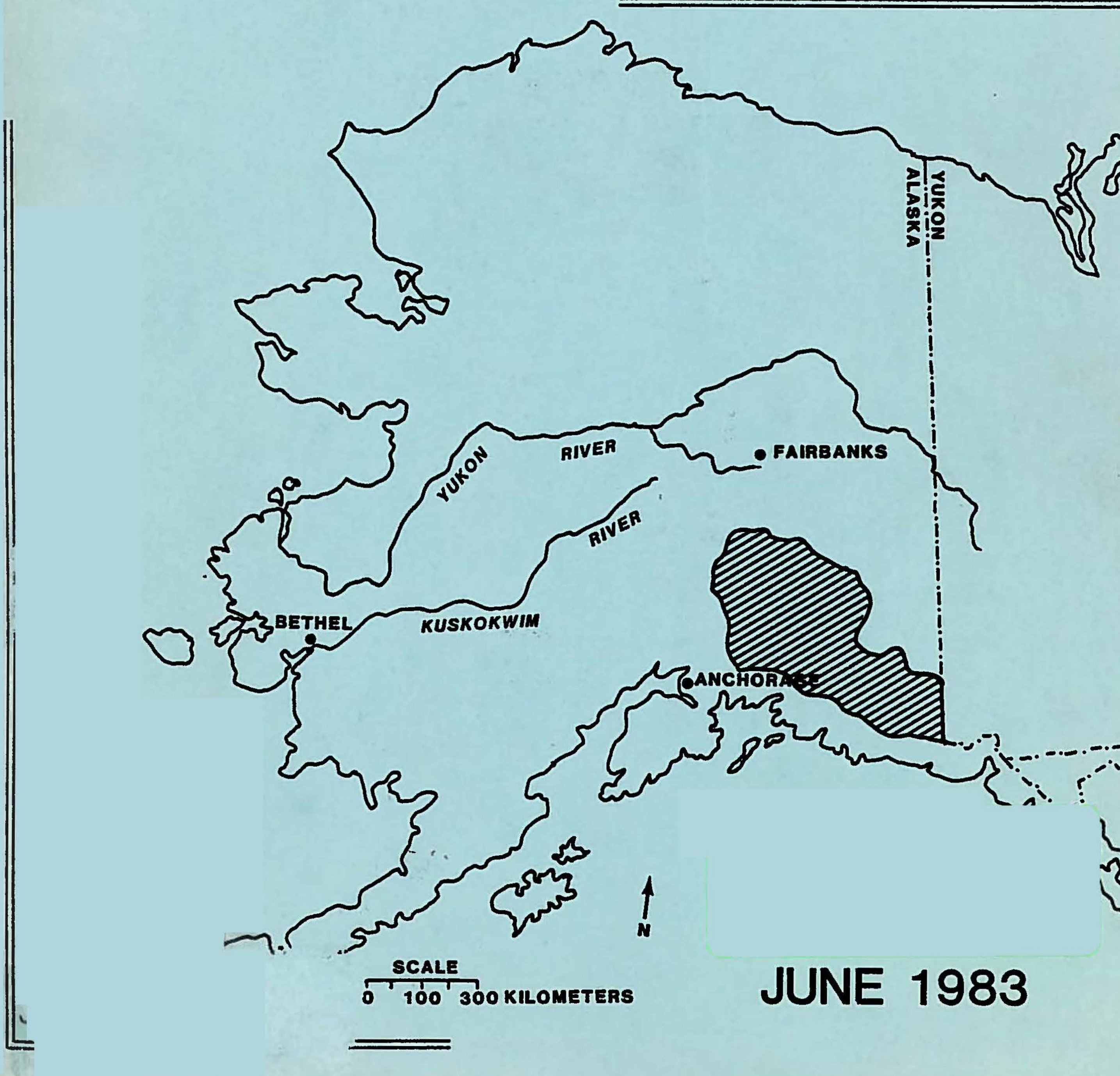
ALASKA INTERAGENCY FIRE MANAGEMENT PLAN

Copper Basin Planning Area



JUNE 1983

ALASKA INTERAGENCY FIRE MANAGEMENT PLAN

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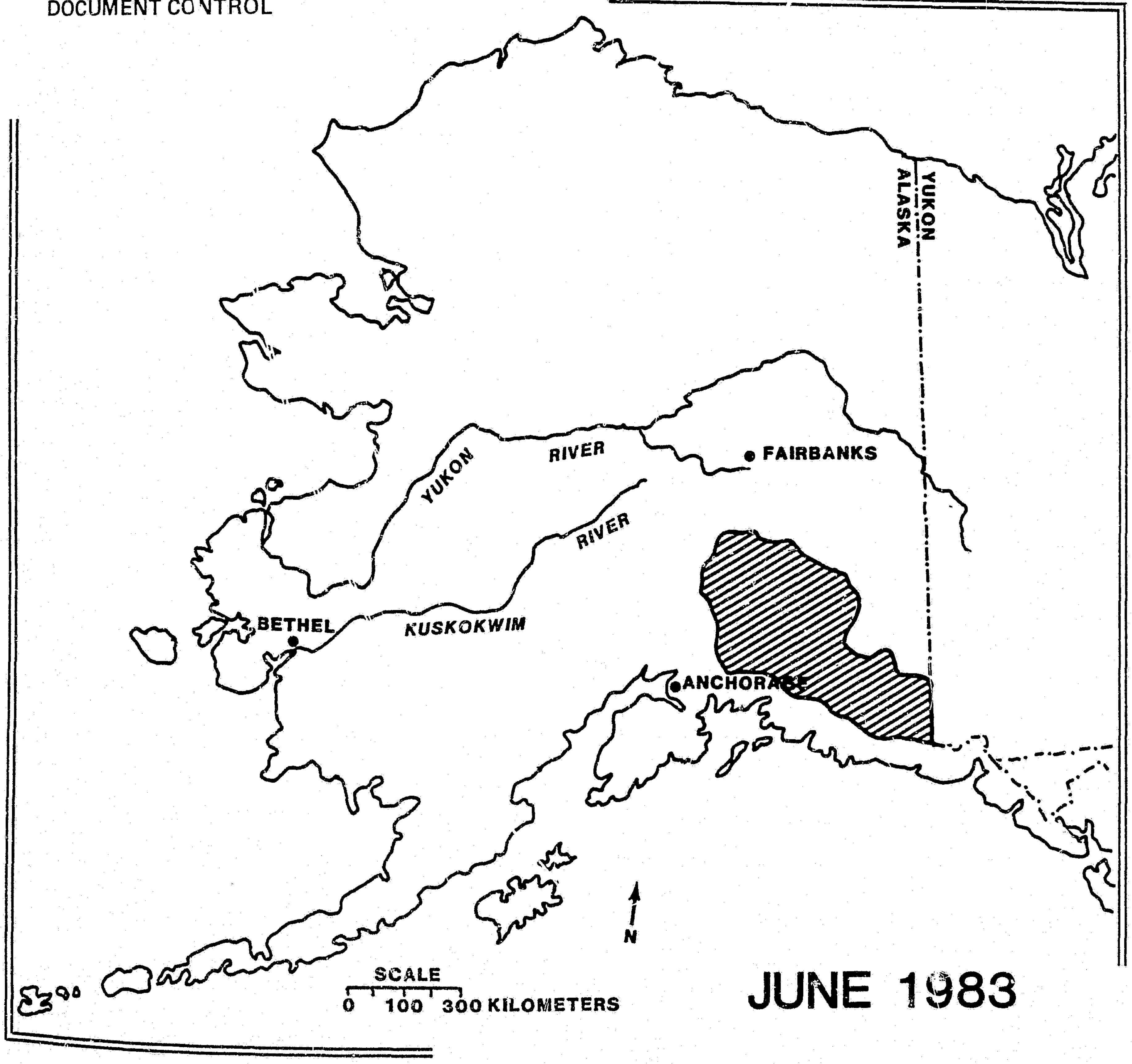
Copper Basin Planning Area



JUNE 1983

ALASKA INTERAGENCY
FIRE MANAGEMENT
PLAN:

COPPER BASIN

I recommend the Bureau of Land Management and the State of Alaska fire suppression organizations implement the Alaska Interagency Fire Management Plan: Copper Basin. I concur with fire management option(s) to be applied on the lands administered by my organization. I have reviewed the plan and recognize the fire management options to be applied by the other cooperating organizations on lands adjacent to those administered by my organization.

(For Federal agencies only: I agree to adopt the environmental assessment of the Alaska Interagency Fire Management Plan: Tanana/Minchumina. I agree environmental conditions are similar to this plan area and no additional environmental assessment is required. Based on a review and evaluations of the information contained in the supporting references, we have determined that the proposals are not major Federal actions which would significantly affect the quality of the human environment within the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969. Accordingly, the preparation of an Environmental Impact Statement on the proposed actions is not required).

Fred Wolf

Curtis McVee
State Director
Bureau of Land Management

Date 7/6/83

John L Sturgeon

John Sturgeon
State Forester
Department of Natural Resources

Date June 30, 1983

Roger J Contor

Roger Contor
Regional Director
National Park Service

Date 20 June '83

Don Collinsworth

Don Collinsworth
Commissioner
Alaska Department of Fish and Game

Date 7-25-83

Jacob Lestenkof
Area Director
Bureau of Indian Affairs

Date 15 July 1983

~~Keith Schreiner~~
Acting Regional Director
Fish and Wildlife Service

Date 1/4/84

I recommend the Bureau of Land Management and the State of Alaska fire suppression organizations implement the Alaska Interagency Fire Management Plan: Copper Basin. I concur with fire management option(s) to be applied on the lands administered by my organization. I have reviewed the plan and recognize the fire management options to be applied by the other cooperating organization.

Herbert R. Smelcer
Ahtna, Incorporated

Edna Charley
Copper River Native Association

Board Member

Martin N. Finnesand
Chitina Village Council

Keith Gordaoff
Chugach Natives, Incorporated

Edna Armstrong
Matanuska-Susitna Borough

Frank Klett
Cook Inlet Region, Incorporated

I recommend the Bureau of Land Management and the State of Alaska fire suppression organizations implement the Alaska Interagency Fire Managment Plan: Copper Basin where it covers lands in the Talkeetna Mountains. I concur with fire management option(s) to be applied to the lands administered by my organization. I have reviewed the plan and recognize the fire managment options to be applied by the other cooperating organization.

Angie Smith

Angie Stevig Smith, President
Chickaloon-Moose Creek Native Association, Inc. 9-1-84

R. Andy Johnson

R. Andy Johnson, President
Salamatoff Native Assoc., Inc.

Debbie Gump

Debbie Gump, President
Knikatnu, Inc.

B. Agnes Brown

B. Agnes Brown, President
Tyonek Native Corporation

Doug Graham

Doug Graham
Ninilchik Native Assocation, Inc.

I recommend the Bureau of Land Management and the State of Alaska fire suppression organizations implement the Alaska Interagency Fire Management Plan: Copper Basin where it covers lands in the Chickaloon area. I concur with fire management option(s) to be applied to the lands administered by my organization. I have reviewed the plan and recognize the fire managment options to be applied by the other cooperating organization.

Angie Stevig Smith

Angie Stevig Smith, President
Chickaloon-Moose Creek Native
Association, Inc. 9-1-84

I recommend the Bureau of Land Management and the State of Alaska fire suppression organizations implement the Alaska Interagency Fire Management Plan: Copper Basin. I concur with fire management option(s) to be applied on the lands administered by my organization. I have reviewed the plan and recognize the fire management options to be applied by the other cooperating organization.

Ernie Charley
Chistochina Village Council

David Gene
Gakona Village Council

Nick Lincoln
Copper Center Village Council

~~Nora David~~
Mentasta Village Council Vice-pres.

Harding Ewan
Gulkana Village Council

Robert Marshall
Tazlina Village Council

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ALASKA INTERAGENCY FIRE MANAGEMENT PLAN
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I. INTRODUCTION

A. AUTHORITY AND PLANNING TEAM COMPOSITION

This plan is being prepared with the approval of the Alaska Land Use Council (ALUC). The ALUC was formed in 1980 by a provision of the Alaska National Interest Lands Conservation Act (ANILCA).

The ALUC recommended the formation of the Alaska Interagency Fire Management Council to organize and coordinate interagency fire management. The group is comprised of representatives from Alaska Department of Fish and Game; Alaska Department of Natural Resources; Alaska Department of Environmental Conservation; National Park Service; U.S. Fish and Wildlife Service; Bureau of Land Management; Bureau of Indian Affairs; U.S. Forest Service Region 10; and USFS Institute of Northern Forestry.

The Copper Basin Planning Team is a working group under the Alaska Interagency Fire Management Council. The planning team is comprised of representatives from: Ahtna, Inc., Lee Adler; Alaska Department of Fish and Game, Bob Tobey; U.S. Bureau of Land Management, Mike Small; Copper River Native Association, Ray Shinn; National Park Service, Brad Cella; Mat-Su Borough, Jake Wright; Bureau of Indian Affairs, Glenn Anderson; and the team leader from the Alaska Department of Natural Resources, Jeff Bedford. Information specific to the Copper Basin Planning Area is presented in this document. Background information applicable to all fire management plans in interior Alaska is in the Alaska Interagency Fire Management Plan: Tanana/Minchumina Planning Area (AIFMP:TM). The AIFMP:TM is referenced in this document to avoid unnecessary reproduction and associated costs.

B. GOALS AND OBJECTIVES

The purpose of this plan is 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. This will be accomplished by establishing broad fire management strategies for unplanned wildfires that will permit a reduction, compared to the past suppression only policy, in suppression costs commensurate with the value of resources warranting protection. Management options selected should be ecologically and fiscally sound, operationally feasible, and sufficiently flexible to be changed as new objectives, information, and technologies become available.

The objectives of this plan are to ensure:

1. Aggressive and continued suppression action will be taken on fires which threaten human life, private property, and man-made developments.

2. Levels of fire suppression and dollars spent on fighting fires should be commensurate with the value of the resources warranting protection.

3. Selection of fire management options will optimize the ability of the landowners/managers to achieve their individual management objectives for lands and resources they administer.

C. GENERAL GUIDELINES

The plan was prepared within these general guidelines:

1. The boreal forest is a fire dependent ecosystem, which evolved in association with fire and will lose its character, vigor, and faunal and floral diversity if exclusion of fire is attempted.

2. This plan recognizes that land ownership will change continually for several years and that land use plans are in various stages of completion. Yearly reviews, modifications, and updates of the plan will be made accordingly. (See Section H).

