ALASKA RESOURCES

SOUTHWEST PLANNING AREA

UNIT RESOURCE ANALYSIS

Bureau of Land Management

Anchorage District Office

Anchorage, Alaska

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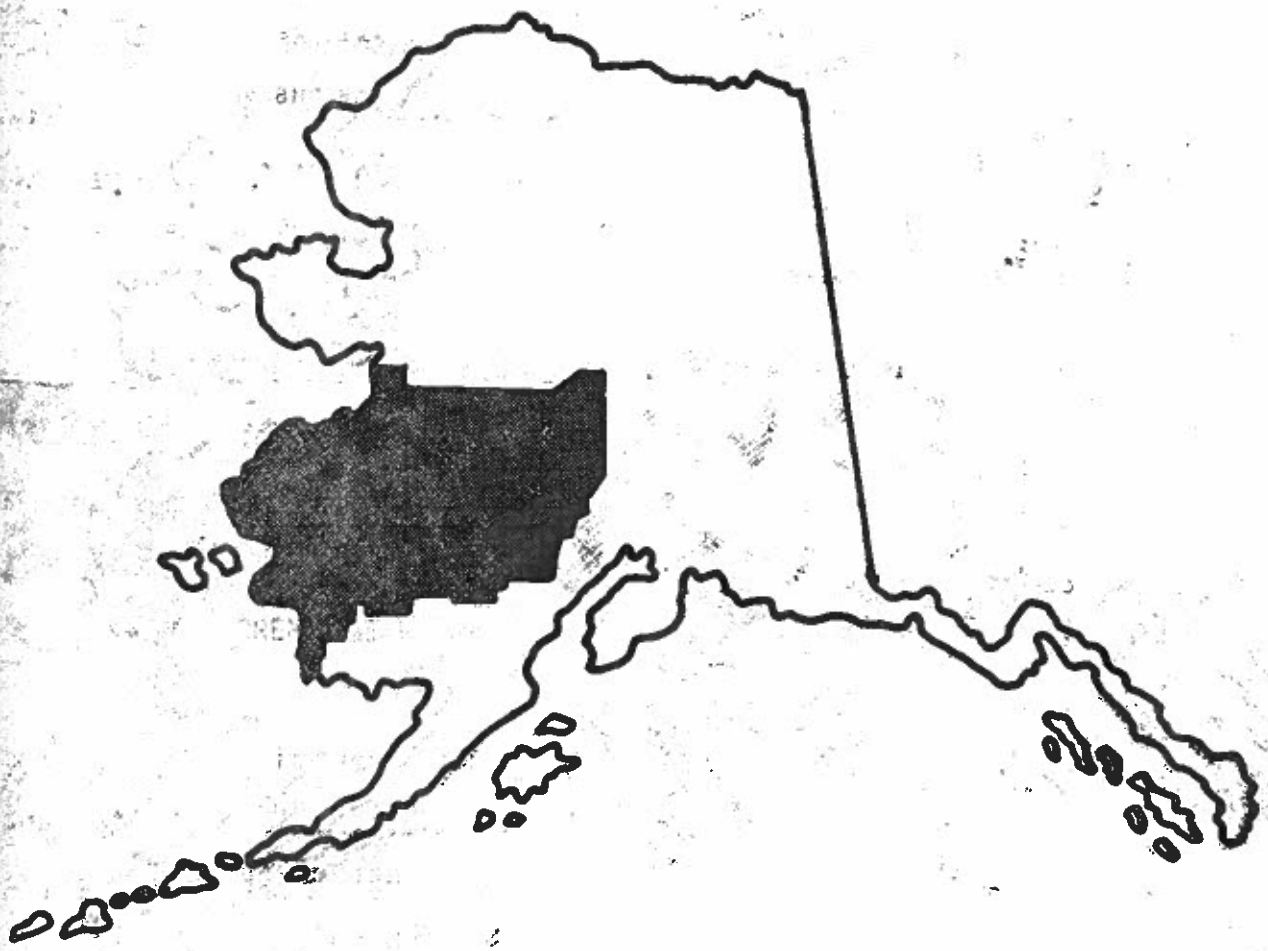

