITION	CONTACT	OFFICE	MOBILE	AFTER HRS.
Dispatch	Report Fires!	(907) 356-5670		
Fire Information		(907) 356-5226		
Receptionist		(907) 356-5600		

State of Alaska, Department of Natural Resources, Division of Forestry, Tok Area

POSITION	CONTACT	OFFICE	MOBILE	AFTER HRS.
Duty Officer	Report Fires!	883-5657		883-5657
Area Forester	Ray Kraemer (Acting)	883-5134		
Assistant Dispatcher	Barb Kraemer	883-5681		
Suppression Foreman	Ray Kraemer	883-5134		
FAX		883-5135		

OTHER COOPERATORS			
AGENCY	LOCATION	CONTACT	PHONE
40-Mile Air	Tok	Leif Wilson	883-5191
AK Dept.of Environmental	Fairbanks	Ann Lawton	(907) 451-2139
AK Dept.of Fish and Game	Tok	Craig Gardner	883-2971
AK Dept.of Transportation	Northway	Gary Thomas	(907) 778-2206
AK Dept.of Transportation	Tok		883-5129
AK State Troopers	Northway		(907) 778-2245
AK State Troopers	Tok		883-5111
BLM, Fortymile District	Tok		883-5121
Canadian Customs	Beaver Creek		(867) 862-7230
Doyon	Fairbanks		(907) 452-4755
Emergency Hotline	Tok, Northway		911
Federal Aviation Administration	Northway Airport		(907) 778-2240
National Weather Service	Fairbanks		(907) 458-3705
NIFC- FWS Fire	Boise, ID	Andrea Olson	(208) 387-5597
NIFC- RAWS	Boise, ID	Buddy Adams	(208) 387-5475
Northway Natives Inc.	Northway		(907) 778-2297
Northway Village Council	Northway	Gerald Albert	(907) 778-2311
Office of Aircraft Services	Anchorage	Jeff Powers	(907) 271-5258
Royal Canadian Mounted Police	Beaver Creek		(867) 862-5555
Tanacross Village Council	Tanacross	Jerry Issaac	883-5024
Tetlin Village Council	Tetlin	Danny Adams	(907) 324-2130
Tok Clinic	Tok		883-5855
Tok EMS	Tok		883-5873
Tok Native Association	Tok	Elizabeth Webb	883-3718
Tok Volunteer Fire Department	Tok	Tony Conrad	883-2333
U.S. Customs and Immigration	Port Alcan	Doug Harmon	(907) 774-2252
Wrangell/ St. Elias National Park	Slana		(907) 822-5236
Yukon Fire Management	Whitehorse		(867) 667-3397
Yukon Fire Management	Whitehorse	REPORT FIRES!	(888) 798-3473

C. Electronic Data

The Refuge computer network provides tools and data essential to fire management. Available hardware includes:

- 600 MHz Micron Desktop- Win 98
- 800 MHz Gateway Desktop- Win 98
- Micron Desktop- Win NT
- HP Laserjet 5 Printer
- HP DesignJet 755CM Plotter
- HP Deskjet 2500 Color Printer
- Flatbed Scanner
- Hi Resolution Slide/Negative Scanner
- Olympus 2 mega-pixel Digital Camera

Software includes:

- Microsoft Office 2000
- ESRI ArcView 3.2
- FireFamily+
- ReRap
- Behave
- FBP 93
- FarSite

The Refuge maintains a GIS database with a wide variety of coverages. Many of these may be useful for planning fire related operations. A complete index of coverages is available on the office network at:

\\Tetlinnt2\Biology Data\Geodata\TNWR Geodata Catalog.wpd

Other fire related information is available over the Refuge 56K dedicated modem line from the following sites:

SITE	URL	AVAILABLE INFORMATION
Alaska Fire Service	http://fire.ak.blm.gov/	Daily situation reports, RAWs data, weather forecasts, lightning and fire occurrence maps, drought indices, and more
Fire Effects Information System	http://www.fs.fed.us/database/feis/	Species data
FWS Fire	http://fire.r9.fws.gov/	Daily situation reports, weather links
FWS Region 7 Home	http://r7internet.fws.gov/	Contacts, Policy
National Weather Service	http://www.alaska.net/~nwsar/	Forecasts, Satellite images, maps
Western Region Climate Center	http://www.wrec.sage.dri.edu/index.html	Archived RAWs data

Exhibit B. 2001 Tetlin NWR Preparedness Plan

**TETLIN NATIONAL WILDLIFE REFUGE
PREPAREDNESS PLAN
2001 FIRE SEASON**

Prepared By: _____ Date: _____
Fire Management Officer

Approved By: _____ Date: _____
Refuge Manager

TETLIN NATIONAL WILDLIFE REFUGE 2001 PREPAREDNESS PLAN

INTRODUCTION

The preparedness levels (required by 910 DM 1.6) and management actions listed below are intended to be a guide. These preparedness levels are localized for the Tetlin National Wildlife Refuge (Tetlin NWR), although they are based on regional and national preparedness level categories. Management actions specified are a minimum response. Unanticipated circumstances may dictate more definitive action than what is listed. **The activation of a particular preparedness level is based upon a subjective evaluation of the criteria listed for each level, not necessarily based on meeting one single criterion or on meeting all criteria listed for each level.**

The Canadian Buildup Index (BUI) referenced in each preparedness level is an indicator of drought conditions based on a Drought Code and Drought Moisture Code. It represents total fuel available for combustion. The Fire Weather Index (FWI) combines the BUI value with a Fine Fuels Moisture Code (FFMC) and wind effect. The FWI represents the intensity of a spreading fire, and is useful as an indicator of fire danger. Each of these codes are generated daily throughout the fire season at selected weather stations. Daily values are recorded in the Alaska Interagency Coordination Center (AICC) situation report. There are three reporting weather stations within the administrative boundaries of the Refuge:

1. **PAOR** is a manned station at Northway Airport
2. **TWR** is a Remote Automatic Weather Station (RAWS) at mile 1244 Alaska Highway
3. **TET** is a RAWS near Jatahmund Lake

The average of the BUI and FWI (predicted or actual) for the three stations on a particular day is the value referred to at various preparedness levels.