3. This plan will be implemented during the 1983 fire season.

4. The current policy of total suppression will be replaced with a fire management program for the planning area.

5. The plan will establish fire management options which each land manager can apply according to his own land-use objectives and constraints. Each land manager/owner will notify the agency responsible for suppression of any desired changes in broad fire management strategies. Selection of fire management options does not preclude the development of prescribed burning programs by any land manager/owner.

6. The functions of allocating forces, detection, and prevention will be considered and addressed as needed to accomplish objectives of the plan.

7. This plan will be developed under the Alaska Interagency Fire Planning Guidelines in order to be compatible with adjacent fire plans.

D. RELATIONSHIP TO LAND USE PLANNING

This plan is not a land use plan. Rather, it is a guide to coordinate use of fire suppression forces among a wide variety of land managers and to promote a comprehensive fire management program. It does not develop land use objectives; it implements these objectives relative to fire management.

Unfortunately, land use planning has only been completed within very small portions of the planning area. Thus, specific objectives have not been developed for most of the planning area. Nevertheless, land managers are guided by basic policies and objectives which can be stated without land use planning (e.g., protection of human life). These policies and objectives provide a solid foundation for this planning effort. As more specific objectives are developed by various land managers, they will be incorporated into this plan.

The status of land use planning for individual agencies is reviewed below.

Native Corporation - Planning is in preliminary stages of collecting information. No specific planning is underway although the need is recognized to promote effective use of resources.

State of Alaska - The State has completed land use allocations in most of the area. General land use planning for the western part of the area has begun and is scheduled for completion in late 1983, at which time land use planning will begin for the remainder of the Copper Basin.

National Park Service - Development of the General Management Plan is ongoing and scheduled for completion by mid 1984.

Bureau of Land Management - The Southcentral Management Framework Plan (MFP) was completed in 1981, was amended in 1982, and directs management of BLM land in the Copper River Basin.

E. CURRENT FIRE MANAGEMENT POLICY

Refer to pages 3-4 of AIFMP:TM.

F. PUBLIC MEETINGS

One public meeting was held in Glennallen on March 8, 1983. Four members of the public attended (see Appendix B). Additional meetings were held for the leaders of the Ahtna Village Fire Councils and the chiefs of the local volunteer fire departments. A majority of those affected attended each meeting. These meetings were held to inform people of the fire plan and to solicit their comments.

II. PLANNING AREA

A. GENERAL

1. Location and Size

The Copper River Planning area encompasses approximately 19,776,585 acres (30,901 square miles), about 154 square miles smaller than the state of South Carolina. It is located in the eastern portion of Southcentral Alaska and is bounded on the east by the Canadian border, on the north by the Alaska Range, on the west by the Talkeetna Mountains, and on the south by the Chugach Mountains.

The Copper River, the largest in the planning area, roughly divides the area in half, leaving an east and west portion. Most of the area's population is located in small settlements along major roads and highways in the western portion.

2. Land Ownership

Major shifts in land ownership are occurring and will continue for several years as a result of the Alaska Native Claims Settlement Act (ANCSA), Alaska Statehood Act, and Alaska National Interest Land Conservation Act. The area includes Ahtna Regional Corporation, seven recognized native villages, and five native groups awaiting approval. Corporate native lands include patented, interim-conveyed, and selected designations for both village and regional corporation, as well as cemetery and historical site selections. Land that is in the selected phase of ANCSA is managed by the Federal Agency within whose boundaries the selected land lies. Interim conveyed and patented land is managed by the native corporation.

State land is in a category similar to native lands; that is, patented, tentatively approved, or selected. Approximately 98 percent of State land is located west of the Copper River. Lands in the Wrangell-Saint Elias National Park and Preserve are under the jurisdiction of the National Park Service. The Bureau of Land Management (BLM) manages the remaining federal lands in the planning area.

Additionally, there are parcels of privately patented land. The claimants for trade and manufacture (T&M) sites, headquarters sites, and patented mining claims have possessory interests which place the claims in the same category as private land. Approximately 200 native allotments are in the planning area. Native allotments are land owned by individual Natives and either held in trust by the United States or subject to a statuary restriction on alienation. Most native allotments in Alaska are "restricted" allotments in which the fee is owned by the Native allottee, subject to a restriction against alienation held by the United States or a federal officer.

3. Population and Facilities

According to the 1980 Alaska census there are 2,721 people living in the planning area. A heavy concentration of the populations is settled around the Glennallen-Copper Center vicinity, with a sparse population in the rest of the region.

The road system in the planning area consists of three major roads and six secondary roads. The major roads are: the Richardson Highway which connects

Fairbanks and Valdez, the Glenn Highway which intersects with the Richardson Highway at Glennallen and connects the region with Anchorage and southcentral Alaska, and the Tok cutoff which connects the Richardson Highway with the Alaska Highway.

The secondary roads are the 1) Denali Highway (seasonal road) which connects with the Richardson Highway at Paxson, 2) Edgerton cutoff which connects the Richardson Highway with Chitina, 3) Old Edgerton, a spur of the Edgerton cutoff, 4) Chitina/McCarthy Road (seasonal) which connects those two communities, 5) Lake Louise Road which connects a major recreation area with the Glenn Highway, and 6) that portion of the Nabesna road which runs through the planning area. The Trans-Alaska Pipeline, a major utility corridor, bisects the planning area.

Most facilities are located near population centers or along the road network. There are some remote communication sites scattered through out the area.

B. PHYSICAL ENVIRONMENT

1. Climate

The majority of the unit is under continental climatic influences. However, areas south of the Chitina River are influenced by transitional climatic conditions.

The unit is characterized by extreme temperature variation with the range between annual minimum and maximum temperatures over 140°F. Winter temperatures of -50°F or lower are not uncommon and can be expected to occur for extended periods of time. Freezing conditions have occurred in every month of the year within the planning unit. Summertime temperatures are relatively mild but have exceeded 90°F. There is no pronounced diurnal variation in burning conditions during the peak of the fire season since sunlight and twilight hours occur 24 hrs/day throughout the majority of the unit and slightly less in the southern portion.

The transition zone results from the flow of warm moist maritime air being blocked by the Chugach Mountains. The abruptness of the zone is demonstrated by a comparison of Thompson Pass and Chitina areas. Thompson Pass on the inland side of the Chugach ridge receives an average of 83 inches of precipitation annually with snowfall consistently over 600 inches compared to Chitina which receives an average of 12 inches with a snowfall of over 50 inches.

The continental zone average annual precipitation ranges between 10 and 14 inches in the lowlands with a snowfall of 50 to 60 inches. Precipitation at higher elevations in the unit's interior mountain ranges tends to exceed 80 inches as a result of the additional moisture condensation as the air which has passed over the coastal range is again forced upward. Localized storm cells occur frequently during the summer months and thunderstorms occur but are infrequent. Due to the high level of precipitation in both the coastal and interior mountain ranges numerous glaciers and icefields occur, including some of the largest in the world. In general both the mean temperature and precipitation decrease northward.

Prevailing winds are from the south and southwest and tend to be associated with passage of weather frontal systems. Terrain also plays an important role in determining wind flow patterns. Severe winds often occur near the mouths of valleys and steep gorges along the mountain ranges. These winds influence adjacent areas for up to 20 miles.

A climatological study performed for the Bureau of Land Management by the University of Alaska (Searby, 1975) showed wide variations of temperature and precipitation between years and during an individual season indicating that any predictions of seasonal or long-range burning conditions would be accompanied by a high degree of risk.

2. Topography

The planning unit is composed of six physiographic regions:

a. Talkeetna Mountains - This ice-carved mountain range forms the western boundary of the unit. It is separated from the Alaska Range to the north by the Nenana River and the Chugach Mountains to the south by the upper Matanuska Valley. The summit is composed of peaks ranging in elevation from 6,000 to 7,000 feet. Several glaciers up to 10 miles (16 km) in length and numerous ice masses occur within this range.

b. Alaska Range - This long narrow mountain chain forms the northern boundary of the unit. Steep talus and scree slopes, razorback ridges and deep valleys predominate, with many peaks higher than 10,000 feet. Huge glaciers are the source of many of the major rivers and streams. Rivers that flow from the Alaska Range into the planning area include the Nenana, Susitna, Maclaren, Gulkana, Gakona, Chistochina, and Slana.

c. Wrangell Mountains - This volcanic range with peaks over 10,000 feet and several that exceed 16,000 feet in elevation forms the eastern boundary. Numerous large icefields and glaciers, including the Nabesna which is one of the longest in the world, are sustained in this range. Waters laden with glacial silt drain from the peaks to feed the Copper and Chitina Rivers, major waterways of the area.

d. Chugach Mountains - This extremely rugged coastal chain defines the southern boundary of the fire planning unit. This segment of the Kenai-Chugach Range possesses peaks that range in elevation from 7,000 to 13,000 feet. The upper reaches of this chain contain the Bagley Ice Field and several piedmont glaciers that drain to the coast.

e. Gulkana Uplands - This area, located in the northwest of the unit, in conjunction with the Copper River lowlands constitutes the majority of the intermontane basin. The uplands are characterized by large lakes that occupy ice-scoured basins, numerous thaw lakes, and bogs.

f. Copper River Lowlands - This relatively smooth plain (1,000-2,000 feet elevation) is deeply incised by the Copper River and its tributaries. Major tributaries include the Gulkana, Gakona, Chistochina, Tazlina, Klutina, Tonsina, Slana, Bremner, and its main tributary the Chitina. This area is also characterized by many large lakes, bogs, and thaw lakes. The eastern plain of the lowlands is glacial outwash interlaced with steep-banked streams.

3. Soils-Watershed

A description of soils in the planning area can be found in the Exploratory Soil Survey of Alaska (Rieger et al, 1979). In general, the soils on raised areas along moraines and hills, or along major drainages, are well-drained, sandy, or gravelly loams. These are the warmest, most productive, and frequently the driest sites. Severe fire can damage soils on these sites if the organic mat is thin. However, these sites usually support broadleaf plant communities which are relatively fire-resistant.

In lowlands, extensive areas are underlain by cold wet soils, usually with a thick organic mat and often with permafrost. Fire effects on these sites can vary widely with the severity of fire and the nature of the permafrost.

Permafrost is a condition in which ground temperature remains below freezing for two or more years. Above the permanently frozen soil is an "active layer" which thaws and freezes each year. Thawing is retarded by the insulating effect of a thick organic layer.

Fine-grained permafrost soils may contain up to 50 percent water. They are extremely unstable and easily eroded when the insulating cover of vegetation is removed because water released by the melting ice can cause runoff even on very gentle slopes. Sandy soils can have a fairly high ice content but resist erosion because of their large particle size. Coarse-grained soils tend to be very stable because they are generally well-drained.

Many of the soil and substrates in the planning unit are composed of fine-grained materials. North-facing slopes, south-facing toe slopes, valley bottoms, and areas shaded by heavy tree cover are completely underlain by ice-rich permafrost. Complete removal of the shading or insulating vegetation mat results in rapid melting of the ice-rich, fine-grained soils and substrates. Rain may greatly accelerate melting. If the vegetation mat is removed to the edge of a water body, silt and organic material may wash into the water. Significant erosion rarely occurs after wildfires in interior Alaska because fires rarely consume the entire organic mat, although slumping and landslides occasionally occur on steep slopes after severe fires.

While wildfires have little effect on watershed values, major erosion frequently results from the use of mechanized fire equipment on ice-rich, fine-grained, permafrost soil. Complete removal of all of the vegetation and organic material during fireline construction causes much deeper permafrost melting than occurs in adjacent burned areas. Runoff channels and deep gulleys frequently form, and siltation can result.

C. VEGETATION

1. Major Plant Communities

The flora of the majority of the Copper Basin planning area is typical of interior Alaska. The area includes nearly all plant communities found in the Interior, ranging from needleleaf and broadleaf forests to alpine tundra. The predominant forest cover types include black spruce, white spruce, broadleaf, and mixed broad-needleleaf. Along the southern boundary of the planning area the flora reflects some coastal influence and additional species such as devils club, Sitka spruce, and hemlock can be found.

a. Black Spruce Woodland - Black spruce forests with a canopy closure of less than 25 percent, but greater than 10 percent, typically occur on poorly-drained permafrost sites. The understory is dominated by sphagnum moss on wetter sites and feathermoss/lichen on drier sites. Ericaceous shrubs*, dwarf arctic birch, willow, and cottongrass are also important. The trees are often very stunted due to the harshness of the site. These black spruce communities often have a thick organic mat. The surface of the organic mat quickly responds to changes in the relative humidity, either becoming moister or drier. This, along with the continuity of fuel over large areas, allows this vegetation type to burn readily when ignited during dry periods, usually consuming the overstory. The site will be ready to burn again in 30 to 40 years, once a moss/lichen layer has developed in the new black spruce stand.

b. Open/Closed Black Spruce Forest - Black spruce stands with canopy cover greater than 25 percent occur throughout the planning area. Paper birch is a rare component. These stands are usually located on drier sites than are woodlands black spruce communities and the trees are often taller. The understory is usually dominated by feathermosses, although lichens may form a nearly continuous mat in some stands. Ericaceous shrubs, dwarf arctic and resin birch, and willows make up most of the shrub layer. Open/closed black spruce forests burn with a frequency similar to that of black spruce woodlands.

c. White Spruce Woodland - Within the planning unit white spruce woodlands occur at the elevational limits of trees. Resin birch and willows are components of these areas. The organic mat is formed by feathermoss and lichens.

d. Open/Closed White Spruce Forest - White spruce forests with canopy cover greater than 25 percent form large, productive stands on well-drained sites, especially along major rivers. White spruce also commonly form "stringers" along smaller streams and around lakes. Balsam poplar often comprise a significant part of the tree canopy in these stands.