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August 1, 1981

ANCHORAGE DISTRICT OFFICE

BUREAU OF LAND MANAGEMENT

ANCHORAGE, ALASKA

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P R E F A C E

The Southwest Planning Area covers approximately 72 million acres of land in the general region drained by the lower Yukon and Kuskokwim Rivers. The Alaska Range forms the eastern border of the Planning Area, and the northern border basically follows the BLM Anchorage District boundary along latitude 64° N., from Lake Minchumina westward to Unalakleet. The southern border conforms to the McGrath Resource Area boundary, which follows the southern drainage divide of the Kuskokwim River basin. The Bering Sea forms the western border (see the URA base map for more detailed boundaries).

Land status in much of the region is still in a transitional state; however, present analysis indicates that BLM is likely to retain management of six separate planning blocks totaling about 11.6 million acres. Approximate acreage of each block is as follows:

Goodnews (1), with 312,000 acres
NYAC (2), with 429,000 acres
Anvik River (3), with 4,132,000
Sleetmute (4), with 3,700,000 acres
Lime Village (5), with 2,772,000 acres
Minchumina (6), with 327,000 acres

BLM has prepared several site-specific plans or studies for certain lands within the Planning Area. These plans include the Iditarod National Historic Trail Comprehensive Plan (in preparation); the Bear Creek Fire Burn Effects Study; the Tanana-Minchumina Fire Plan (in preparation); the Raptor Surveys and River Profiles in the Kuskokwim, Unalakleet and Yukon River Drainages, Alaska (September 1979); and A Profile of Various Rivers and their Raptor Populations in Western Alaska (1977).

The URA is divided into two main sections, the physical profile and the current situation/resource opportunities. This information, along with that provided by the Planning Area Analysis (PAA), will form the basis for formulating MFP objectives and recommendations.

PHYSICAL PROFILE

CHAPTER 1

CLIMATE

C L I M A T E

INTRODUCTION

An understanding of the climate of an area is essential for land use planning considerations. Although there can be no single climate for a region as large and varied as the Southwest Planning Area, certain general characteristics can be observed.

CLIMATIC ZONES

The Southwest Planning Area is influenced by only two basic climatic zones: the Continental, and the Transitional (figure 1-1) (Searby, 1968). There is no Maritime Zone in the Southwest Planning Area because of the cold ocean currents of the Bering Sea. The northernmost limit of the Maritime Zone is reached along the south coast of the Alaskan Peninsula and is not represented in the Planning Area. The Transition Zone of