A **Fire Activity Assessment** (Exhibit A) will be filled out:

1. at the beginning of the fire season.
2. whenever the Refuge Preparedness Level changes to Level 4 or to Level 5.
3. immediately prior to ignition of a prescribed burn.

The Department of the Interior Departmental Manual, Part 910, Chapter 3 authorizes Bureau of Land Management- Alaska Fire Service (AFS) to provide suppression services on Fish and Wildlife Service (FWS) lands. Through a reimbursable Cooperative Agreement between AFS and the State of Alaska Division of Forestry (DOF), Tok Area DOF provides these suppression services on Tetlin Refuge lands. Suppression guidelines for Tetlin NWR have been established and are outlined in the **Alaska Interagency Wildland Fire Management Plan (AIWFMP)**.

The Tetlin NWR Refuge Manager retains ultimate responsibility for all wildfire management and prescribed fire management activities that occur on the Refuge.

REFUGE PREPAREDNESS LEVEL 1.

One or more of the following criteria may indicate a preparedness level of 1:

- Low to moderate fire danger (FWI 0- 3.)
- No significant fire activity locally, regionally or nationally.
- Local, regional and national resources available.
- No fires burning on the Refuge.
- Average BUI less than 70.

Level 1 Refuge Management Actions:

- No restrictions on prescribed burning.
- Adequate contingency suppression resources are certified available by the Tetlin refuge manager, if prescribed burning is taking place.
- Normal non-fire staff assignments on Refuge are unrestricted.
- The Refuge fire staff may be available for call out if no prescribed burns are in progress on the Refuge.
- AICC Situation Report and weather forecasts not monitored.
- Refuge weather stations monitored periodically to determine BUI and FWI.
- Any new wildfire starts on Refuge will receive appropriate response as delineated in the AIWFMP.

REFUGE PREPAREDNESS LEVEL 2.

One or more of the following criteria may indicate a preparedness level of 2:

- Moderate Fire Danger (FWI 4- 13)
- Minor local or regional fire activity.
- Local, regional and national resources still available, although some local and regional resources are committed to fire assignments.
- Numerous small fires may be occurring within the region.
- Small fires may be occurring on the Refuge.
- Average BUI less than 90.

Level 2 Refuge Management Actions:

- No restrictions on prescribed burning.
- Adequate contingency suppression resources are certified available by the Tetlin refuge manager, if prescribed burning is taking place.
- No restrictions on non-fire staff assignments.
- Qualified Refuge staff members may be assigned monitoring duties if fires occur on the Refuge.
- Fire staff may be available for call out if no prescribed burns are in progress.
- AICC Situation Report and weather forecasts monitored daily by Fire Management Officer (FMO) or designate.
- Refuge weather stations monitored daily by FMO or designate if a prescribed burn is in progress.
- Limited response wildfires occurring on the Refuge will be monitored at least once a week.
- Any new wildfire starts on Refuge will receive appropriate response as delineated in the AIWFMP.

REFUGE PREPAREDNESS LEVEL 3.

One or more of the following criteria may indicate a preparedness level of 3:

- High fire danger (FWI 14-23.).
- Moderate local and regional fire activity.
- Many local and regional resources committed to fire assignments
- National resources still available.
- One Type II fire and numerous small fires may be occurring in region.
- Small fires may be occurring on the Refuge.
- Average BUI between 90 and 100.

Level 3 Refuge Management Actions:

- Prior to July 10, new ignitions of prescribed burns may not be allowed unless the prescription for the specific burn requires dry conditions associated with a BUI value between 90 and 100.
- After July 10, ignitions of prescribed burns allowed as long as Refuge Manager certifies adequate regional contingency suppression resources are available.
- Refuge fire staff may be available for call out in the region if no prescribed burns are in progress.
- Qualified Refuge staff members may be assigned monitoring duties if fires occur on the Refuge.
- AICC Situation Report and weather forecasts monitored daily by FMO or designate.
- Refuge weather stations monitored daily by FMO or designate.
- Limited response wildfires occurring on the Refuge may be monitored every three days if weather and flying conditions and fire behavior warrant.
- Any new wildfire starts on Refuge will receive appropriate response as delineated in the AIWFMP.

REFUGE PREPAREDNESS LEVEL 4.

One or more of the following criteria may indicate a preparedness level of 4:

- Very high fire danger (FWI 24- 28.)
- Significant local and regional fire activity.
- Most local and regional resources committed to fire assignments
- National resources in short supply.
- Multiple Type II fires and numerous small fires may be occurring in region.
- Small fires and/or one Type II fire may be occurring on the Refuge.
- Average BUI between 100 and 110.

Level 4 Refuge Management Actions:

- A Refuge Fire Activity Assessment (Exhibit A) will be completed daily by the FMO or designate and provided to the Refuge Manager and Regional Fire Management Coordinator.
- No new ignitions of prescribed burns allowed.
- Ongoing prescribed burn activity will be phased down and curtailed when it is determined or anticipated that insufficient regional contingency suppression resources are available for support. This will be documented on the Fire Activity Assessment (Exhibit A) and signed by the Refuge Manager.
- Refuge fire staff may be available for call out in the region if no prescribed burns are in progress.
- Qualified Refuge staff members may be assigned monitoring duties if fires occur on the Refuge.
- Refuge activities may be reduced due to high fire danger or adverse smoke conditions.
- AICC Situation Report and weather forecast monitored daily by FMO or designate.
- Refuge weather stations monitored daily by FMO or designate.
- Limited response wildfires burning on the Refuge will be monitored daily by aerial flyovers if weather, flying conditions, fire behavior and availability of aircraft warrant.
- Any new wildfire starts on Refuge will receive appropriate response as delineated in the AIWFMP.
- The regional fire activity situation may result in a decision by the Alaska Multi-Agency Coordination (MAC) Group to require suppression of new starts and restrict prescribed burn activities.

REFUGE PREPAREDNESS LEVEL 5.

One or more of the following criteria may indicate a preparedness level of 5:

- Extreme fire danger (FWI >28.)
- Critical local and regional fire activity.
- Shortage of local, regional, and national resources.
- Type II or larger fires and numerous small fires may be occurring locally and regionally.
- One or more Type II or larger fire may be occurring on the Refuge.
- Average BUI greater than 110.