In open stands, a wide variety of shrubs and herbs dominate the understory, along with feathermosses. Alder, resin birch, willow, prickly rose, buffaloberry, bunchberry, twinflower, and ericaceous shrubs are common. Fire occurs much less frequently in these forests than in the black spruce types. When they occur they tend to have lower intensities, although, fires occasionally kill white spruce, particularly in older stands.

e. Mixed White/Black Spruce Woodland - These mixed woodlands commonly occur at the elevational limits of trees. Alder and resin birch are shrubs that are commonly associated with this forest type. The organic mat is composed of feathermosses and lichens.

f. Open/Closed Broadleaf Forest - Aspen and balsam poplar are the two species common on upland sites in the planning area. Aspen are most common on warm, well-drained sites. A well developed understory of alder, willow, highbush cranberry, and low shrubs is usually present, as well

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* Ericaceous shrubs include blueberry, cranberry, Labrador tea, and other shrubs belonging to the taxonomic family Ericaceae.

as herbaceous vegetation, mosses, and lichens. Fires are infrequent in deciduous forests and generally are low intensity when they do occur. However, these fires often kill the thin-barked overstory, after which a new broadleaf stand will quickly reestablish.

g. Open/Closed Mixed Forest - These forests are composed of aspen/white spruce, aspen/black spruce, or balsam poplar/white spruce stands. Balsam poplar is an intermediate successional stage leading to white spruce. Aspen are most common on well-drained sites and are also an intermediate stage which results in sites usually dominated by white spruce but occasionally by black spruce. The dominance by black spruce may be the result of the area being burned by an intense fire previously. Alder, willow, prickly rose, and ericaceous shrubs are common.

h. Open/Closed Tall Shrub Scrub - Tall willow, alder, and shrub birch form dense stands between treeline and alpine communities and also occur in some riparian zones and on floodplains. The understory varies considerably, consisting of dense grasses and herbs, or mosses and lichens. Fires tend to burn slowly and with low intensity on the rare occasions when they occur in this vegetation type.

i. Open/Closed Low Shrub Scrub - Low willows and shrub birch form extensive communities, particularily near the foothills of the Alaska Range. On moist sites the understory consists of a dense feathermoss/ericaceous shrub mat, while on dry sites there may be nearly continuous cover of lichens. The meager fuels and typically moist conditions seldom support fires of any notable size.

j. Graminoid Communities - The sites occupied by these communities vary widely from wet to dry. The sites are usually not extensive, but are frequently encountered. Elymus, carex, fescue, and calamagrostis species are widely distributed and can burn readily when dry. The tussock tundra type, dominated by cottongrass, often occurs on the edges of wet areas. Fires in tussock tundra can burn with high intensity at any time of the warmer months because of the large amounts of dead material. Fires can burn very deeply into the organic mat after a long dry period, but more characteristically consume only the surface layer.

k. Herbaceous Tundra - Meadow communities dominated by grasses and other herbaceous plants, particularly fireweed, are found on adequately drained protected sites. Fires would be infrequent and of low intensity, because of low fuel loading and high moisture content of live fuels.

l. Mat-and-cushion Tundra - These communities are located where harsh environmental conditions limit the development of vegetative cover. Discontinous low growing mats of vegetation, primarily of Dryas species and prostrate willow, are found, along with ericaceous shrubs, other forbs, sedges, and sometimes lichens. Fire occurrence is very low because fuels are sparse and discontinuous, and any fire would be quite small.

2. Fire Effects on Vegetation

Refer to pages 14 and 15 of the AIFMP:TM.

3. Postfire Vegetative Recovery

Refer to pages 15 through 18 of the AIFMP:TM.

D. WILDLIFE

1. Fire Effects on Habitat

Fire is a natural occurrence within Alaska ecosystems. Generally, the effects of fire on habitat are much more significant than the effects on resident animals. Habitat changes determine the suitability of the environment for future generations of animals. Fires may have a short-term negative impact on resident animals by displacing them, disrupting critical reproductive activities, or, rarely, killing them. However, these animal populations recover quickly if suitable habitat is available. Generally, fire improves the habitat for a wide variety of species. The adverse effects that the immediate generation of wildlife may experience are usually offset by the benefits accrued for future generations.

Most of the planning area is covered with a mosaic of forest, bog, and tundra habitat types that have been collectively termed the northern boreal forest. Fire is the primary agent of change in the boreal forest and is responsible for maintaining habitat heterogeneity. Wildlife have evolved in the presence of fire and have adapted to its presence. Indeed, the continued well-being of most species of wildlife depends on periodic disturbance of the habitat by fire.

The grasses and herbaceous plants that quickly reestablish on burned areas provide an ideal environment for many species of small mammals and birds. A rapid increase in microtine population usually occurs following a fire. This abundance of small prey animals in turn makes the recently burned area an important foraging area for predatory animals and birds. However, the size of the fire and the subsequent proximity to cover and denning or nesting sites affects the degree of use by larger animals.

Fire severity and frequency greatly influence the length of time that the grass and herbaceous plant stage will persist. Severe burning delays the reestablishment of shrubs, a benefit to grazing animals and seed-eating birds. Frequent reburning of a site further retards generation of shrubs and seedlings and prolongs the grassland environment.

For some species of wildlife, such as bison, this perpetuation of a grassland environment is beneficial. Where bison are present, a management program that entails periodic burning to preclude invasion by shrubs and trees can supplement the rangeland that is naturally available along the braided river courses.

Browsers such as moose, ptarmigan, and hares can benefit from the fire as soon as shrubs and tree seedlings begin to reestablish. If a fire leaves most of the shrub root and rhizome systems intact, sprouting will occur very soon after burning. In the case of early season fires, some forage may be available by the end of the growing season and limited use by browsing animals may occur. Forage quality is much improved, with increased digestability and protein and mineral content for some years after fire. As tall shrubs and tree saplings begin to dominate, the site provides shelter and forage for a greater

X

variety of wildlife. Although the rate of regrowth varies among burned areas and is dependent on many factors, this productive stage can persist for as long as 30 years after fire.

The greatest diversity of wildlife will be found during the tall shrub-sapling stage. Many species, which up to that point have frequented the burned area only to hunt or forage, begin to find that it provides shelter and denning or nesting sites as well. This abundance and diversity of wildlife, in turn, makes these burned areas extremely important to people, whether it be to hunt and trap or to view and photograph.

On most sites the young trees outgrow the shrubs and begin to dominate the canopy after 25 to 30 years. At this point the shrub component thins out and changes, as more shade-tolerant species replace the willows. Subsequently, use by browsing animals such as moose, hares, and ptarmigan declines. On mesic sites which are developing into black spruce forest, the lichen biomass becomes significant during this period and increases in abundance for 50 to 60 years.

As the forest canopy develops and the understory species disappear, a burned site becomes progressively less productive. Relatively few animal species find the requirements necessary for their survival in the mature spruce forest that will eventually develop in the absence of further fire.

Because lichen cover increases in these more mature stages of black spruce stands, these areas are valuable for lichen foraging animals such as caribou. In older stands, lichens are slowly replaced by feather and sphagnum mosses. On valley bottoms where a muskeg-bog situation exists, lichen cover also develops, but, contrary to the upland sites, lichens may persist as succession advances.

Generally speaking, large, severe fires are not nearly as beneficial to wildlife as are more moderate fires. Less intense fires quickly benefit browsing animals and their predators by opening the canopy, recycling nutrients, and stimulating sprouting of shrubs. In addition, the mature trees which are killed but not consumed by the fire, provide nesting sites for hole nesters such as woodpeckers, flickers, kestrels, and chickadees, as well as some cover for other animals. A severe fire that burns off the aboveground biomass and kills root systems, slows the regeneration of the important browse species, which must now develop from seeds.

Some sites, however, have progressed so far toward a spruce forest community that very little shrub understory exists from which regeneration of the site may occur. Furthermore, many sites are so cold and poorly drained that black spruce have a competitive edge over the less tolerant shrub species. In these situations, a light fire simply results in more spruce. Severe fire or frequently recurring fires are necessary to kill the seeds in the spruce cones and prepare a suitable seedbed for other species. Then the value of the site to most species of wildlife is enhanced.

2. Wildlife Response to Fire

a. Moose - Moose were formerly more abundant within virtually all portions of this planning area. Quality and quantity of moose browse in much of the area appears to be deteriorating and until fire or other disturbances are permitted to occur, overall carrying capacity for moose will not significantly increase. Fire suppression activities have interrupted the natural fire regime in much of the area to the overall detriment of moose and other species dependent on early forest seral stages.

Moose populations usually increase following fire due to increased production of high quality browse in the burned area. However, if the moose population has declined for reasons other than poor habitat, moose may be slow to utilize new habitat created by burning and numbers may not increase dramatically. Under these circumstances the remaining moose have little trouble obtaining sufficent browse without utilizing the new burn. Use of a burned area will depend largely on whether it is situated in an area traditionally used by moose or through which they migrate. Dispersal to new areas may be slow. If, however, a fire occurs in an area where the moose population is near carrying capacity of the range, then competition for food and social pressures between individuals will result in more rapid exploitation of new habitat created by a fire. The use of burned areas by moose is also related to the amount of available cover. Fires of moderate size or large fires that contain numerous unburned inclusions enhance the edge effect resulting in better moose habitat, compared to extensive severe fires.

b. Caribou - It appears that caribou may not be adversely affected by fire to the degree once believed. The short-term effects of fire on caribou winter range are mostly negative. These include destruction of forage lichens, reduced availability of other preferred species in early postfire succession, and temporary alterations in caribou movements. However, forage quality of vascular plants will be improved by fire.

Long-term effects are generally beneficial. Light fires may rejuvenate stands of lichens with declining production. Fire helps maintain diversity in vegetation type, replacing old forest stands where lichens have been replaced by mosses, thereby initiating the successional cycle which leads to the reestablishment of lichens. Fire creates a mosaic of fuel types that naturally precludes a series of large, extensive fires that may be devastating to caribou habitat. Caribou are nomadic and each herd has historically utilized a range much larger than necessary to meet its short-term food needs. Thus, effects of fire upon the forest system can be accomodated and may be essential to prevent large severe fires which burn huge portions of a herd's range and result in lowering of range carrying capacity.

c. Dall Sheep - Winter range, lambing areas, and mineral licks are critical elements of Dall sheep habitat. Because the vegetative cover found on sheep range does not carry fire well in most cases, fire normally does not play a significant role in sheep population dynamics. However, in some areas where fire has occured on sheep range, the plant response appeared beneficial and sheep utilization of the area increased. Additionally, under some circumstances, fire may enhance sheep range by depressing treeline in areas where the boreal forest has encroached on alpine habitat.

d. Bison - Wildfires are extremely beneficial to bison. A portion of the present habitat is maintained primarily by river erosion and flooding. However, fire has the potential for greatly improving and expanding bison habitat away from the floodplain. The grasses and forbs that are the mainstay of their diet quickly reestablish after a fire. Burning serves to stimulate new growth and remove the mat of old material, causing earlier green-up. In addition, an extensive, severe fire may result in a long lasting grass stage, by killing sprouting trees and shrubs, and tree seeds.

e. Black and Grizzly Bears - Black and grizzly bears are both benefited by fire, responding in much the same way as do their prey species. Both are omnivorous, and fires increase the availability of both plant and animal foods. Blueberries, cranberries, and soapberries increase following fire, particularily in upland areas. Moose calves are important in the diets of both the black and grizzly bears in the springtime. Early stages of plant succession tend to increase moose production, therefore, more calves are available as prey. Small mammals are more readily available and play an important role in bear diets during the snow-free months. The grizzly, in particular, should benefit from increased large rodent populations following fire, although this is speculative and not proven. Because black bears make extensive use of lowland marshy areas during spring, fires ocurring in such areas should be considered beneficial for this species.

f. Upland Game Birds and Small Game Mammals - Upland game birds and small mammals are also herbivores and, as such, generally benefit from the increased forage and diversity created by fires in the boreal forest.

Sharp-tailed grouse prefer the open, shrubby areas created by fire over the dense forest. In the absence of fire, sharp-tailed grouse frequent the open muskeg bogs; however, openings created by fire apparently are preferred and are not nearly as limited. Sharp-tailed grouse extensively utilize young burns both for foraging and for essential reproductive activities such as "lekking" (display activity on communal dancing grounds). Since the onset of fire suppression sharp-tail numbers have declined dramatically.

Ptarmigan summer habitat is high elevation alpine areas that have extremely low fire occurrence. However, fires near treeline could increase ptarmigan nesting habitat by removing spruce trees that are encroaching on alpine tundra sites. Since most ptarmigan migrate to lowland areas for the winter months where their primary winter foods are young willow and birch, fires in the boreal forest can improve habitat for ptarmigan.

Spruce grouse appear not to be benefited by fires because of their preference for mature coniferous forest habitat. Changes in habitat that affect availability and suitability of nesting areas, brood rearing areas, feeding places, or roosting sites would significantly impact spruce grouse.

Snowshoe hares normally prefer older stands of black spruce and thick alder tangles during lows in their 10-year cycles. During population highs, however, hares will use even severly burned areas. Hares normally use open areas during summer months when their diet consists largely of herbaceous plants and leaves from low shrubs which are more abundant and nutritious on recently burned sites. Small fires or large fires with numerous unburned inclusions of black spruce or other heavy cover should provide optimal habitat for hares.

g. Aquatic Furbearers and Waterfowl - When fires occur in riparian (streamside) areas and marshes, they can be beneficial to muskrat, beaver, goose, duck, and swan populations. Without fire, ponds will usually be filled in by marsh vegetation. Organic matter accumulation will then favor the establishment of shrubs and trees. Fire rids marshes of dead grass, sedges, and shrubs and thereby tends to open up dense marsh vegetation to a degree that suits feeding waterfowl. Burning also stimulates the growth of new shoots which are of greater forage quality. Beaver benefit from the increase in willow production around lakes. Fire can have a short term negative impact when it occurs during nesting or molting periods.

Fire is also an important factor in the maintenance of marsh systems. In dry summers, peat marshes can burn down to the point where new bodies of water are created. Burning also alters the insulative effect of old marsh vegetation and allows solar heat to penetrate and alter the marsh subsurface where permafrost or ice lenses are prevalent. Subsequent melt-outs can result in new ponds and altered vegetative cover.

h. Terrestrial Furbearers - The furbearers other than beaver and muskrat are carnivorous and tend to respond to fire in a manner similar to that of their primary prey populations. Some predators such as lynx are very specific, concentrating their efforts toward securing snowshoe hares. Others, such as the red fox, are less specific and are able to thrive on a variety of prey species such as rodents, hares, birds, and even fruits and berries at certain times of the year.

Because of their extremely large home ranges, wolves should not be adversely affected by fires of small or moderate size and will derive benefits from such fires as habitat conditions develop that favor prey species. Extremely large fires in caribou winter range, however, may cause changes in caribou migration routes and choice of wintering areas. In that case, wolves would also be forced to disperse or switch to alternate prey species.

Fire probably benefits wolverine in most cases because ample food sources are apparently their key habitat requirement.

Red foxes have been characterized as animals of open grasslands and low shrubs, subsisting primarily upon rodents and hares. Red foxes should benefit in the first 10 to 20 years following fire, during which the numerical response of red-backed and meadow vole populations is apparent.

Lynx appear to prefer the same habitat types as snowshoe hares, their primary prey. Fires which benefit hares by increasing browse production in association with adequate cover will also benefit lynx. Numerous small fires with numerous unburned inclusions should create optimal conditions for hares and lynx.