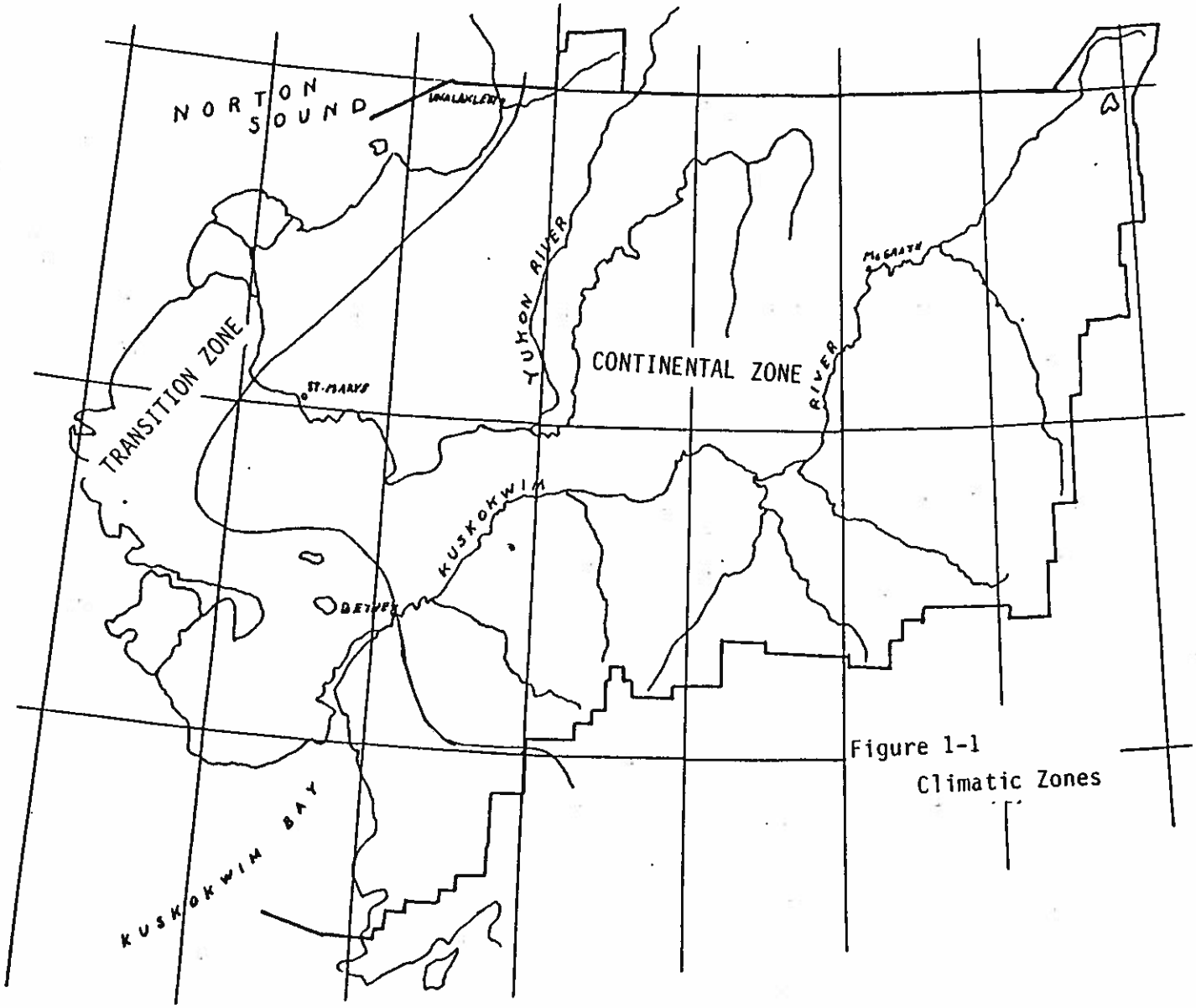

Figure 1-1
Climatic Zones

the Yukon-Kuskokwim delta experiences both maritime effects from the Bering Sea and continental effects from the interior land mass.

The Continental Zone is found inland and is affected by land mass temperatures. It is characterized by warm summers (66° to 70° F) and cold winters +6° to -20° F with a temperature range of about 90° F. The average annual precipitation is usually less than 20 inches with local exceptions. Surface winds are generally light except for areas of channeling through narrow mountain valleys.

The Transition Zone lies between the Bering Sea and the Continental Zones and may be affected by relatively warm ocean or variable land mass temperatures depending on local conditions. Temperature ranges are generally more extreme than those of an area in a Maritime Zone, but less extreme than in the Continental Zone. Precipitation is variable. Surface winds are generally light, although there are numerous exceptions. In Southwest Alaska, the Transition Zone is a narrow area inland from the coast.

The mean annual precipitation (figure 1-2) for almost the entire Planning Area is about two inches. The Ahklun Mountains near Goodnews receive about 40 inches annually.

Figure 1-3 shows the annual snowfall distribution in inches. Generally, the areas nearest the Alaska Range receive the most snowfall, 100 to 200 inches. This is followed in descending order by the Kuskokwim Mountains and Nulato Hills, 80 to 90 inches, and the lowlands and coastal areas with 40 to 70 inches of annual snowfall.

The seasonal temperature variations are depicted in figures 1-4, 1-5, 1-6, and 1-7. It can be seen by these maps that the Yukon-Kuskokwim delta and the coastal areas are warmer in winter and cooler in summer than the Continental Zone farther inland. The Transition Zone is affected somewhat by Continental factors, but is definitly influenced by the relatively constant temperature of the Bering Sea. Table 1-1 shows general climatic data for locations within the planning area.