Level 5 Refuge Management Actions:

- No prescribed burning allowed.
- The Fire Activity Assessment Form (Exhibit A) will be completed daily by FMO or designate and submitted to the Refuge Manager and Regional Fire Management Coordinator.
- All Refuge staff will be available for call out locally as fire qualifications allow.
- Non-fire Refuge activities may be limited due to smoke conditions and fire traffic.
- If a Type II or larger fire is occurring on the Refuge, the FMO will not be available for other assignments, and will function as the Refuge Manager's liaison with the suppression organization.
- FWS fire information officer may be requested.
- Qualified Refuge staff members may be assigned monitoring and resource advisor duties for large fires occurring on the Refuge, which may be collateral with other fire duties.
- Additional personnel may be called in if Refuge fire staff cannot adequately monitor existing fires on Refuge.
- AICC Situation Report and weather forecast monitored daily by FMO or designate.
- Refuge weather stations monitored daily by FMO or designate.
- Limited response wildfires occurring on the Refuge will be monitored daily if weather and flying conditions, fire behavior and availability of aircraft warrant.
- New wildfire starts in limited response zones may be aggressively suppressed if fires can be detected early enough, resources are available, and the local suppression agency concurs.
- Highest priority will be given to protection of the communities of Northway, Northway Junction, Port Alcan, Tetlin native lands, private inholdings, and administrative or permitted cabins.
- Next priority will be given to protection of natural resource values.

WILDLAND FIRE SITUATION ANALYSIS

Incident Name: _____

Jurisdiction: _____

Date and Time Completed: _____

This page is completed by the Agency Administrator(s).

Section I, WFSA Information Page

- A. Jurisdiction(s): Assign the agency or agencies that have or could have fire protection responsibility, e.g., USFWS, BLM, etc.
- B. Geographic Area: Assign the recognized "Geographic Coordination Area" the fire is located in, e.g., Northwest, Northern Rockies, etc.
- C. Unit(s): Designate the local administrative unit(s), e.g., Hart Mountain Refuge Area, Flathead Indian Reservation, etc.
- D. WFSA #: Identify the number assigned to the most recent WFSA for this fire.
- E. Fire Name: Self-explanatory.
- F. Incident #: Identify the incident number assigned to the fire.
- G. Accounting Code: Insert the local unit's accounting code.
- H. Date/Time Prepared: Self-explanatory.
- I. Attachments: Check here to designate items used to complete the WFSA. "Other" could include data or models used in the development of the WFSA. Briefly describe the "other" items used.

I. Wildland Fire Situation Analysis	
<i>To be completed by the Agency Administrator(s)</i>	
A. Jurisdiction(s)	B. Geographic Area
C. Unit(s)	D. WFSA #
E. Fire Name	F. Incident #
G. Accounting Code:	
H. Date/Time Prepared _____@_____	
I. Attachments	
- Complexity Matrix/Analysis *	_____
- Risk Assessment/Analysis *	_____
Probability of Success *	_____
Consequences of Failure *	_____
- Maps *	_____
- Decision Tree **	_____
- Fire Behavior Projections *	_____
- Calculations of Resource Requirements *	_____
- Other (specify)	_____
* Required	
** Required by FWS	

This page is completed by the Agency Administrator(s).

Section II. Objectives and Constraints

- A. Objectives: Specify objectives that must be considered in the development of alternatives. Safety objectives for firefighter, aviation, and public must receive the highest priority. Suppression objectives must relate to resource management objectives in the unit resource management plan.

Economic objectives could include closure of all or portions of an area, thus impacting the public, or impacts to transportation, communication, and resource values.

Environmental objectives could include management objectives for airshed, water quality, wildlife, etc.

Social objectives could include any local attitudes toward fire or smoke that might affect decisions on the fire.

Other objectives might include legal or administrative constraints which would have to be considered in the analysis of the fire situation, such as the need to keep the fire off other agency lands, etc.

- B. Constraints: List constraints on wildland fire action. These could include constraints to designated wilderness, wilderness study areas, environmentally or culturally sensitive areas, irreparable damage to resources or smoke management/air quality concerns. Economic constraints, such as public and agency cost, could be considered here.

II.

Objectives and Constraints

To be Completed by the Agency Administrator(s)

A. Objectives (Must be specific and measurable)

1. *Safety*

- Public

- Firefighter

2. *Economic*

3. *Environmental*

4. *Social*

5. *Other*

B. Constraints

This page is completed by the Fire Manager and/or Incident Commander.

Section III. Alternatives

- A. Wildland Fire Management Strategy: Briefly describe the general wildland fire strategies for each alternative. Alternatives must meet resource management plan objectives.
- B. Narrative: Briefly describe each alternative with geographic names, locations, etc., that would be used when implementing a wildland fire strategy. For example: "Contain within the Starvation Meadows' watershed by the first burning period."
- C. Resources Needed: Resources described must be reasonable to accomplish the tasks described in Section III.B. It is critical to also look at the reality of the availability of these needed resources.
- D. Final Fire Size: Estimated final fire size for each alternative at time of containment.
- E. Estimated Contain/Control Date: Estimates of each alternative shall be made based on predicted weather, fire behavior, resource availability, and the effects of suppression efforts.
- F. Cost: Estimate all incident costs for each alternative. Consider mop-up, rehabilitation, and other costs as necessary.
- G. Risk Assessment - Probability of Success/Consequences of Failure: Describe probability as a percentage and list associated consequences for success and failure. Develop this information from models, practical experience, or other acceptable means. Consequences described will include fire size, days to contain, days to control, costs, and other information such as park closures and effect on critical habitat. Include fire behavior and long-term fire weather forecasts to derive this information.
- H. Complexity: Assign the complexity rating calculated in "Fire Complexity Analysis" for each alternative, e.g., Type II, Type I.
- I. A map for each alternative should be prepared. The map will be based on the "Probability of Success/Consequences of Failure" and include other relative information.