There is a common assumption that all fires are detrimental to Pine marter populations because intense fires remove large trees which provide denning habitat. However, the presence may expand the food base for marten. Food preferences are broad and marten are not dependent upon a particular prey species. Mice and voles constitute the main source of food, along with birds, squirrels, and berries. The frequently voiced assuption that martens depend heavily upon red squirrels probably is not valid in Alaska.

Large fires that result in extensive replacement of mature spruce with aspen and birch are decidedly detrimental to marten. Marten usually abandon these sites. However, the mosaic created by small fires or fires with unburned inclusions of spruce probably benefit marten populations more than they harm them. Cover and denning sites are retained in the unburned portions, while nearby openings created by fire become important foraging areas.

Both the least and short-tailed weasel benefit from the increased prey abundance that usually follows burning.

Coyote populations are benefited by fires that result in many openings within the boreal forest or which result in replacement of forest with grassland.

i. Small Mammals and Birds - Fires either immediately benefit most small mammals or cause only temporary declines in their populations. Because vegetative recovery enormously increases available biomass on burned areas, population declines are more than compensated for in a short time. Red-backed voles, a species known to inhabit mature black spruce forests, will quickly exploit newly burned areas adjacent to mature stands of black spruce. Meadow voles often will begin using such a burned area in about the third year. Peak rodent densities in one study occurred 7 to 16 years following fire, when environmental conditions could be tolerated by both red-backed and meadow voles. The implications of these observations are that predators largely dependent upon rodents will derive maximal overall benefits from a fire during that period of rodent abundance.

Although most small mammal species thrive best in early seral stages of vegetation, a few, like the red squirrel and flying squirrel, are adapted to old-age coniferous forests. These squirrels are dependent on white spruce for food and cover, and would be adversely affected by fire.

The habitat requirements for passerine birds varies greatly. Some like the pine grosbeak are specialized seed eaters that prefer spruce forest. However, most species frequent younger seral stages of vegetation and are most abundant in areas of greatest plant diversity. All burned areas will not be the same age nor size in an area with a history of fire, nor will conditions in same age burns be the same because of differences in prefire vegetation and fire severity. This presents a diverse vegetative mosaic that will support a wide spectrum of bird life. Extensive stands of black spruce, on the other hand present a rather narrow set of environmental conditions which restricts the number of bird species which can inhabit such areas.

Studies of songbirds in relation to fire in the north are scarce; however, one study (Klein, 1963) graphically demonstrated some of the changes that can occur following fire in the boreal forest. After burning of a white spruce forest in Alaska in 1948, only 19 birds of 7 species were seen during 20 hours of observation. By 1957, 9 years later, nearly 200 birds of 19 species were seen, but by 1961, 13 years later, only 16 species were observed. Woodpeckers were well represented because of insects in the fire-killed spruce.

j. Raptors - Hawks, owls, eagles, and falcons generally benefit from fire. Small raptors that feed on mice and voles benefit most rapidly, since the herbaceous vegetation that is preferred by these small rodents returns to a burned site quickly after a fire. Raptors that specialize in preying on hares, grouse, and ptarmigan benefit the most when shrubs and sapling trees invade the burned site. Small fires or large fires with many unburned inclusions would generally be best because of the vegetative mosaic that would result. The sharp-shinned hawk is probably the only raptor in Alaska that might be adversely impacted by fire. These hawks forage in the scrubby, open black spruce muskegs and prefer spruce trees for nesting sites. Other raptors are not nearly so restrictive in their foraging and nesting requirements. Golden eagles, great gray owls, great horned owls, boreal owls, goshawks, and hawk owls will nest in conifers, but neither require them nor necessarily prefer them. Kestrels, hawk owls, and boreal owls nest in tree cavities created by nesting woodpeckers. Burning produces standing dead trees that are readily utilized by woodpeckers, flickers, and other hole nesting species. Other raptors such as short-eared owls and harriers forage and nest in grassy meadow situations which are usually created and maintained by fire.

k. Fish - Fire effects which can directly impact fish populations are increased siltation, altered water quality (D.O., pH, suspended and dissolved solids, total hardness, turbidity) and water temperature changes. Indirectly any alteration of the nutrient flow which adversely affects aquatic organisms or a reduction in emergent insect production will also affect fish populations, at least temporarily.

The extent of surface erosion after a fire will depend on the topography and soil type of the immediate area. Very little surface erosion normally occurs on burned sites in portions of interior Alaska with gentle topographical features. Thus stream siltation is usually negligible. Siltation becomes more of a problem in steep areas and when heavy equipment is used to supress the fires.

The available data concerning postfire effects on stream temperatures and stream production capabilities is inadequate at this time to accurately assess the effects of fire on productive salmon streams. Certainly inappropriate fire suppression activities could have detrimental effects to salmon streams by blocking migration for returning spawners with debris, logs, and so forth.

E. THREATENED AND ENDANGERED SPECIES AND OTHER RARE SPECIES

1. Animals

Under the Federal Endangered Species Act, as amended (16 USC 1531-1543), five species of animals, all birds, are listed as endangered in Alaska. They are as follows:

1. Eskimo curlew *Numenius borealis*
2. Aleutian Canada goose *Branta canadensis leucopareia*
3. Arctic peregrine falcon *Falco peregrinus tundrius*
4. American peregrine falcon *Falco peregrinus anatum*
5. Short-tailed albatross *Diomedea albatrus*

The State of Alaska also recognizes the same five species in its Miscellaneous Game Regulations Number Three booklet, dated July 1, 1982.

Of the five endangered birds, only the peregrine falcons may occur in the Copper Basin Fire Planning Area. Parts of the area have been carefully inventoried for peregrines or their nests. The route of the oil pipeline, the proposed Susitna Dam location, and the major rivers have received the most inventory emphasis. No peregrines have been found. Nevertheless, occasional reports of peregrine falcons, usually undocumented, have been made. The important thing to note is that no known peregrine falcon nests or designated critical habitat exists in the Copper River Basin.

No threatened species are listed for Alaska.

2. Plants

No plants in Alaska are listed as either threatened or endangered at the present time. However, over 30 species are currently listed on a Notice of Review for possible listing after additional study. Federal agencies in Alaska normally treat Notice of Review listed species as threatened or endangered.

Three taxa proposed for threatened status (Murray, 1980) have been located within the planning unit. Two of the taxa occur on dry sites, *Papaver alboroseum* is found on high, well-drained alpine ridges and *Smelowskia borealis* var. *villosa* occurs on calcereous screes at high elevations. The third taxon, *Montia bostockii* is found in wet, alpine sedge-grass-forb meadows and in the moist centers of frost scars. The low fire potential in these areas minimizes the risk of destruction by fire and the inaccessibility or unsuitability of the areas precludes their consideration as staging areas for fire equipment or personnel. Although conflict between the occurrence of these plants and fire operations is unlikely, their presence should be noted.

F. HUMAN VALUES AND ACTIVITIES

1. Wilderness

Wrangell St. Elias National Park and Preserve contains the designated wilderness within the planning area. As a natural ecosystem process, fire will maintain characteristics associated with wilderness areas. The opportunity for primitive recreation and solitude will be enhanced. Conversely, the use of bulldozed firelines would be inappropriate in wilderness areas. X

2. Cultural/Historic Resources

Cultural resources are the prehistoric and historic evidence of human activities. In addition to physical remnants, cultural resources can be found in oral accounts and customs passed down through the generations, and in lifestyles and lifeways that continue to be lived. Because fire suppression is only a recent activity in Alaska, most cultural values, especially lifeways, have evolved in fire dependent environments. Some aspects of the cultural heritage in the planning area have been significantly influenced by fire, since fire has played a major role in the vegetation and wildlife resources that substantially contribute to those lifeways, customs, and cultural styles.

The planning area contains a variety of known cultural resources, including archeological sites thousands of years old, native cemeteries, former community sites, and travel routes associated with native and pioneer heritage. Evidence of more recent human settlers includes cabins, roadhouse sites, telegraph lines, mines, trails, and tools and equipment associated with European explorers and settlers (Appendix C).

Although some surveys have been done and others are ongoing, only a relatively small portion of the planning area has been extensively investigated for cultural resources. Until surveys can be completed, all cabins and other remains must be considered culturally valuable.

In assessing the impacts of fire and fire suppression activities on cultural resources, it is advisable to draw a distinction between surface and subsurface resources. Surface resources are primarily historic in nature and tend to be constructed of flammable materials. Natural processes of deterioration have not operated long enough to level structures. Subsurface resources are primarily prehistoric and archeological, and tend to consist largely on non-flammable material because natural processes of deterioration have eliminated most organic matter. Furthermore, subsurface resources tend to be much less visible than surface resources because structures have been leveled and the material covered by vegetation.

a. Effects of Fire - Information concerning the effects of fire and fire suppression activities on cultural resources is scanty. Some information has been gathered concerning fire effects in the lower 48 states, but any attempt to generalize from this data to radically different conditions in Alaska would not be appropriate. Nevertheless, logic and reason would seem to indicate that surface historic structures are subject to severe effects from fire itself. Organic materials used in construction are likely to be damaged or destroyed as a result of burning. Subsurface resources are much less likely to be significantly affected by fire. In a severe fire, organic material such as bone, ivory, and wood that is present in the soil matrix will be destroyed.

Intense heat is also likely to fracture and otherwise damage non-organic material such as ceramics and chipped stone. Because of well-developed vegetation mats and generally moist soils, fire in this region does not usually burn extensive areas to mineral soil. Therefore, severe impacts to subsurface cultural resources are very unlikely. Much of the planning area is known to have burned in the past. Evidence of such burning has been observed on several archeological sites that have been excavated, apparently with no evidence of severe impacts from the fires.

b. Effects of Fire Suppression - The possibility of damage to surface cultural resources from fire suppression activities is relatively slight. This is particularly true of standing historic structures which can be easily observed, even by untrained individuals. Consequently it is likely that most suppression activities such as fireline and camp construction can be located so as to prevent impacts to surface cultural resources. Surface sites such as lithic scatters will be disturbed by fireline construction and similar ground disturbing activities.

Subsurface cultural resources are more likely to be damaged by suppression activities, particularly fireline construction. Such resources are difficult to observe, particularly in regions such as the Copper River area where well-developed vegetation mats obscure them, increasing the likelihood that such sites will not be discovered until after they have been disturbed.

3. Visual Resources

The effect of fire on the visual resource is primarily beneficial but can be adverse in areas of high visual sensitivity. In general, areas of high visual sensitivity correspond to major travel corridors and population centers. Wildfire is an integral part of the ecological process that maintains or enhances natural visual diversity. In the short-term, a small fire (up to 50,000 acres), blackens an area creating sharp visual contrast and possibly visual interest. Extremely large, severe fires (over 50,000 acres) with few unburned or less severely burned inclusions, create large expanses of blackened landscape which are monotonous and result in reduced visual impact on some users (viewers), although others will view the scene positively, or make no value judgement. Even large burned areas may create a pleasing visual effect once vegetation regrowth has begun.

Fire suppression can cause highly adverse damage to visual resources. Short-term impacts are generally acceptable unless viewed from observation positions such as highways, high use areas, or scenic overlooks. Long-term impacts are unacceptable and are usually a result of bulldozed firelines. Bulldozers disturb the organic mat and expose mineral soil, creating distinct unnatural lines across the landscape, and sharp color contrast that may take decades to disappear.

4. Air Quality

The inevitable fate of vegetation is decomposition and eventual incorporation into soil. During a very short period of time while a fire is burning, processes of oxidation and chemical transformation occur which are similar to those that slowly occur in decomposition, with the concurrent production of some materials that go into the atmosphere and are eventually returned to the vegetation system. There is a great chemical similarity between the products of combustion of forest fuels and the products of decay. A summary of emissions (figure 1) from forest burning indicates relatively large amounts of carbon dioxide, water, particulates, and carbon monoxide. Lesser amounts of hydrocarbon and nitrogen oxides, and essentially no sulfur oxides are produced from forest fires (Martin, 1976).

There are substances, termed and regarded as "pollutants", which emanate from forest burning and enter the atmosphere. Carbon Dioxide (CO_2) and water (H_2O) emissions are not considered pollutants. Carbon Monoxide (CO) is toxic and lethal concentrations of CO have been found in the active part of some fires. High CO concentrations at the fire site decrease rapidly in a direction toward ambient conditions. The burning of forest fuels contributes only 1/600 of the total CO emitted from other natural sources. Unsaturated hydrocarbons (HC) of low molecular weight are related to Los Angeles-type photochemical smog. Hydrocarbons known to be photochemically reactive are present in woodsmoke but, with the exception of ethylene, in very small amounts. Hydrocarbons are extremely widespread in the plant world in volatile oils, waxes, and resins. The most prevalent HC in the atmosphere is methane (marsh gas) which originates primarily from the decay of organic material. The relative importance of HC emitted from forest fires, as far as photochemical smog is concerned, appears to be negligible. Nitric oxide (NO) is also regarded as an important pollutant because of its involvement in photochemical smog processes which may produce