The Continental Zone found in the interior of the planning area is influenced by land mass temperatures which fluctuate with the seasons. Therefore, the winter temperatures are colder and the summer temperatures are warmer than those of the Transition Zone.

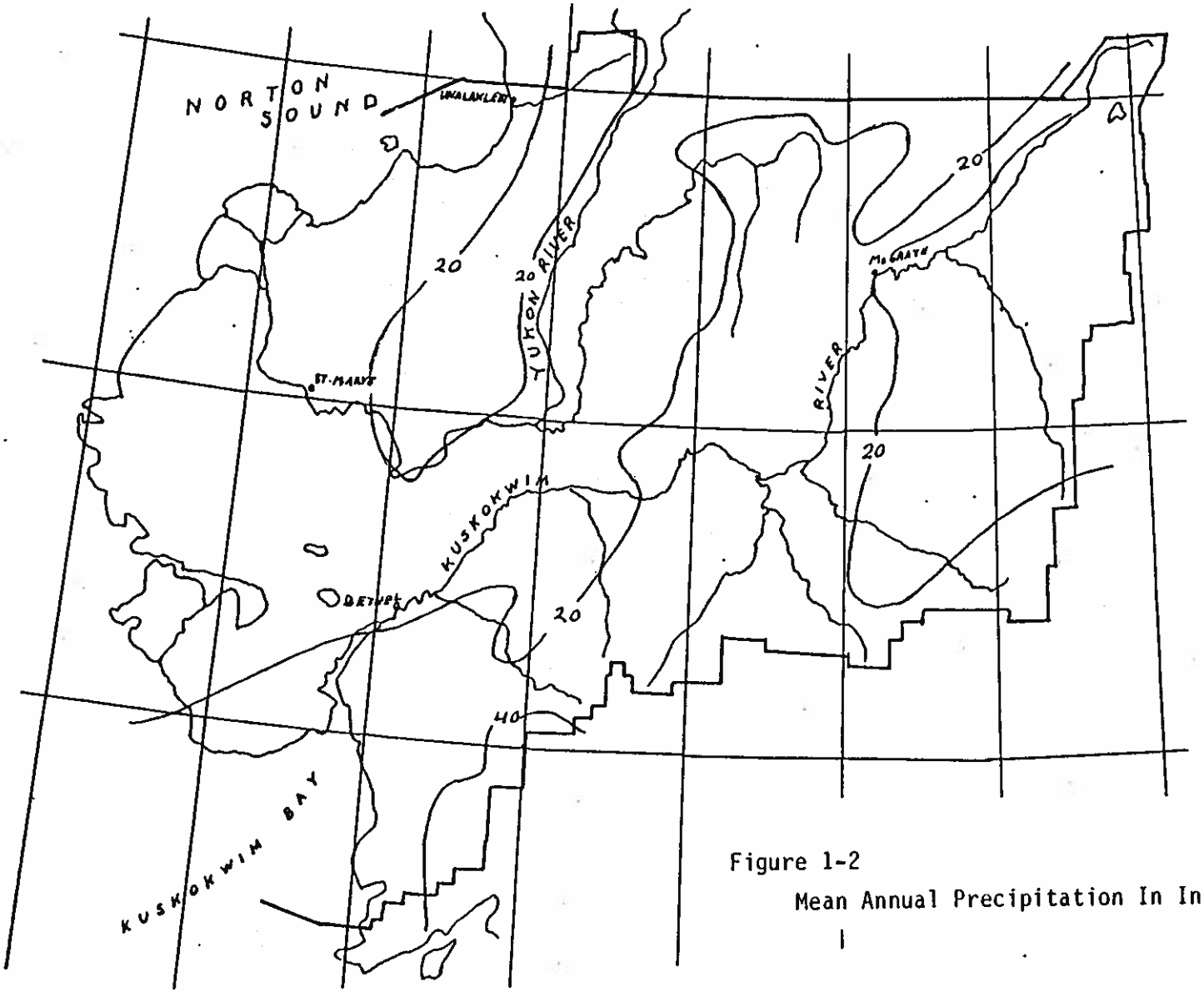

Figure 1-2

Mean Annual Precipitation In Inches