III. Alternatives			
<i>(To be completed by FMO / IC)</i>			
	A	B	C
A. Wildland Fire Strategy			
B. Narrative			
C. Resources needed			
Handcrews	_____	_____	_____
Engines	_____	_____	_____
Dozers	_____	_____	_____
Airtankers	_____	_____	_____
Helicopters	_____	_____	_____
D. Final Size			
E. Est. Contain/ Control Date			
F. Costs			
G. Risk Assessment			
- Probability of success	_____	_____	_____
- Consequence of failure	_____	_____	_____
H. Complexity			
I.	Attach maps for each alternative		

This page is completed by the Agency Administrator(s), FMO and/or Incident Commander.

Section IV. Evaluation of Alternatives

- A. Evaluation Process: Conduct an analysis for each element of each objective and each alternative. Objectives shall match those identified in Section II.A. Use the best estimates available and quantify whenever possible. Provide ratings for each alternative and corresponding objective element. Fire effects may be negative, cause no change, or may be positive. Examples are: 1) a system which employs a "-" for negative effect, a "0" for no change, and a "+" for positive effect; 2) a system which uses a numeric factor for importance of the consideration (soils, watershed, political, etc.) and assigns values (such as -1 to +1, - 100 to +100, etc.) to each consideration, then arrives at a weighted average. If you have the ability to estimate dollar amounts for natural resource and cultural values, this data is preferred. Use those methods which are most useful to managers and most appropriate for the situation and agency. To be able to evaluate positive fire effects, the area must be included in the resource management plan and consistent with prescriptions and objectives of the fire management plan.

Sum of Economic Values: Calculate for each element the net effect of the rating system used for each alternative. This could include the balance of: pluses (+) and minuses (-), numerical rating (-3 and +3), or natural and cultural resource values in dollar amounts. (Again, resource benefits may be used as part of the analysis process when the wildland fire is within a prescription consistent with approved Fire Management Plans and in support of the unit's Resource Management Plan.)

IV. Evaluation of Alternatives			
<i>To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander</i>			
A. Evaluation Process	A	B	C
<i>Safety</i> Firefighter Aviation Public			
<i>Sum of Safety Values</i>			
<i>Economic</i> Forage Improvements Recreation Timber Water Wilderness Wildlife Other (specify)			
<i>Sum of Economic Values</i>			
<i>Environmental</i> Air Visual Fuels T & E Species Other (specify)			
<i>Sum of Environmental Values</i>			
<i>Social</i> Employment Public Concern Cultural Other (Specify)			
<i>Sum of Social Values</i>			
<i>Other</i>			

This page is completed by the Agency Administrator(s) and Fire Manager and/or Incident Commander.

Section V. Analysis Summary

- A. Compliance with Objectives: Prepare narratives that summarize each alternative's effectiveness in meeting each objective. Alternatives that do not comply with objectives are not acceptable. Narrative could be based on effectiveness and efficiency. For example: "most effective and least efficient," "least effective and most efficient," or "effective and efficient." Or answers could be based on a two-tiered rating system such as "complies with objective" and "fully complies with or exceeds objective." Use a system that best fits the manager's needs.
- B. Pertinent Data: Data for this Section has already been presented, and is duplicated here to help the Agency Administrator(s) confirm their selection of an alternative. Final Fire Size is displayed in Section III.D. Complexity is calculated in the attachments and displayed in Section III.H. Costs are displayed on page 4. Probability of Success/Consequences of Failure is calculated in the attachments and displayed in Section III.G.
- C. External and Internal Influences: Assign information and data occurring at the time the WFSA is signed. Identify the Preparedness Index (1 through 5) for the National and Geographic levels. If available, indicate the Incident Priority assigned by the MAC Group. Designate the Resource Availability status. This information is available at the Geographic Coordination Center, and is needed to select a viable alternative. Designate "yes," indicating an up-to-date weather forecast has been provided to, and used by, the Agency Administrator(s) to evaluate each alternative. Assign information to the "Other" category as needed by the Agency Administrator(s).

Section IV. Decision

Identify the alternative selected. Must have clear and concise rationale for the decision, and a signature with date and time. Agency Administrator(s) is mandatory.

V. Analysis Summary			
<i>To be Completed by the Agency Administrator(s) and Fire Manager / Incident Commander</i>			
Alternatives	A	B	C
A. Compliance with Objectives Safety Economic Environmental Social Other			
B. Pertinent Data Final Fire Size Complexity Suppression Cost Resource Values Probability of Success Consequences of Failure			
C. External / Internal Influences			
National & Geographic Preparedness Level			
Incident Priority			
Resource Availability			
Weather Forecast (long-range)			
Fire Behavior Projections			
VI. Decision			
The Selected Alternative is: _____			
Rationale:			
_____ Agency Administrator's Signature		_____ Date/Time	

This Section is completed by the Agency Administrator(s) or designate.

Section VII. Daily Review

The date, time, and signature of reviewing officials are reported in each column for each day of the incident. The status of Preparedness Level, Incident Priority, Resource Availability, Weather Forecast, and WFSA validity is completed for each day reviewed. Ratings for the Preparedness Level, Incident Priority, Resource Availability, Fire Behavior, and Weather Forecast are addressed in Section V.C. Assign a "yes" under "WFSA Valid" to continue use of this WFSA. A "no" indicates this WFSA is no longer valid and another WFSA must be prepared or the original revised.

This Section is completed by the Agency Administrator(s).

Section VIII. Final Review

A signature, date, and time are provided once all conditions of the WFSA are met.

VIII.

Daily Review

To be completed by the Agency Administrator(s) or Designate

Selected to be reviewed daily to determine if still valid until containment or control

			P R E P A R E D N E S S L E V E L	I N C I D E N T P R I O R I T Y	R E S O U R C E A V A I L A B I L I T Y	W E A T H E R F O R E C A S T	F I R E B E H A V I O R P R O J E C T I O N S	W F S A V A L I D

If WFSAs are no longer valid, a new WFSAs will be completed!

VIII. Objectives

Final Review

The elements of the selected alternative were met on: _____
Date Time

By: _____
(Agency Administrator(s))

A GUIDE FOR ASSESSING FIRE COMPLEXITY

The following questions are presented as a guide to assist the Agency Administrator(s) and staff in analyzing the complexity or predicted complexity of a wildland fire situation. Because of the time required to assemble or move an Incident Management Team to wildland fire, this checklist should be completed when a wildland fire escapes initial attack and be kept as a part of the fire records. This document is prepared concurrently with the preparation of (and attached to) a new or revised Wildland Fire Situation Analysis. It must be emphasized this analysis should, where possible, be based on predictions to allow adequate time for assembling and transporting the ordered resources.