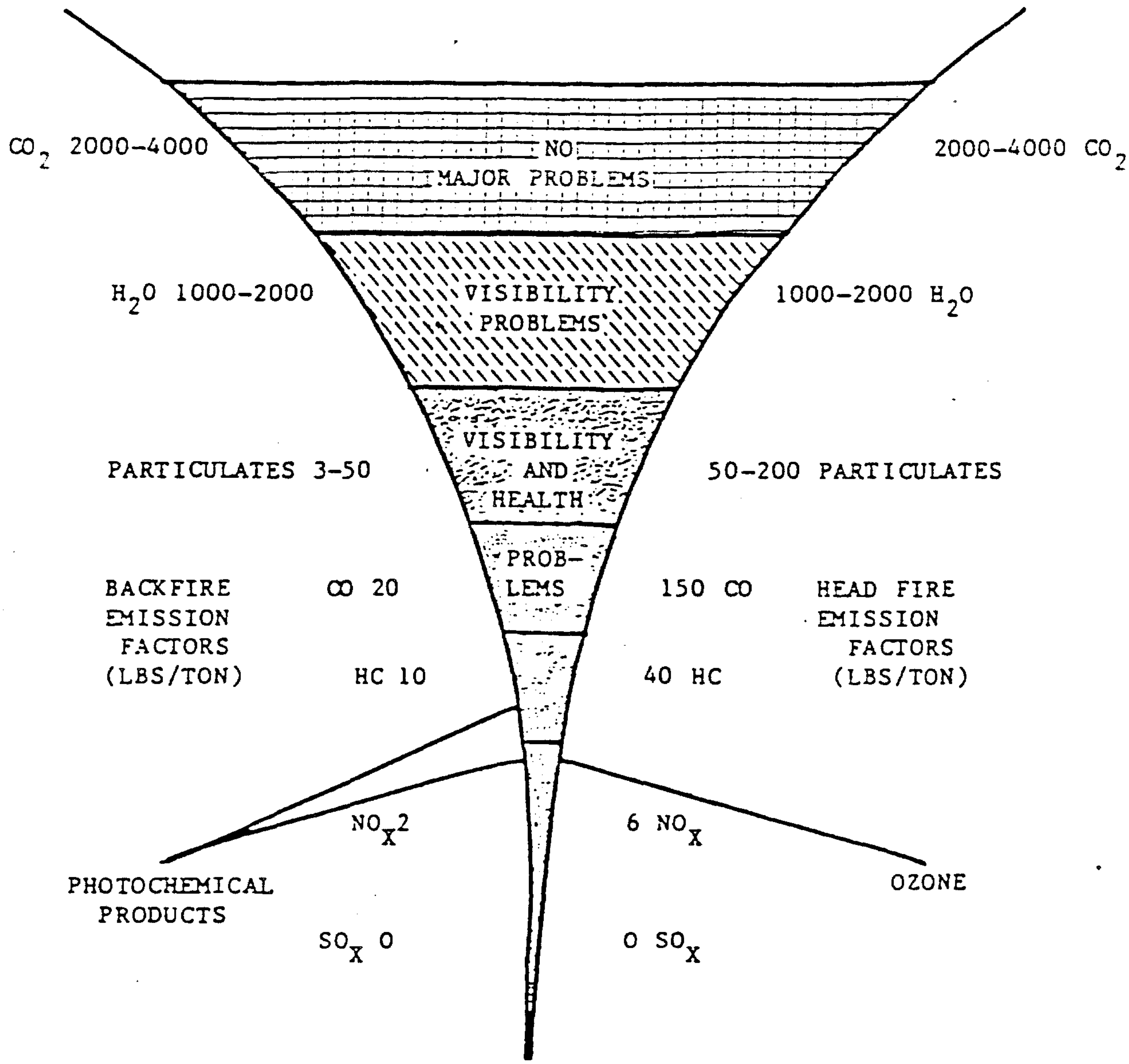


Figure 1 Range of emission factors from forest burning. Because difficulties in sampling and the complexity of the problem, estimated levels of emission factors may vary greatly from these data. (Figure is adapted from that of P. W. Ryan, Southern Forest Fire Laboratory, USDA Forest Service, Macon, Ga. Figures for emissions of carbon dioxide, water, and particulates have been modified.)

damaging compounds such as ozone (O_3) and peroxyacylnitrates. NO is not a combustion product, but forms when air is heated higher than 2800°F. On a global basis, natural production of NO, mostly by soil orgainsms, exceeds man's production by 15 to 1. Forest fires are an insignificant source of NO. There is no evidence that the emissions from combustion of forest fuels are a threat to human health (USDA Forest Service 1976).

The visible column of smoke from a forest fire contains a lot of water, very small aerosols of organic matter, and some unburned carbon in finely divided form. The water condenses on the particulates, forming a cloud of water droplets. The total accumulation of particulates or aerosols from burning wood is very small in comparison with that emanating normally from forests. The principal valid objection to the burning of forest fuels as regards particulate pollution is the temporary interference with visibility. Military, commercial, recreational, and even fire detection and suppression aircraft activities can all be adversely affected by smoke. However, data from the Alaskan interior indicate that smoke conditions severe enough to impact aircraft (visibility reductions to six miles or less) do not occur to the extent generally assumed (refer to Table 1). Yearly occurrences of heavy smoke range from an average of three days per year at Big Delta (not in planning area) to 0.4 days per year at Gulkana. Even when heavy smoke is present, it is seldom (less than 40%) so severe as to exceed the Visual Flight Rule (VFR) weather minimums for aircraft within a control zone airspace and rarely (less than 15%) exceeds VFR minimums for areas outside of control zone airspaces. The historical occurrence, extent, and duration of heavy smoke in the interior of Alaska indicates that the problem is minimal.

X 5. Recreation

Types of recreation in the area include hunting, fishing, recreational trapping, camping, hiking, boating, cross-country skiing, dog sledding, berry picking, gold panning, photography, mountain climbing, nature study, and wildlife viewing. Also automobiles, busses, aircraft, snowmobiles, and ATVs are used in recreational pursuits.

As with other human activities, most recreation is centered around major access routes and population centers. The most intense use is concentrated along roads.

Rivers, lakes, and airstrips concentrate use to a much lesser extent. Few recreation activities occur away from major access points, with the exception of hunting.

Fire promotes vegetation and wildlife diversity which can enhance recreation opportunities in both short and long term. Negative effects of fire on recreation generally are short-term and are directly related to fire effects on specific resources used in recreation. Effects on visual and cultural resources, wildlife, and vegetation will have immediate and direct effects on use of these resources for camping, sightseeing, hunting, and other activities. Recreation users are generally mobile, thus, if recreation is precluded by fire in one area, they generally can find an alternate area in which a similar recreational activity can be pursued. However, smoke thick enough to limit aircraft flights could result in impact on recreational and commercial activities.

TABLE I

OCCURRENCE OF HEAVY SMOKE CONDITIONS

ation Name	Number of years of data	Total number of smoke days (2)	Yearly av. number of smoke days (2)	Total number of days visibility was limited by heavy smoke by distance class (miles) (1)					Occurrence of heavy smoke conditions in Interior Alaska
				0-1/8	3/16-3/8	1/2-3/4	1-2 1/2	3-6	
g Delta	24	71	3.0	1	1	1	22	46	
lkana	20	7	.4	-0-	-0-	-0-	1	6	
rthway	21	29	1.4	-0-	-0-	1	10	18	
tal Number of noke Days		107		1	1	2	33	70	
of total umber of noke-days distance lass				.93	.93	1.87	30.85	65.42	

(1) Heavy smoke - visibility reductions to 6-miles or less.

(2) Smoke day - Any day in which smoke, haze, or smoke and haze was reported at any one of eight tri-hourly observations for the given station.

V.F.R. weather minimums for airports within a control zone airspace are a 1,000 foot ceiling and 3-mile visibility.

V.F.R. weather minimums for aircraft operations outside of the control zone airspace are "clear of clouds" and 1-mile visibility.

6. Economy

Due to lack of significant fires and organized crews, fire and fire suppression activities have had a minimal effect on the economy of the Copper River planning area in the past 10 years. The State of Alaska currently employs about 14 people, 2 full-time, 12 seasonal. Equipment, aircraft, and support services are procured occasionally. Contracting of aircraft services can be an important source of income for local air charter companies, especially in fire monitoring activities.

A busy fire season can have a significant impact on village economies, especially with the plan through the Department of Natural Resources to organize and train crews in the Copper River Area.

Fire can affect sport hunting and subsistence as well as trapping activities by altering wildlife habitat, with increases or decreases in associated species.

7. Forestry

The region exhibits a potential for small commercial harvesting of standing timber stocks. Present inventory of the region indicates roughly 25 percent of the area is covered by forest. The U.S. Forest Service has estimated that 287,000 acres of the timber crop is of commercial grade, with 303.8 million cubic feet of growing stock and a board-foot volume of 1,159.6 million feet. Additionally, a non-commercial stratum was examined that had substantial standing volume but did not meet the growth criteria for commercial forest land. This stratum contained 152,800 acres with a volume of 157.9 million cubic feet. There are small timber sales in the planning area that are conducted by the Department of Natural Resources, BLM, and Ahtna Native Corporation. The timber harvested in these sales is used locally for house logs, saw timber, and fire wood. Also timber within Wrangell Saint Elias National Park and Preserve is used for firewood and by permit for house logs. The mountain ranges surrounding the Copper River Valley rise abruptly from the plateau confining most timber stands including non-commercial, to a 5 to 25 mile wide band along the larger rivers. The only exception is the Lake Louise area extending northwest to the Talkeetna Range and Alaska Range foothills. Within that area are many acres of the non-commercial, poorly drained, black spruce sites so typical of much of interior Alaska.

Of the units inventoried both by area (76%) and volume (85%), white spruce is predominant. Aspen is next, followed by cottonwood, with no birch type, although scatterings of birch are found mixed with other types. The best and highest volume stands are found along the Klutina River; other good stands are on river-bottom terraces and levees adjacent to the Copper, Chitina, and Tazlina Rivers.

Although the various broadleaf species have different potential lifespans, they are all managed on a 70-year rotation under natural conditions. After the age of 70 or 80 years, broadleaf species are very susceptible to fungal decay, primary cause of mortality. Although white spruce is capable of surviving for over 300 years, few stands reach this age, because overstocked or old stands tend to develop heavy fuel loading which make them susceptible to fire.

Fire protection increases the probability that commercial forests will reach their full rotation ages. However, some commercial size stands are so small in area and inaccessible that fire protection is not justified.

Effects of Fire - All commercial forest species in interior Alaska germinate and grow best on mineral soil in open sunlight. Because seedling success is quite low on organic seedbeds or under shaded conditions, fire provides optimum conditions for both hardwood and spruce seedlings.

Aspen and birch are very susceptible to damage from fire because of their thin bark. White spruce and balsam poplar have thicker bark and may survive light surface fires. Most fires will result in prolific sprouting from roots and stem bases of aspen and birch, while balsam poplar sprouts to a lesser degree. All species are generally killed by severe fires which destroy their shallow root systems. However, these fires create the seedbed which permits the reestablishment of hardwood stands from seed and the replacement of decadent white spruce stands.

Many species of wildlife such as moose, beaver, and sharp-tail grouse benefit from the effects of forest fires. Generally, the animals that subsist on browse, hardwood buds, and bark benefit from forest fires.

8. Subsistence and Lifestyle

The residents of the Copper Basin fire planning area have lifestyles and lifeways oriented to the outdoors. Fishing, hunting, and gathering activities provide much of the food needs of rural residents. However, the degree of dependency upon the natural resources of the area varies considerably, ranging from those who lead a truly subsistence lifestyle to those who supplement their income by hunting, trapping, and fishing.

In recent years moose hunting has provided a source of meat to supplement the needs of rural residents. Presently moose occupy most of the planning area and are frequently found in areas adjacent to population centers or in areas where access is available. Additionally, moose hunting produces an important cash income to local guides, sporting goods stores, and service-oriented businesses by meeting the needs of hunters from urban areas of Alaska and nonresidents.

Historically, people living in this planning area have relied more heavily on caribou to meet many of their domestic needs. The Nelchina and Mentasta caribou herds occupy extensive ranges throughout the planning area and are accessible to most basin residents during various portions of the year. The summer range of the Nelchina caribou herd includes portions of the Alaska Range, the Talkeetna Mountains, and the Alphabet Hills.

Fall hunting usually entails the use of aircraft or all-terrain vehicles, although a number of caribou are taken off the Denali Highway and Lake Louise Road. The Nelchina caribou winter range extends from the Lake Louise flats to Slana along the Copper River. During the winter caribou are accessible along the major road systems and by snowmachine. The Mentasta caribou herd is primarily located along the western slopes of the Wrangell Mountains and extends north across the Copper River to the Mentasta Mountains. The Mentasta herd is hunted during the fall along the Nabesna Road and also by airplane and ATV along the base of the Wrangell Mountains.

Black bear hunting provides food, recreation, and economic value during a time of year when most hunting seasons are closed. Most black bears are hunted in spring and early summer. During the fall, bears frequent the good berry producing hillsides and are often taken incidental to other hunting activities. More than 50 percent of the bears harvested are taken by local residents and are used for food.

Grizzly bears are rarely eaten and most of the harvest is by sport hunters. Some are killed as nuisance or in defense of life and property. There is a considerable amount of guiding activity in the planning area, which in turn generates fees that are used towards the management of other species.

The Copper River bison herd is hunted by the local residents more than the Chitina herd because it is more accessible by airplane or boat. The Chitina herd is in a more remote area accessible only by air. The meat is a highly valued food supplement.

Dall sheep are numerous in mountain portions of the planning area. Extensive areas of sheep habitat are inaccessible except for airplane, horse, or backpack travel. Most sheep are taken by sport hunters and supplying the needs of these hunters is a major income source to the basin. However, sheep are taken for subsistence use by many locals where roads and trails make walk-in hunts feasible.

Migrating waterfowl play a small part as food supplement for residents of the planning area. There is a small amount of recreational and subsistence hunting of waterfowl on the ponds and lakes along the road system. Waterfowl reared in this area do contribute to the migratory species that provide recreational hunting opportunities for many throughout the United States and Canada.

Grouse, ptarmigan, and hares are also used locally as important supplements to other food sources. Usually these species are readily available and easily caught in snares or shot. Most are used to augment food needs; however, sport hunting has increased throughout the area. Hares are also used as dog food and as bait for traps. Although the hides are fragile they are sometimes used for mittens and garments, and occasionally the pelts are sold commercially.

Trapping is a major source of income for a few families residing in the planning area, and an income subsidy for others. Marten, fox, mink, coyote, lynx, beaver, and muskrat are the furbearers of greatest importance to local residents. Trapping effort depends on both abundance of the furbearers and the prices being received for the various pelts. Many pelts are retained for local domestic uses such as mittens, hats, and garment trim. Carcasses of lynx, beaver, and muskrat are frequently used for human or dog food. All are usable as trap bait.

Lynx and fox are the economic mainstay of most trappers in the area. Because of the importance of lynx and fox in the local economy, factors that influence their abundance must be carefully evaluated.

The wolf and wolverine are also highly valued furbearers. However, wolves and wolverine are more difficult to trap and occur at lower densities than do other furbearers. Consequently, the harvest remains relatively low.

III. FIRE MANAGEMENT INFORMATION

A. HISTORICAL FIRE ROLE AND OCCURRENCE

Fire occurrence in the Copper River Basin follows the general pattern found throughout the boreal forest region of the northern hemisphere. Fire plays a dominant ecological role in the establishment and appearance of the expansive forests of this region. Indeed, the greatest testimonial to the past fire history of the Copper River Basin is in the forest itself, where a complex mosaic of forest types indicate where fires have previously burned. This broad mosaic can be seen from nearly any vantage point in the basin.

The earliest records of exploration by western man contain evidence of the magnitude of fire occurrence during the exploration era of this region. The journals of Canadian explorer-authors W.H. Davies (1843) and A.P. Low (1896) contain references to numerous large fires. These writers attribute large areas of burned forest to the Native population, who were known to start fires to enhance hunting, to kill insect pests, and to kill timber for firewood. Carelessness with camp and cooking fires was also a leading cause of wildfire.

Almost all early explorers reported encountering forest fires. William R. Abercrombie in his journal of the Copper River Exploring Expedition (1898) described large fires in the vicinity of Klutina Lake. He stated "the entire valley seemed to be on fire, which made traveling through the timber very dangerous, as the falling trees were liable to injure man or beast if they did not stampede the entire pack train."

On his journey to the Tanana River in 1898, E.F. Glenn traveled through the country north of the Tazlina River. He reported, "We entered what we called the 'burned district' which seemed to extend as far as the country is visible toward the Copper River and to the northward almost to the Alaska Range."

plenty fires!

With the discovery of gold in the Klondike and copper in the Chitina valley, white men began to bring in their own brand of carelessness. The Copper River Valley was a principal route from the coast to the gold fields of the north. Construction of the Copper River and Northwestern Railroad (CR&NWRR) and the Valdez to Eagle telegraph further aided the rapid spread of civilization. With this influx of white men in the Copper River country, an increase in the incidence of man-caused fire was inevitable. There appeared to be a widespread belief that fires were "good for the land." Intentionally set fires became more common for reasons that included increasing moose browse and grass production, to kill mosquitos, and to make prospecting easier. Fires due to carelessness also increased. Railroad and construction fires, debris burning, campfires, and tobacco smoking were additional causes of fires.

Although there is only fragmented information available about the number and extent of fires during the period from the turn of the century until the advent of fire control, there were several fires of notable proportions. They include:

1. The 1915 Sourdough Hill Fire, which was presumably set by sparks from the CR&NWRR. It burned from Chitina to the Kennecott River and from the Chitina River to the mountains on the north; 384,000 acres were burned.

2. The 1915 Kenecott Fire was intentionally set to kill timber so as to provide fuel-wood for sale at the Kennecott mine; about 64,000 acres were burned.

3. The 1927 Willow Creek Fire was started by construction crews and burned between the Copper River and Tonsina River with the Richardson Highway as the western boundary; 128,000 acres were burned.

4. The 1947 Tazlina Fire burned 125,000 acres from Tazlina Lake to the Glenn Highway. The cause is unknown.

From 1939 until 1945, fire control in Alaska was the responsibility of the Alaska Fire Control Service of the U.S. General Land Office. In 1946 the Bureau of Land Management became the responsible fire control and record keeping agency.

The first complete records available are of the 1953 fire season. The lack of efficient communication is evident in these early reports. Much of the fire suppression responsiblility fell upon local "Per Diem" guards who independently oversaw firefighting activities in their area. The dedication and fortitude of such men as V.J. "Judge" Henderson and Fred Rungee were the main factors in keeping fires of this area within manageable limits.

Improved communication and equipment in the 1960s aided in more efficient initial attack and most fires were suppressed when they were small. However, notable exceptions were the Ahtell Creek fire in 1967 which burned 2,200 acres on both sides of the Tok Highway and threatened the community of Slana and the 1969 Kenny Lake Fire which burned 1,830 acres and several buildings. Both fires were man-caused.

In 1979, the State of Alaska acquired fire protection responsibility from the Bureau of Land Management. In June of 1981, the Wilson Camp Lightning Fire burned 13,000 acres on the western slopes of Mt. Drum - 8,000 acres the first day - and threatened to jump the Copper River between Glennallen and Copper Center.

B. FUELS

The fuels in the Copper River Basin are similar to those in much of Alaska and contribute to similar fire behavior and problems. The majority of the fire-prone areas are typified by complexes of fine fuels, both living and dead, which react rapidly to changes in relative humidity. They are capable of rapid drying, even after substantial rainfall. Fuel beds are often continuous, with few breaks. Deep organic mats allow fires to be carried beneath the surface, increasing the possibility of hold over fires and the difficulty of mop-up.

Black spruce and white spruce are often associated with these fuel complexes and contribute to additional fire behavior considerations. Spruce trees (especially black spruce) often have branches growing near the ground and retain a large number of dead branches. These dead fuels form a vertical ladder that easily carries a surface fire into the crowns. The problems associated with crown fires are increased when the spruce grow in dense stands with closed canopies, forming a continuous fuel bed above the ground. In addition to crowning, spotting ahead of the main fire is a common problem in spruce stands. The embers are lofted as crowns burn, and are carried by the wind to points ahead of the main fire.

Fuels under broadleaf stands and tall shrub scrub communities do not create the same problems; because they are not as dense, they usually do not burn as readily and crown fires are rare. Fires occur in this fuel type after snowmelt but before green-up in spring, then again after leaf drop in the fall. However, the potential for suppression problems does exist after periods of extensive drying.

A third important fuel type in the planning area is tussock tundra. From a fuels and fire viewpoint, the tussock tundra is essentially a grassland. Virtually all of the burnable material is small diameter and loosely packed dead grass and sedges. This fuel wets and dries very rapidly, burns quickly, and because there is typically a substantial amount of fuel, the fires can be remarkably intense when burning under dry, windy conditions. This situation presents a set of suppression problems unique to the fuel type. Line building may be questionable and is certainly time consuming because of the commonly deep layers of organic material. For the same reasons, mop-up is slow and tedious. Because the dead grass fronds are retained on the tussocks, this fuel type is ready to burn any time the area is snow free, and even beyond that under the right circumstances.

Elevations above 3,000 feet form effective barriers to fire spread because they generally do not support enough vegetation to carry fire. Extensive high elevation areas in the Wrangell Mountains, Chugach Mountains, Talkeetna Mountains, and the Alaska Range are unvegetated and form natural firebreaks. Major, wide rivers such as the Copper, Susitna, and Chitina form natural, but not invincible, firebreaks as well.

C. SUMMARY OF FIRE OCCURRENCE BY MANAGEMENT UNIT

The Copper Basin Planning Area has been divided into 11 fire management units. Their boundaries generally follow ridges, highways, or major rivers as shown in Figure 2.

Summaries of information from old fire reports and other records have been made for these management units and appear in the tables on the following pages. These summaries cover the years 1956 through 1978.

The Copper Basin is a unique area in that it experiences continental climate and has fuel types similar to the interior, but has a much lower incidence of lightning-caused fires. Less than six percent of all fires were caused by lightning and only three of the management units had 10 percent or greater lightning-caused incidence (see Table 2).

One-third of the fires in Unit E-1 were lightning-caused but only three fires were reported during the period studied (see Table 3). Unit E-5 had 15 percent

COPPER BASIN INTERAGENCY FIRE PLAN

MANAGEMENT UNITS

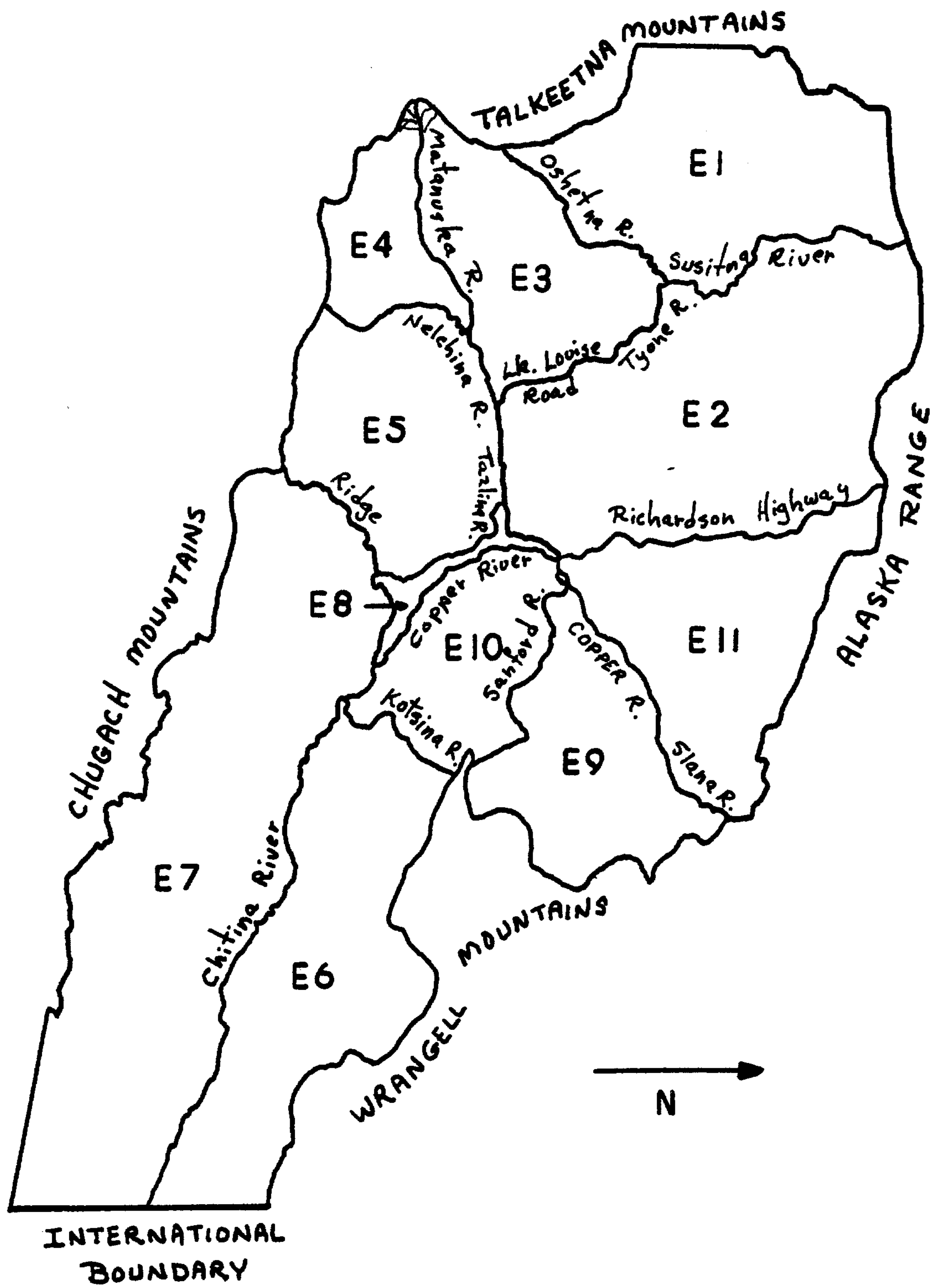


Figure 2

Table 2

Man- and Lightning-Caused Fires by Month
(1956-1978)

Number of Fires	April	May	June	July	Aug.	Sept.	Oct.	Other 1/	Total
Man	19	92	136	102	94	89	14	4	550
Lightning	0	0	4	24	4	1	1	0	34
% Lightning by Month	0	0	2.9	19.0	4.1	1.1	6.7	0	5.8

1/ November through March.

Table 3

Total Number of Fires and Acres Burned by Cause
(1956-1978)

Management Unit 1/	Number of Fires/Acres Burned			
	Lightning	%	Man-Caused	%
1	1/1	33/8	2/12	67/92
2	4/87	7/25	54/255	83/75
3	5/116	9/44	50/150	91/56
4	2/2	6/1	31/291	94/99
5	7/102	15/76	41/32	85/24
6	---	0/0	16/118	100/100
7	3/2	8/1	36/135	92/99
8	3/0	1/0	214/4598	99/100
9	1/10	5/1	21/2557	95/99
10	2/4	8/13	26/31	92/87
11	6/702	10/19	59/3069	90/81
Totals	34/1026	6/8	550/11248	94/92

1/ See Page 29 for map delineating management units.

lightning incidence and E-11 had 10 percent during the same period. From 1956 to 1978 the largest lightning-caused fire burned 700 acres, but in 1981 lightning caused the 13,000 acre Wilson Camp Fire, the largest fire in the planning unit during the recording of fire history. The coastal transition zone which is represented by Unit E-6 and the eastern 80 percent of Unit E-7 had no lightning-caused fires.

Although the overall lightning-caused incidence was quite low, lightning did account for nearly 20 percent of all fire starts during the month of July.

Only about 0.06 percent of the entire Copper Basin Planning Area was burned by wildfire during the 23 year period of record (see Table 4).

Over 94 percent of the 584 fires reported from 1956 through 1978 were man-caused. This includes the four fires that burned more than 1,000 acres. Most of these were roadside fires near the population centers. Incidence also increases with distance from the major mountain ranges with the exception of the Mentasta Pass area. Management Unit E-8, which covers the road network from Gakona through Glennallen to Kenny Lake, had over 37 percent of all wildfire starts but comprises less than 1 percent of the planning area's land mass. From 1956 through 1978 over 2.8 percent of this unit's acreage was burned by wildfire, which is 45 times greater than the Basin average. An important exception to this pattern of roadside fires are late season remote man-caused fires, most of which are started during hunting season which usually begins in mid-August.

Monthly wildfire occurrence of all causes is relatively constant throughout the Basin for the months of May through September. June had the highest number of incidents representing 24 percent of the average season's fires (see Table 5). September has the lowest percent occurrence of these five months, with 15.4 percent. The number of fire starts is dramatically lower for the months of April and October. The remainder of the year has less than 1 percent of total fire starts. With the exception of E-1, all units had not received 90 percent of their average season's fire starts until after September 1st.

With the notable exception of the Wilson Camp Fire of 1981, all wildfires since 1956 of over 1,000 acres were started near the road network (see Table 6). The 2,500 acre Copper Canyon Fire and the 1,830 acre Edgerton Fire both burned within Unit E-8. Unit E-9 had the 2,200 acre Ahtell Creek Fire and E-11 had the 1,800 acre Bone Creek 5 Fire.

Within most management units during an average fire season, 90 percent of the fire acreage is burned by the end of July. Exceptions include E-2 and E-6 which reach the 90 percent level in August, E-4 in September, and E-1, which had only three fires in 23 years, in May. It should be noted that for each management unit except E-3 and E-11, one large fire comprised over 50 percent of all acres burned from 1956 through 1978.

D. SUPPRESSION COSTS

Annual suppression costs have been extremely variable ranging from $569 in 1962 to $2,663,791 in 1981. The Wilson Camp Lightning Fire accounted for over

Table 4

Acres and Percentage Burned Compared to the Total Acreage of Each Management Unit (1956-1978).