Use of the Guide:

1. Analyze each element and check the response "yes" or "no."
2. If positive responses exceed, or are equal to, negative responses within any primary factor (A through G), the primary factor should be considered as a positive response.
3. If any three of the primary factors (A through G) are positive responses, this indicates the fire situation is, or is predicted to be, Type I.
4. Factor H should be considered after all the above steps. If more than two of these items are answered "yes," and three or more of the other primary factors are positive responses, a Type I team should be considered. If the composites of H are negative, and there are fewer than three positive responses in the primary factors (A-G), a Type II team should be considered. If the answers to all questions in H are negative, it may be advisable to allow the existing overhead to continue action on the fire.

GLOSSARY OF TERMS

Potential for blow-up conditions - Any combination of fuels, weather, and topography excessively endangering personnel.

Rate or endangered species - Threat to habitat of such species or, in the case of flora, threat to the species itself.

Smoke management - Any situation which creates a significant public response, such as smoke in a metropolitan area or visual pollution in high-use scenic areas.

Extended exposure to unusually hazardous line conditions - Extended burnout or backfire situations, rock slide, cliffs, extremely steep terrain, abnormal fuel situation such as frost killed foliage, etc.

Disputed fire management responsibility - Any wildland fire where responsibility for management is not agreed upon due to lack of agreements or different interpretations, etc.

Disputed fire policy - Differing fire policies between suppression agencies when the fire involves multiple ownership is an example.

Pre-existing controversies - These may or may not be fire management related. Any controversy drawing public attention to an area may present unusual problems to the fire overhead and local management.

Have overhead overextended themselves mentally or physically - This is a critical item that requires judgment by the responsible agency. It is difficult to write guidelines for this judgment because of the wide differences between individuals. If, however, the Agency Administrator feels the existing overhead cannot continue to function efficiently and take safe and aggressive action due to mental or physical reasons, assistance is mandatory.

FIRE COMPLEXITY ANALYSIS

	Yes	No
A. FIRE BEHAVIOR: Observed or Predicted		
1. Burning Index (from on-site measurement of weather conditions). Predicted to be above the 90% level using the major fuel model in which the fire is burning.	---	---
2. Potential exists for "blowup" conditions (fuel moisture, winds, etc.)	---	---
3. Crowning, profuse or long-range spotting.	---	---
4. Weather forecast indicating no significant relief or worsening conditions.	---	---
Total	---	---
B. RESOURCES COMMITTED		
1. 200 or more personnel assigned.	---	---
2. Three or more divisions.	---	---
3. Wide variety of special support personnel.	---	---
4. Substantial air operation which is not properly staffed.	---	---
5. Majority of initial attack resources committed.	---	---
Total	---	---
C. RESOURCES THREATENED		
1. Urban interface.	---	---
2. Developments and facilities.	---	---
3. Restricted, threatened or endangered species habitat.	---	---
4. Cultural sites.	---	---
5. Unique natural resources, special designation zones or wilderness.	---	---
6. Other special resources.	---	---
Total	---	---
D. SAFETY		
1. Unusually hazardous fire line conditions.	---	---
2. Serious accidents or facilities.	---	---
3. Threat to safety of visitors from fire and related operations.	---	---
4. Restricted and/or closures in effect or being considered.	---	---
5. No night operations in place for safety reasons.	---	---
Total	---	---
E. OWNERSHIP		
1. Fire burning or threatening more than one jurisdiction.	---	---
2. Potential for claims (damages).	---	---
3. Conflicting management objectives.	---	---
4. Disputes over fire management responsibility.	---	---
5. Potential for unified command.	---	---
Total	---	---

F. EXTERNAL INFLUENCES

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

G. CHANGE IN STRATEGY

1. Change in strategy to control from confine or contain.	___	___
2. Large amount of unburned fuel within planned perimeter.	___	___
3. WFSA invalid or requires updating.	___	___
Total	___	___

H. EXISTING OVERHEAD

1. Worked two operational periods without achieving initial objectives.	___	___
2. Existing management organization ineffective.	___	___
3. IMT overextended themselves mentally and/or physically.	___	___
4. Incident action plans, briefings, etc., missing or poorly prepared.	___	___
Total	___	___

Signature _____

Date _____ Time _____

Exhibit D. Tetlin NWR Prescribed Burn Plan Template

**U.S. Fish and Wildlife Service
Tetlin National Wildlife Refuge**

Prescribed Burn Plan

2001

Prepared By: _____ Date: _____
Fire Management Officer

Reviewed By: _____ Date: _____
Prescribed Burn Boss

The approved Prescribed Fire Plan constitutes the authority to burn. No one has the authority to burn without an approved plan or in a manner not in compliance with the approved plan. Actions taken in compliance with the approved Prescribed Fire Plan will be fully supported.

Approved By: _____ Date: _____
Refuge Manager

Reviewed By: _____ Date: _____
Regional Fire Management Coordinator

Reviewed By: _____ Date: _____
Refuge Supervisor, Northern Alaska

Approved By: _____ Date: _____
Regional Chief, National Wildlife Refuge System

TETLIN NATIONAL WILDLIFE REFUGE

Prescribed Burn

I. BURN UNIT DESCRIPTION.

- A. Legal Description:
- B. Size:
- C. Elevation:
- D. Aspect:
- E. Slope:
- F. Primary Fuels:
- G. Fuel Models:
- H. Boundary Description:
- I. Adjacent Landowners:
- J. Access:
- K. Suppression Response

II. GOALS AND OBJECTIVES OF BURN.

A. Compliance with US Fish and Wildlife Service (USFWS) Policy

Tetlin National Wildlife Refuge was set aside in 1980 as a result of the Alaska National Interest Lands Conservation Act (ANILCA). The specific purposes for which Tetlin National Wildlife Refuge has been established and managed as specified in Section 302(8)(B) of ANILCA are:

- (i) to conserve fish and wildlife populations and habitat in their natural diversity including but not limited to waterfowl, raptors and other migratory birds, furbearers, moose, caribou, salmon and Dolly Varden trout;
- (ii) to fulfill international treaty obligations with respect to fish and wildlife and their habitats.
- (iii) to provide the opportunity for continued subsistence uses by local residents consistent with the purposes set forth above;
- (iv) to ensure water quality and necessary quantity within the refuge to the maximum extent practicable;
- (v) to provide opportunities for interpretation and environmental education.