Mgmt. Units 1/	Acres In Unit	Acres/% Burned
1	2,062,050	13/0.0006
2	3,196,522	342/0.0107
3	1,324,846	266/0.0201
4	627,091	293/0.0467
5	1,586,965	134/0.0084
6	2,368,145	118/0.0049
7	4,482,024	137/0.0031
8	162,852	4598/2.8234
9	1,295,726	2567/0.1981
10	986,272	35/0.0035
11	1,684,092	3771/0.2239
TOTAL	19,776,585	12274/0.0621

1/ See Page 29 for map delineating management units

Table 5

Fire Occurrence by Month
(1956-1978)

Management Unit[1/]	April	May	June	July	August	September	October	Other[2/]
1	0	2	0	1	0	0	0	0
2	0	4	11	17	12	12	1	1
3	2	7	12	12	9	12	0	1
4	1	2	6	9	4	7	3	0
5	1	3	6	15	12	10	1	0
6	0	1	2	1	6	5	1	0
7	0	4	10	10	9	5	0	0
8	11	49	56	41	31	23	6	0
9	1	3	8	3	4	2	0	1
10	1	4	8	4	3	6	2	0
11	2	11	21	14	8	8	1	0
Total	19	91	140	127	98	90	15	3
% by Month	3.2	15.8	23.9	21.6	16.8	15.4	2.6	0.7

1/ See Page 29 for maps delineating management units.
2/ November through March.

Table 6

Total Number of Fires and Acres Burned by Fire Size Class[1]
(1956-1978)

Management Unit[2]	Number of Fires/Acres Burned							Total
	A[3]	B	C	D	E	F	G	
1	1/0	1/1	1/12	---	---	---	---	3/13
2	40/0	13/25	4/117	1/200	---	---	---	58/342
3	29/0	19/40	6/126	1/100	---	---	---	55/266
4	18/0	11/21	3/79	1/193	---	---	---	33/293
5	41/0	4/7	2/27	1/100	---	---	---	48/134
6	6/0	8/33	2/85	---	---	---	---	16/118
7	28/0	10/32	---	1/105	---	---	---	39/137
8	168/0	44/83	2/65	1/120	---	2/4430	---	217/4598
9	16/0	2/7	1/10	2/350	---	1/2200	---	22/2567
10	21/0	6/20	1/15	---	---	---	---	28/35
11	38/0	20/48	3/38	1/260	2/1625	1/1800	---	65/3771
Totals	406/0	138/317	25/574	9/1428	2/1625	4/8330		584/12274

1/ Definitions of the size classes are as follows:
Class A is less than 0.25 acre.
Class B is larger than A but less than 10 acres
Class C is larger than B but less than 100 acres.
Class D is 100 acres or larger but less than 300 acres
Class E is 300 acres to 999.99 acres
Class F is larger than E but less than 5000 acres
Class G is greater than 5000 acres

2/ See Page 29 for map delineating management units.

3/ Class "A" fires are up to 0.25 acre is size. Since individual fire statistics were rounded to the nearest acre all class "A" and some class "B" fires appear to have zero acres burned which is not the case.

98 percent of the costs for 1981. It burned from June 17 to September 16, covered over 13,000 acres, and cost $2,626,771 to suppress. For comparison, Table 7 shows annual suppression costs from 1956 through 1978. They have been adjusted for inflation with 1967 as the base year.

From 1956 through 1978 four fires accounted for 54 percent of total adjusted suppression costs. These were not the largest fires of that period, ranking third, fifth, seventh, and tenth in acreage burned. Their relatively high cost was due to heavy manning to protect dense population areas or to dependence on expensive air attack methods.

The Copper Basin has not been an area of frequent large fire occurrence. In twenty-five years of fire history (1956-1981) there have been only 16 fires of size class "D" (100+ acres) or larger. Five of these exceeded 1,000 acres (Class F - 1000 to 4999 acres or Class G 5000+ acres). These five large fires, although accounting for less than 1 percent of the incidence, comprised over 84 percent of the acreage burned.

E. SUPPRESSION RESOURCES

Wildfire protection on all lands within the Copper Basin area is provided by the Southcentral District of the State Division of Forestry. They protect Federal lands in this part of the State in return for having state lands west and north of Fairbanks protected by the BLM.

During fire season, State Forestry maintains initial attack forces at their Copper River Area Office near Tazlina and Anchorage-Mat-Su Area Office near Big Lake. These are primarily tanker forces that will be supplemented by helitack when the fire danger warrants. Retardant bases and one retardant aircraft with water scooping capability will be stationed in the Southcentral District. The Gulkana Airport can accomodate retardant aircraft.

Table 7
Suppression Costs Using 1967 as the Base Year

Year	Number of Fires[1]	Cost	÷	Adjustment Factor[2]	=	Adjusted Cost	Acres Burned
1956	23	11,903		.830		14,341	126
1957	21	31,415		.843		37,266	1008
1958	36	61,097		.866		70,551	4328
1959	11	11,084		.873		12,696	218
1960	19	21,821		.887		24,601	288
1961	10	902		.896		1,007	1
1962	7	569		.906		628	0
1963	17	24,823		.917		27,070	227
1964	11	1,690		.929		1,819	1
1965	9	2,745		.945		2,905	22
1966	22	20,720		.972		21,317	175
1967	34	37,670		1.000		37,670	2,247
1968	15	16,600		1.042		15,931	25
1969	71	637,630		1.098		580,719	2,911
1970	47	19,000		1.163		16,337	27
1971	28	171,195		1.213		141,134	365
1972	17	15,877		1.253		12,671	5
1973	23	15,256		1.331		11,462	14
1974	45	172,644		1.477		116,888	214
1975	13	19,004		1.612		11,789	22
1976	40	43,171		1.705		25,320	31
1977	20	44,870		1.815		24,722	8
1978	43	65,736		1.954		33,642	11
					Total	1,242,486	
						2,663,7[illegible]	

1. Includes false alarms.
2. Factor for 1956 was extrapolated as average change for years 1957-1962.

IV FIRE MANAGEMENT ALTERNATIVES

Refer to pages 47 through 50 for the AIFMP:TM. Also refer to Appendix D in the Copper Basin Fire Plan for map delineating management option boundaries.

V GENERAL OPERATIONAL POLICY

Refer to pages 51 through 53 of the AIFMP:TM.

VI OPERATIONAL PROCEDURES FOR INDIVIDUAL FIRE MANAGEMENT OPTIONS

Refer to pages 55 through 69 of the AIFMP:TM.

Additionally fire suppression activities are bound by cooperative agreements between the Bureau of Land Management and the National Park Service as well as the Bureau of Land Management and the State Department of Natural Resources.

VII ENVIRONMENTAL ASSESSMENT

Refer to pages 71 through 97 of the AIFMP:TM.

VIII SELECTED REFERENCES

Refer to pages 99 through 100 of the AIFMP:TM.

Selkregg, Lidia L. 1974. Alaska Regional Profiles - Southcentral Region, Volume 1. State of Alaska. 255 p.

APPENDIX A

CANADIAN INTERNATIONAL AGREEMENT

A. Synopsis. An agreement has been consummated by exchange of diplomatic notes between the US Department and Canadian Government approving an agreement signed by Minister of Indian Affairs and Northern Development of Canada and Secretary of the Interior. This agreement identifies the parties as follows: Canada - Department of Indian Affairs and Northern Development (Canadian Forest Service) and United States - Department of the Interior (BLM).

The purpose of this agreement is for cooperation of both parties in the detection and suppression of fires in the buffer zone (an area 10 miles on either side of the boundary of Yukon Territory and Alaska). Upon detection of a fire anywhere in the buffer zone, either party may commence suppression action without prior notice to the other part. However, when the fire is on land of the other party, the party that initiated suppression action will notify the other party of its action. The party that initiated the action may continue or discontinue action on the fire by giving notice to the other party of its intentions. In the event one party commences suppression action in the buffer zone and notifies the other party, the other party may appoint a laison officer charged to observe the progress and report on it or actively join the party which has commended suppression action and participate in it. Unless otherwise agreed upon a fire in the buffer zone that both parties take action on will be taken over by the party in whose territory the fire has occurred.

B. Reimbursements. There are no reimbursements between either party, thus waiving all claims on liability against each other for any loss, damage, injury, or death resulting from failure of either party to begin suppression action or discontinue action. Each party will provide its own fire control resources in suppression action with the buffer zone, and assume its costs, expenses, and liabilities without any right of reimbursement from the other party.

C. Fire Plan Operational Procedures. Where Alaska Fire plans have identified limited action areas (no initial attack) within the ten-mile buffer zone, the following procedures will be adhered to:

Intent

It is our intent to prevent all fires originating within Alaska from crossing over into Canada, unless specific written agreements between adjacent land managers/owners permit exchange of wildfire across the border.

Procedures

All fires detected within the ten-mile buffer zone will be immediately reported to the responsible protection agency. For follow-up communication with the involved land manager and responsible protection agencies, the following shall apply:

1. Fortymile Unit: AFS- FCC, follow up by Circle Hot Springs FMO

2. Copper Basin Unit: DOF, Copper River Area Office

3. Upper Yukon - Tanana Unit: AFS - FCC, follow up by Circle Hot Springs FMO

If in the professional judgment of the evaluator, the fire possesses a clear and immediate threat to burn onto Canadian lands, immediate suppression action will be taken (unless modified by specific written agreement), commensurate with other suppression priorities.

In all cases, the involved land manager will be immediately notified of actions taken and/or actions recommended.

APPENDIX B

IN REPLY REFER TO

9210(017)

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Glennallen Resource Area
P.O. Box 147
Glennallen, Alaska 99588

March 15, 1983

Memorandum

To: Area Manager, Glennallen

From: Natural Resource Specialist, Glennallen

Subject: Public Meeting on the Regional Fire Plan

On March 8, 1983, a public meeting was held at the Glennallen school to hear public comment on the draft Copper Basin Regional Fire Plan. In my view, the meeting was well advertised, but poorly attended. Because it was a small group there was not a great deal of comment, but the comments made by the public were in general agreement with the plan. No comments opposed to the plan were voiced by the public, and several comments specifically stated that moose used to be more plentiful when there were more fires.

The following is a list of attendees; please note that the last six are planning team members:

Jerome Luebke	Jeff Bedford (DNR)
George Hopson	Ray Shinn (CRNA)
Sam George	Lee Adler (AHTNA)
Fred Rungee	Jake Wright (Mat-Su)
Bob Tobey (ADF&G)	myself (BLM)

Mike Small

Copper River Native Association
ATNA' T'AENE NENE'
Drawer H • Copper Center, Alaska 99573 • Phone (907) 822-5241

BIA-83-62

MEMORANDUM

TO: Area Forester, Copper River

FROM: Forest Fire Management Plan - C.R.N.A.

SUBJECT: COPPER BASIN FIRE PLAN MEETING WITH VILLAGE REPRESENTATIVES

DATE: May 2, 1983

On April 14, 1983, Jeff Bedford, Area Forester for the Copper River Area gave an intense and detailed description of the Copper River Basin Fire Plan. Mr. Bedford discussed the Why's, Where's and What For's of the plan. The representative seem to be in general aggreement with the plan. One question asked by a representative was "Why wasn't this plan thought of before?".

Below is a list of attendee's:

Wilbur Sanford (Chistochina)
Sam George (Copper Center)
Ronnie Gene (Gakona)
Daniel Nicholai (Mentasta)
Georage Hobson (Tazlina)
Lee Adler (Ahtna)
Ray Shinn (C.R.N.A.)

RS/ap

APPENDIX C

Protection of Cultural Resource Values from Wildfire

The Alaska Land Use Council has determined that fire protection warrants a coordinated interagency approach. A uniform set of criteria for fire protection and response, and a process and schedule for completing fire management plans on lands within Alaska has been initiated. To facilitate this approach and other related activities, the Alaska Interagency Fire Management Council was organized. The Council is currently sponsoring four fire planning efforts, covering approximately 120,000,000 acres, that are to be completed by June 1, 1983. Within the next two to three years, the remaining land base will be similarly addressed.

The planning process has recognized protection requirements for cultural and historic resources pursuant to CFR 36 Sec. 800(a) for nonsite specific areas, and 800.8(a)(3) for programs designed to further preservation and enhancement of National Register or eligible properties.

Implementation of final decisions will result in a higher level of protection for cultural resources than is currently provided. Specific objectives to be accomplished are:

1. Cultural values needing protection will be identified and mapped.

2. Cultural resources will be given a relatively high value rating as compared to other resource concerns.

Background

For over 30 years, occurrence of wildfire has been treated as an emergency situation wherein full suppression was the only action taken. It has been demonstrated that the costs associated with suppressing all wildfires has reached the point of diminishing returns; that damage created by the suppression action can often be more harmful than the fire itself; and current research has documented the need for ecologically based fire management policies. This has altered the attitude of allowing strict fire suppression policies to remain intact.

Fire is becoming recognnized as a normal feature of the natural history of any area. The evolutionary development of plants and animals has occurred in a natural system where fire was a part of the environment. Human occupation of any area was also subjected to the natural fire regime, as well as increase in fire occurrence due to human activity. In Alaska, the natural national fire regime is characterized by having a return interval of 50 to 200 years, depending on the cover type and location under consideration.

This natural fire cycle has implications for cultural resources: Sites in excess of 200 years old are likely to have been burned over, and some site locations may have been burned repeatedly. Structural elements made of flammable materials have in all probability been lost. Conversely, non-flammable materials have likely been burned, but not damaged, since scientifically valid data have been excavated in recent years.

Fire Plans

The Alaska Interagency Fire Management Council is preparing Fire Management Plans for the State. These plans allow four categories of suppression:

Full Suppression - Fires will be controlled through immediate and aggressive action.

Modified Suppression - Fires will be contained unless otherwise directed by land manager/owner upon completion of an annual evaluation.

Limited Suppression - Fires will be allowed to burn with the exception of necessary action to prevent undesirable escape from the area. Critical sites within such sites will receive specific protection.

Critical Protection Sites - This designation is for those areas where fire presents a real and immediate threat to human safety and designated physical developments. Fires burning in these areas will be immediately and aggressively suppressed.

For fire protection purposes, cultural resources are divided into two classes; structural and non-structural sites:

Structural Sites are those values which stand above the ground and are made of flammable materials. Non-Structural Sites are values on or under the ground and are typically non-flammable.

Structural sites are vulnerable to damage from fire, but because they are relatively obvious, they are less likely to be endangered by suppression activity. Non-structural sites are not likely to be harmed by fire, but are vulnerable to fire suppression activities such as construction of control lines, temporary fire camps, and other activities. All fire crews will be briefed as to their responsibility for cultural resources. Illegal collecting by fire crews will not be tolerated.

Cultural resources will be protected and mapped according to the following criteria:

- Critical suppression is given to structural resources designated as National Historic Landmarks. Only protection of life or occupied homes may have a higher priority.

- Full suppression is for structures on, or eligible for inclusion on the National Register of Historic Places.

- Not sensitive is for abandoned structures that are not eligible for inclusion on the National Register of Historic Places. Protection is given to the same level as surrounding lands.