In October 1987, the Comprehensive Conservation Plan, Environmental Impact Statement and Wilderness review were completed and approved for Tetlin National Wildlife Refuge. A common management direction for all alternatives developed and considered is to ensure that fish and wildlife populations and ecological relationships necessary to conserve natural diversity are maintained. The preferred alternative that was selected, within which the Refuge has operated since that time, provides in part for the following resource management directions:

1. Emphasize restoration of the refuge's natural diversity and key fish and wildlife populations and habitats to historic levels.
2. Utilize prescribed burning as a primary wildlife habitat restoration technique.
3. Provide for increased subsistence use of refuge resources.
4. Provide for increased opportunities for recreational hunting, fishing and wildlife observation.
5. Maintain the refuge in an undeveloped state.

The burn unit is identified in the refuge Comprehensive Conservation Plan as falling within a _____ management area. In minimal management areas, natural fish and wildlife population dynamics and habitats are emphasized and prescribed burning is allowed. Within moderate management areas, habitat manipulation is permitted on a site-specific basis to restore target wildlife habitat. There are _____ areas within the maximum allowable perimeter targeted to burn totaling approximately ____ acres.

B. Prescribed Burn Goals

- 1. Conduct prescribed fire activities in a way that ensures the safety of fire personnel and the public.
- 2. Enhance _____ habitat through.....
- 3. Assist in the re-introduction of fire in appropriate amounts and intensities to an area where suppression has occurred for 45 years. Lightning has provided the natural ignition source in the past.

C. Objectives

- 1. No accidents of firefighting personnel or the public while conducting the prescribed burn or as a result of prescribed burn activities.
- 2.
- 3. Burn at least _____ acres within the Maximum Manageable Area.

III. ORGANIZATION.

Prescribed Fire Manager	
Prescribed Burn Boss	
Prescribed Burn Boss Trainee	
Ignition/Holding Specialist	
Ignition/Holding Crew	

This burn is _____ considered a _____ complexity burn according to a complexity matrix completed and attached in Appendix B. As a result, some positions will be filled concurrently by the same individual. A minimum number of three people are required. When individuals named below are not available, replacements will be fully qualified for the positions they fill.

IV. FUNDING

This is an approved project that is funded out of Hazardous Fuels Operations subactivity code _____. Refer to Appendix D for a cost analysis.

V. SCHEDULING.

- A. Ignition Window:
- B. Anticipated Duration:
- C. Time of Ignition:
- D. Actual Ignition Date/Time
- E. Date Declared Out:
- F. Date DI-1202 submitted: _____

VI. PREBURN CONSIDERATIONS.

- A. On Site Preparation.
Weather observations and data for the local burn area will be collected for at least two weeks prior to and during ignition. This weather data will be obtained from the refuge portable RAWS (Remote Area Weather Station) or the manual weather station at _____. Weather data collected will be relative humidity, wind speed and direction and air temperature.
- Off Site Preparation
Public Contacts must be made according to time frames listed in Appendix G. Additionally, a newspaper article will be written at the beginning of the season (approximately April-May) for the local newspaper explaining the Tetlin Wildlife Refuge plans for prescribed burning for the season. The article must cover prescribed fire location, timing, objectives along with refuge contact person and phone number.

VII. BURNING PRESCRIPTION AND MEASURED CONDITIONS.

<p>A. WEATHER CONDITIONS Temperature Relative Humidity Midflame Windspeed Wind Direction* W,NW,N,NE preferred No thunderstorms predicted in the area</p>	RANGE	MEASURED
<p>B. FUEL MOISTURES 1-hour 10-hour 100-hour Woody (live) Herbaceous (live)</p>	RANGE	MEASURED
<p>C. FIRE CHARACTERISTICS Fireline Intensity ** Rate of Spread Flamelength</p>	RANGE	MEASURED
<p>D. CFFDRS*** Fire Weather Index(FWI) Buildup Index(BUI) _____</p>	RANGE	MEASURED

*Any direction acceptable if smoke production is not large enough to significantly impact Smoke Sensitive Areas defined in section IX of this plan.

**Intensity will be controlled by ignition methods at the lower fuel moistures to minimize control problems.

*** Canadian Forest Fire Danger Rating System–These levels have been adopted from historic regional fire hazard thresholds and are part of the refuge preparedness plan available at refuge headquarters.

Refer to Appendix E. for fire behavior predictions based on 1-hour fuel moisture range, midflame windspeed range and whether ignition is headfire, flanking fire or backing fire.

VII. IGNITION METHODS, TECHNIQUES AND PATTERNS.

A small test burn will be performed prior to the main ignition. If burn boss determines that prescribed burn goals will not be met, ignition will be stopped and ground personnel will contain the existing fire.

The primary ignition patterns used will be Ignition will only take place in one targeted area of the burn unit at a time. Drip torches with 3:1 diesel-to-gas-mix will be used for ignition. Burn patterns will be adjusted to maximize safety of personnel on the ground and to minimize control problems.

Pre-established ignition patterns may be altered by the burn boss as the burn progresses based on evaluation of factors such as wind direction, windspeed, and observed fire behavior and ignition progress. Resources required are listed in Appendix C.

Ignition of areas late in the day that may cause residual smoldering problems will be avoided.

IX. SMOKE MANAGEMENT CONSIDERATIONS.

A. Burn Permit

An Open Burn Permit has been received from the Alaska Department of Environmental Conservation (DEC): approval number _____, expires _____. All conditions of the burn permit will be met. See copy of the burn permit in Appendix _____. A copy of the burn permit should be kept on the burn site during burn activities.

B. Distance and Direction to Smoke Sensitive Areas

The prescribed burn area is approximately

C. Actions to Reduce Smoke Impacts

Prescribed burn personnel will monitor smoke plume size, direction and extent hourly during the burn on a smoke monitoring datasheet (Appendix F3). Ignition will be suspended if smoke threatens to impact _____. The most favorable wind direction for avoiding smoke sensitive areas will be from the _____.

The DEC (Department of Environmental Conservation) will be notified at least one day in advance of any planned burning of 40 acres or more. Smoke complaints received during the burn will be documented and submitted to the DEC. Smoke hazard signs will be placed along the Alaska Highway if smoke is visible.

D. Particulate Emissions

Emissions of particulates were modeled using the computer program SASEM. Approximately ____ tons of particulates will be emitted for every 100 acres of burning. Refer to Appendix F2 for results. The Program predicts _____.

X. HOLDING, MOP UP AND PATROL

The maximum manageable area was established at defensible natural barriers (see map in Appendix A).

The ignition crew will periodically discontinue ignition to patrol the burn perimeter. An aerial observer may be utilized to monitor burn progress. Holding actions will be accomplished by utilizing natural barriers and ignition patterns which will keep fire intensity at a manageable level. Backpack pumps and a portable pump set up at a lake margin will be available to cool down hotspots. Only one target area will be allowed to burn at any one time.. The burn boss or their designate will conduct a visual inspection of the burned areas in late afternoon from an aerial platform to determine residual smoldering on a regular basis after ignitions have stopped. Residual smoldering that may cause smoke or holding problems will be mopped up by qualified refuge staff or EFF crew personnel, if necessary.

XI. CONTINGENCY PLAN FOR FIRE ESCAPE.

The burn boss, if necessary, will declare the prescribed fire a wildfire. Prescribed fires will be suppressed if they threaten:

4. Human life and safety
5. Cultural resources or physical facilities of the refuge
6. To have a negative impact on threatened or endangered species
7. To escape from predetermined units (the maximum manageable area) or from the refuge, except where interagency agreements provide for certain fires to cross such boundaries
8. To exceed the prescription and/or cannot be successfully managed under the existing Prescribed Fire Plan

Once a prescribed burn has been declared a wildfire, no new ignitions will occur and personnel on the prescribed burn/declared wildfire will commence suppressing the fire, under the direction of the burn boss.

Tok Area Forestry (TAF) will be notified immediately and appraised of the situation. If the fire threatens native corporation land, the burn boss will discuss suppression options (including surveillance, containment, extinguishment) with the appropriate tribal representative. TAF and the burn boss will decide the type and amount of additional forces that will be needed to suppress the fire. The burn boss and TAF staff will complete a Wildland Fire Situation Analysis if the fire is determined to be beyond initial attack capabilities. Contingency forces potentially available include _____. All suppression actions taken on refuge lands will adhere to minimum impact suppression guidelines.

Ongoing prescribed burn activity may also be phased down and curtailed when the refuge preparedness level reaches four or five and it is determined or anticipated that insufficient regional contingency suppression resources are available for support. No new ignitions will be allowed at refuge preparedness levels four or five.

XII. COMMUNICATIONS AND COORDINATION.

A. Prescribed Burn Operations

Radios will be issued to the Burn Boss, the Ignition/Holding Specialist and crewmembers. Primary communications will be via the refuge FM radio system on 172.450 local (Channel 1). The repeater (Channel 2) will be accessed by the Burn Boss in the event Tetlin base needs to be contacted or the radio telephone interface needs to be used. The call sign for this operation is _____.

Tok Area Forestry Dispatch will be kept informed of progress on the burn via radio telephone interface capability on the refuge radio system.

B. Medical Emergencies—TOK Clinic 883-5855 Fairbanks Memorial Hospital 907-452-8181

In the event of an emergency, the Burn Boss should be contacted immediately. If a medical emergency develops, primary first aid treatment will be provided by the personnel on scene. If medivac is required, the refuge plane will be utilized if feasible for transportation to Tok for the injured individual. If injuries are severe enough to preclude that option, assistance will be requested from the Alaska State Troopers via the radio telephone interface (883-5111) for a medical emergency. In that event, military helicopter medivac assistance (MAST Unit) from Ft. Greely will be requested. MAST unit response will normally be directly from the accident site to Fairbanks. The nearest clinic is in Tok, where a physician is available. The nearest hospital is located in Fairbanks, approximately 180 air miles from Tok. If a medivac is required to Fairbanks, the Tok Clinic will request a local fixed wing air ambulance if available, or military helicopter medivac assistance (MAST Unit) from Ft. Greely. Response time is approximately 30 minutes for the local air ambulance and 2.5 hours for the MAST Unit.

C. Revalidation and Certification

A GO-NO-GO checklist (Appendix I.) must be completed by the burn boss immediately prior to ignition and every day before new ignitions occur.

The Burn Boss will maintain daily communication with the Refuge Manager or their designated representative. The Burn Boss will brief the Refuge Manager on burn operations, problems encountered, weather and fuel conditions and results achieved.

The Refuge Manager or their designate will certify in writing, daily (including weekends and holidays) on the Fire Activity Assessment (Appendix H) that:

1. The prescribed fire is within prescription and is expected to remain in prescription for the next 24 hours.
2. Adequate funds are available to manage the prescribed fire.
3. Sufficient fire management resources have been assigned or committed to manage the fire and to implement the approved suppression alternatives.

XIII. MONITORING AND EVALUATION PROCEDURES.

Pre-burn weather trends will be documented and analyzed for at least a two week period preceding ignition. Weather data will be obtained from the _____ Manual Weather Station _____ miles north of the proposed burn.

Once the burn is initiated, on-site weather conditions will be measured every hour while personnel are on the burn site. Wind speed and direction, temperature, relative humidity and 1 hour timelag (fine dead fuel moisture) will be recorded. Smoke column characteristics and plume direction, fire rate of spread and flame length will also be documented every hour. Spot weather forecasts will be requested daily by the burn boss when ignition is underway. The burn boss or other qualified personnel will determine 1 hour timelag fuel moisture by using the Fire Behavior Field Reference Guide prior to ignition and during the burn to determine if prescription parameters are being met.

An evaluation report will be prepared by the burn boss within 60 days of completion of the burn including a narrative of burn events, a determination of whether objectives of the burn were met, a cost analysis, and a critique of the entire operation.