- Full suppression is given non-structural sites on the National Register. Suppression activity must be off the site. This includes any site currently being excavated.

- Avoid. No suppression activity is to take place within this area.

- The National Park Service (NPS) may wish to protect cultural resource sites on a park's <u>List of Classified Structures or Cultural Sites Inventory</u>. Sites on this list may be given the same level of protection as sites designated on the National Register of Historic Places.

Maps will be based on existing data and will be updated each winter to accommodate new information. An example of the mapping process is attached.

MAP LEGEND

INTERAGENCY FIRE MANAGEMENT PLANNING

The map legend symbols are provided on "tack back" mylar to insure all teams use the same symbols for mapping. The symbols are used to identify five broad categories of information and specific suppression standards for sensitive features. The symbols were chosen to be compatable with the digitizing/computer graphics system used on the Fortymile Area.

CATEGORY I: EXTERIOR PERIMETER OF THE PLANNING AREAS.
A set of symbols is provided to distinguish which planning area, if any, is on either side of the outer boundary lines. The symbols provided refer to:

UNPL	UNPLANNED AREAS
T/M	TANANA/MINCHUMINA PLANNING AREA
FM	FORTYMILE PLANNING AREA
CB	COPPER BASIN PLANNING AREA
K-I	KUSKOKWIM-ILIAMNA PLANNING AREA
U-T	UPPER YUKON-TANANA PLANNING AREA: Note-- A mistake in printing occurred. "UK-T" should have the "K" removed.

CATEGORY II: FIRE MANAGEMENT OPTION BOUNDARY LINES.
Large letter symbols are provided for each of the four management options: Critical (C), Full (F), Modified (M), and limited (L). These, like Category I symbols, should be placed along the appropriate side of the lines frequently enough to insure that the dispatchers remain oriented correctly.

C F M L

CATEGORY III: ALL STRUCTURES (including historically significant structures).

A small point designator symbol (✡) is to be placed on the structure site. A small letter qualifier symbol is to be placed next to the point designator to specify what level of suppression the structure requires.

✡ C	CRITICAL
✡ F	FULL
✡ N	NOT SENSITIVE

CATEGORY IV: KNOWN CULTURAL/HISTORIC RESOURCES (Not including structures). The symbol "©" is the point designator for these resources. Use the small letter qualifiers next to the point symbol to define activity level.

© F FULL

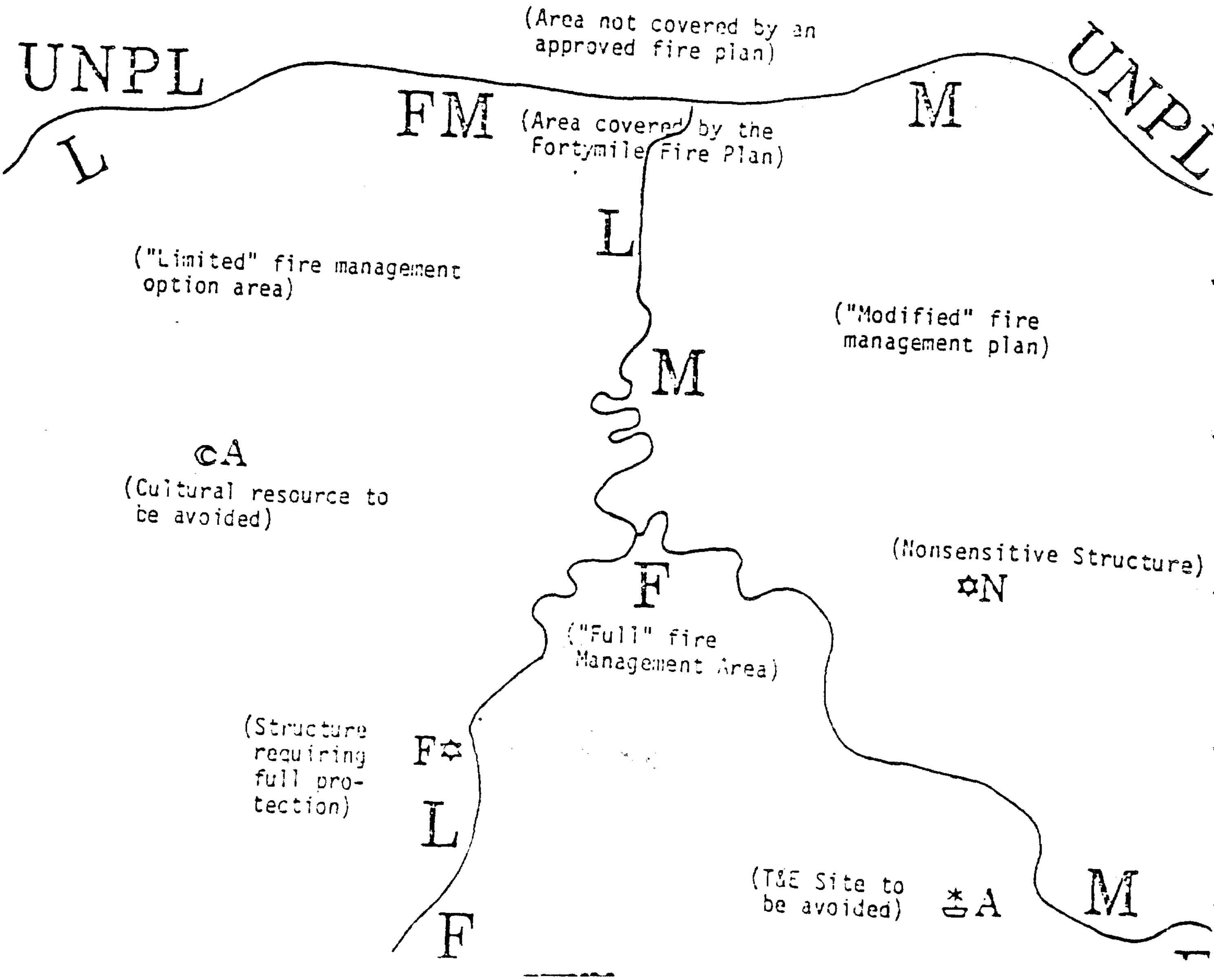
© A AVOID

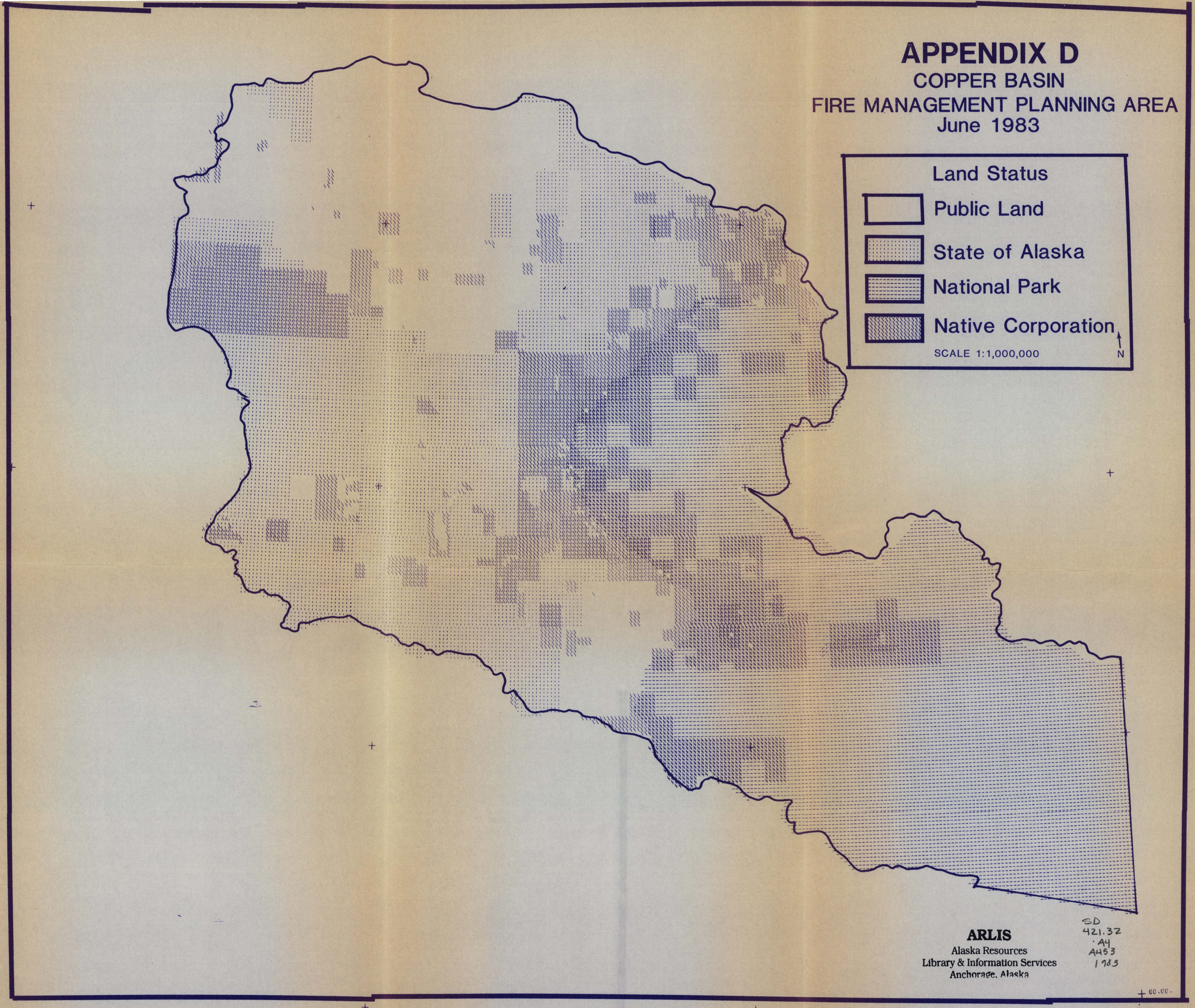
CATEGORY V: T&E SPECIES
The symbol "⛼" is the point designator for these resources.

⛼ F FULL

⛼ A AVOID

NOTE: If the maps we prepare this year are to be used next year for digitizing, then the lines drawn must be kept thin!

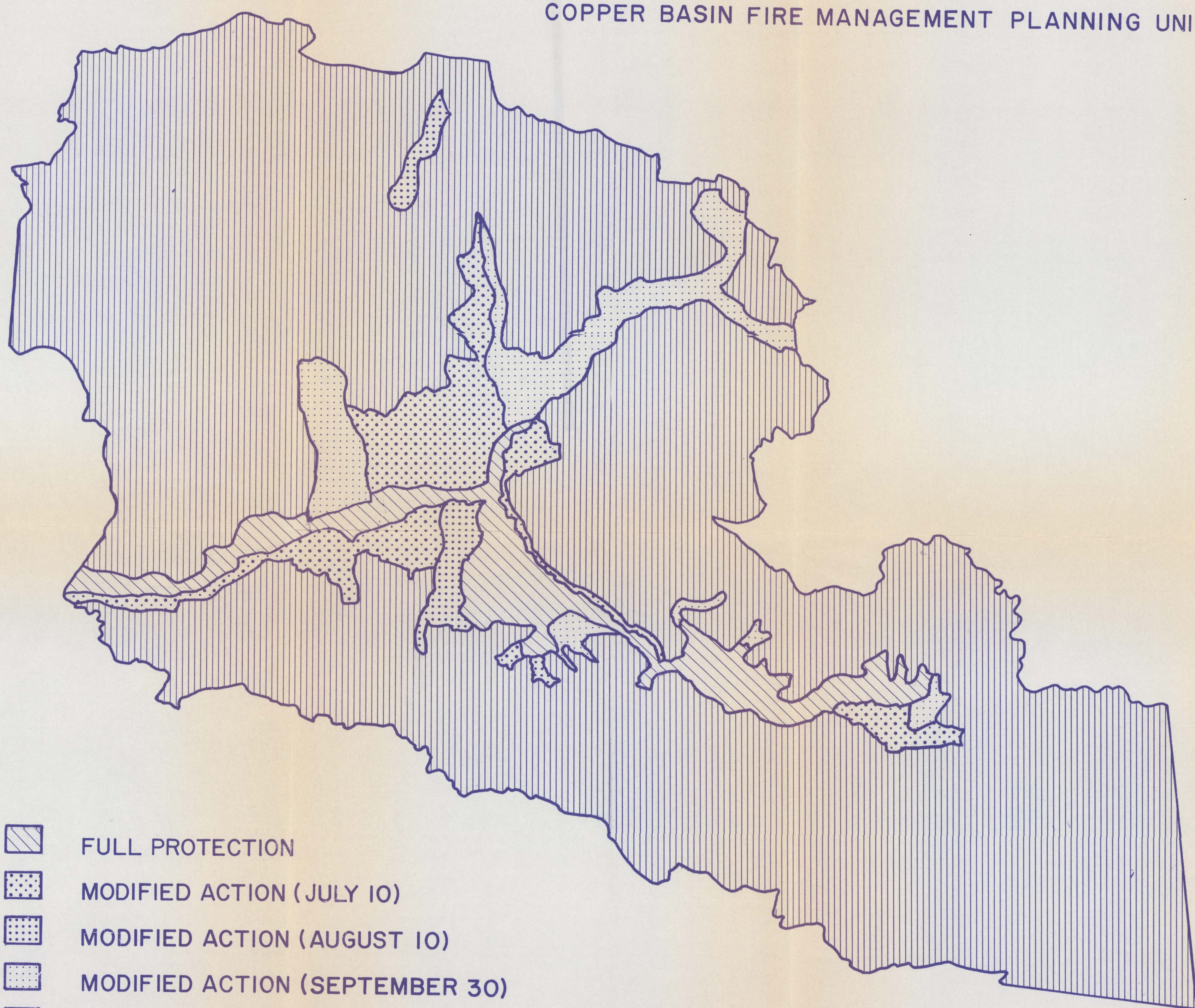




FIRE MGMT. PLANNING UNIT
COPPER BASIN
ALBERS EQUAL AREA PROJECTION
SCALE 1:1000000
06/14/83
REG39C

---LEGEND---
\ NATIVE LANDS
, STATE LANDS
- NAT. PARKS

COPPER BASIN FIRE MANAGEMENT PLANNING UNIT



FULL PROTECTION

MODIFIED ACTION (JULY 10)

MODIFIED ACTION (AUGUST 10)

MODIFIED ACTION (SEPTEMBER 30)

LIMITED ACTION

IDENTIFIED IN MAP ATLAS:

Critical Sites & Areas

Full Protection Sites (including elevated portions Trans-Alaska Pipeline)