A Section 7 consultation with Fish and Wildlife Enhancement is/is not necessary.....

XIV. REHABILITATION

Mop up should be minimized to reduce ground disturbance. Suppression actions, if taken, will follow minimum impact suppression guidelines when feasible.

XV. OTHER CONSIDERATIONS.

A. Special Safety Considerations--Safety is the number one priority.

1. Burn Boss will conduct a prescribed fire job hazard analysis during the daily briefing of burn personnel. Safety Zones and routes to them will be identified. All burn personnel will wear required PPE and abide by the ten standard firefighting orders and be guided by the 18 "situations that shout watch out"
2. All staff will comply with R7 policies about bear safety.
3. Light, flashy fuels could result in a fast moving fire after ignition. Boggy or tussocky ground may slow travel of personnel. Burn patterns will be adjusted to maximize safety of personnel on the ground.
4. Walking around snow or water on lake margins without proper clothing could induce hypothermia. The lakes may be frozen and only the margins may be thawed. Anyone entering the water will wear a personal flotation device (PFD).
5. Aircraft safety briefings will be given to passengers. Assigned aircraft will monitor local airport frequency and comply with FAA regulations. Only properly OAS-carded aircraft and pilots will be used.

B. Potential Impacts on Visitors, Users and Local Communities

APPENDIX A. BURN PROJECT VICINITY AND LOCATION MAPS

APPENDIX B. PRESCRIBED FIRE COMPLEXITY WORKSHEET

COMPLEXITY ELEMENT (WEIGHTING FACTOR)	RATING VALUE	WEIGHTED VALUE	BURN COMPLEXITY LOW	BURN COMPLEXITY HIGH
1. Potential for escape. (10)		10	Low probability for escape.	Significant probability for escape.
2. Values at risk. (10)		10	Low risk to people, property or resources.	High risk to people, property or resources.
3. Fuels/fire behavior. (5)		15	Fuels uniform, fire behavior predictable. Moderate fuel moisture conditions.	Great variability in fuels. Fire behavior difficult to predict. Low fuel moisture conditions
4. Fire duration. (5)		15	Short duration, minimal management.	Long duration, extended management.
5. Smoke/air quality. (7)		7	Low or insignificant smoke impact anticipated.	Potential to impact smoke sensitive areas.
6. Ignition methods. (3)		3	Simple, limited hazard.	Technical, significant hazard.
7. Mgt team size. (3)		3	Burn requires only a few generalized positions.	Burn requires many specialized positions.
8. Treatment objectives.(7)		21	Objectives simple, easy to achieve. Prescriptions broad and encompass low risk burning conditions.	Objectives complex. Prescriptions restrictive and encompass high risk burning conditions.
TOTAL WEIGHTED VALUE		0		

* COMPLEXITY LEVEL

LOW
 MODERATE
 COMPLEX

0-250 WEIGHTED VALUE POINTS
 250-350 WEIGHTED VALUE POINTS
 350-500 WEIGHTED VALUE POINT

APPENDIX C.

RESOURCES REQUIRED

APPENDIX D.

COST ANALYSIS CHART.

FUNDING SOURCES:

Activity or Item	Cost	
	Estimated	Actual
TOTAL COST		
FINAL COST PER ACRE		

APPENDIX E. FIRE BEHAVIOR MATRICES.

APPENDIX F.1. SMOKE PLUME TRANSPORT ESTIMATION

APPENDIX F.2. PARTICULATE EMISSION ESTIMATIONS.

APPENDIX F.3. SMOKE MONITORING DATA SHEET.

APPENDIX G. PUBLIC CONTACTS.

CONTACTS:	PHONE #:	WHEN?	CONTACT BY:	INDIVIDUAL CONTACTED DATE/TIME:
Dave Allen-FWS Regional Director	david_b_allen@fws.gov	24 hour advance		
Tetlin NWR Visitor Center	907-774-2245	24 hour advance		
Alaska DNR Division of Forestry, Tok-Ray Kraemer	907-883-5134	24 hour advance		
Wrangell-St. Elias NP-Slana	907-822-5238	30 day		
Alaska Fire Service AICC Intelligence-Mary Lynch	907-356-5674	24 hour advance		
Region 7 Fire Management Coordinator	907-786-3654 larry_vanderlinden@fws.gov	24 hour advance by e-mail		
Doyon Corp-Lands	907-459-2035	24 hour		
Alaska State Troopers	907-883-5112	day of burn		
FAA, Northway Airport	907-778-2240	24 hour advance		
Northway Village		24 hour advance		
U.S. Customs Port Alcan	907-774-2252	day of burn		
Alaska DEC Ann Lawton	907-269-3066	24 hour advance if >40 acres or sensitive		
Yukon Forestry	867-667-3397	day of burn		
Adj. Allotment Owners	Phone	30 day adv.		
Permit Holders in Area	Phone	30 day adv.		

Exhibit E. Prescriptive Criteria for Wildland Fires Managed for Resource Benefit

1. Refuge Preparedness Level One

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

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

2. Refuge Preparedness Level Two

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

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

3. Refuge Preparedness Level Three

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

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

4. Refuge Preparedness Level Four

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

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

5. Refuge Preparedness Level Five

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

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

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

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

Exhibit F. References

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- Larson, Keith L. 2000. Guide to the flora and fauna of Tetlin National Wildlife Refuge and the upper Tanana Valley. U.S. Fish and Wildlife Service, Tok, Alaska. 68 pp.
- Lipkin, Robert, and D.F. Murray. 1997. Alaska Rare Plant Field Guide. U.S. Department of the Interior, Washington D.C.
- Sheppard, William L. 1999. Archaeological survey of areas in and adjacent to Tetlin National Wildlife Refuge. Report submitted to the U.S. Fish and Wildlife Service. Sheppard Research, Portland OR. 35 pp.
- Tetlin National Wildlife Refuge. 2001. Land protection plan for Tetlin National Wildlife Refuge-options for the protection of fish and wildlife habitats. U.S. Fish and Wildlife Service, Tok, Alaska. 86 pp.
- U.S. Fish and Wildlife Service Fire Management Handbook. 2001. U.S. Fish and Wildlife Service, Boise, Idaho.