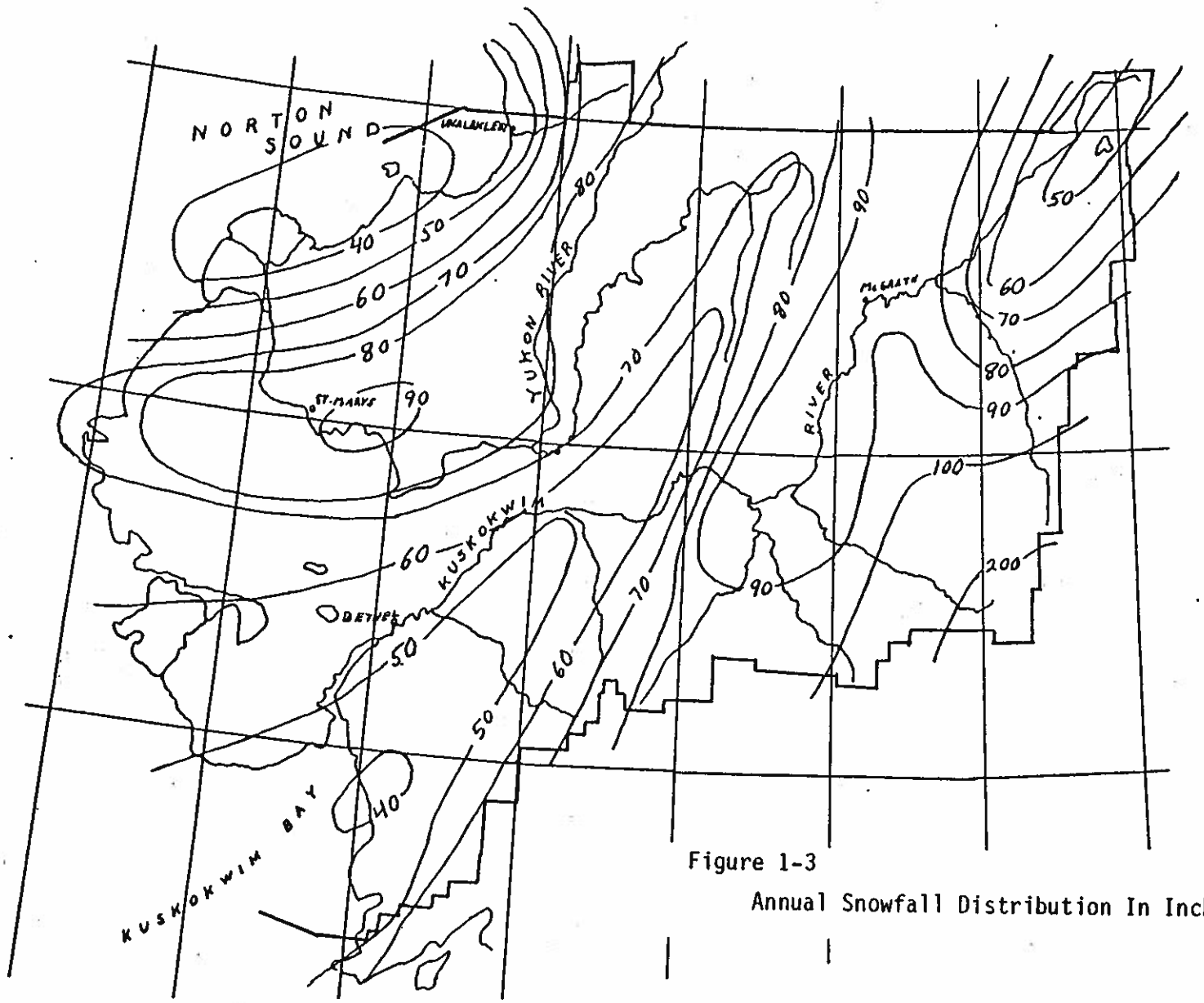

Figure 1-3

Annual Snowfall Distribution In Inches

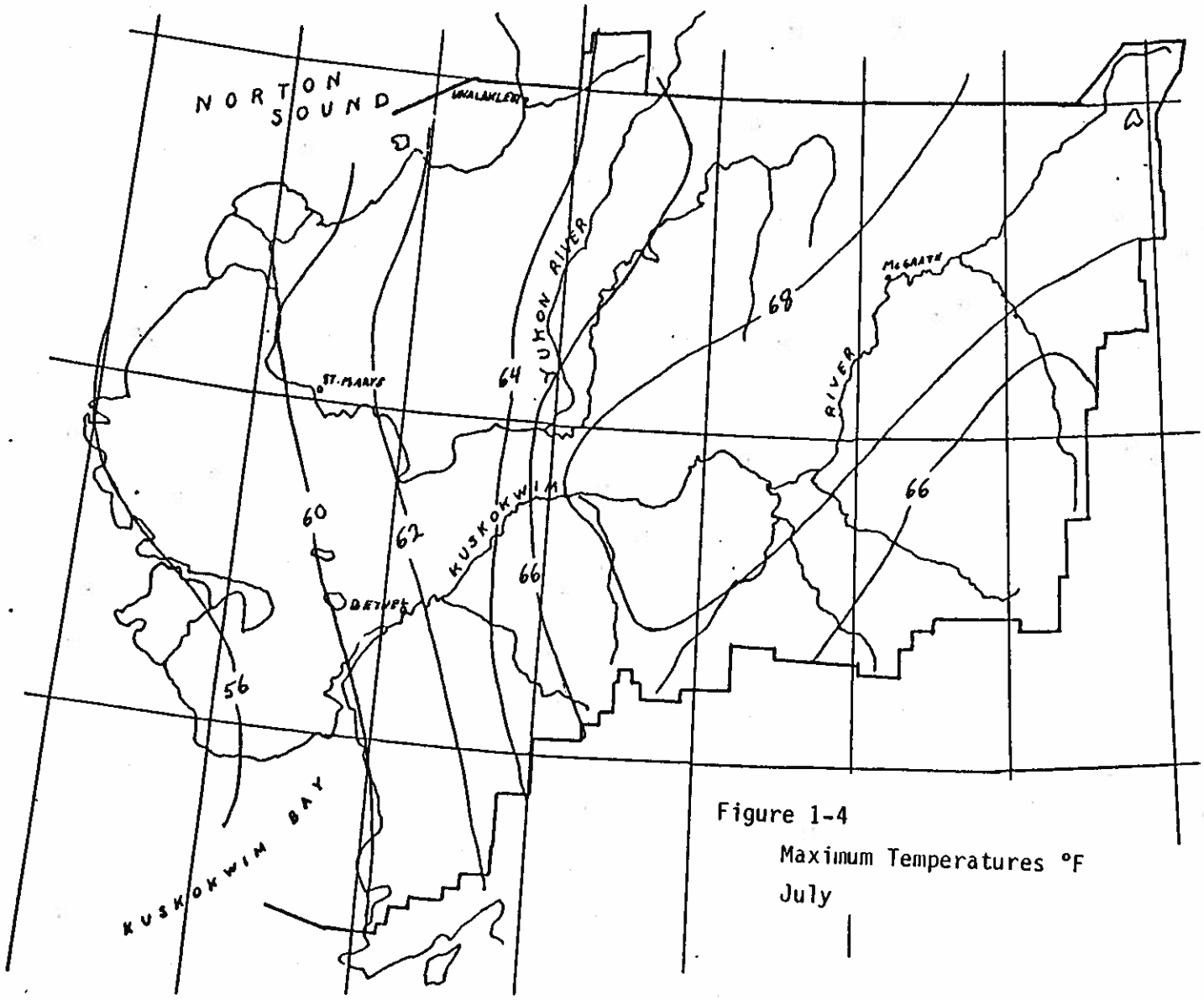

Figure 1-4

Maximum Temperatures °F

July

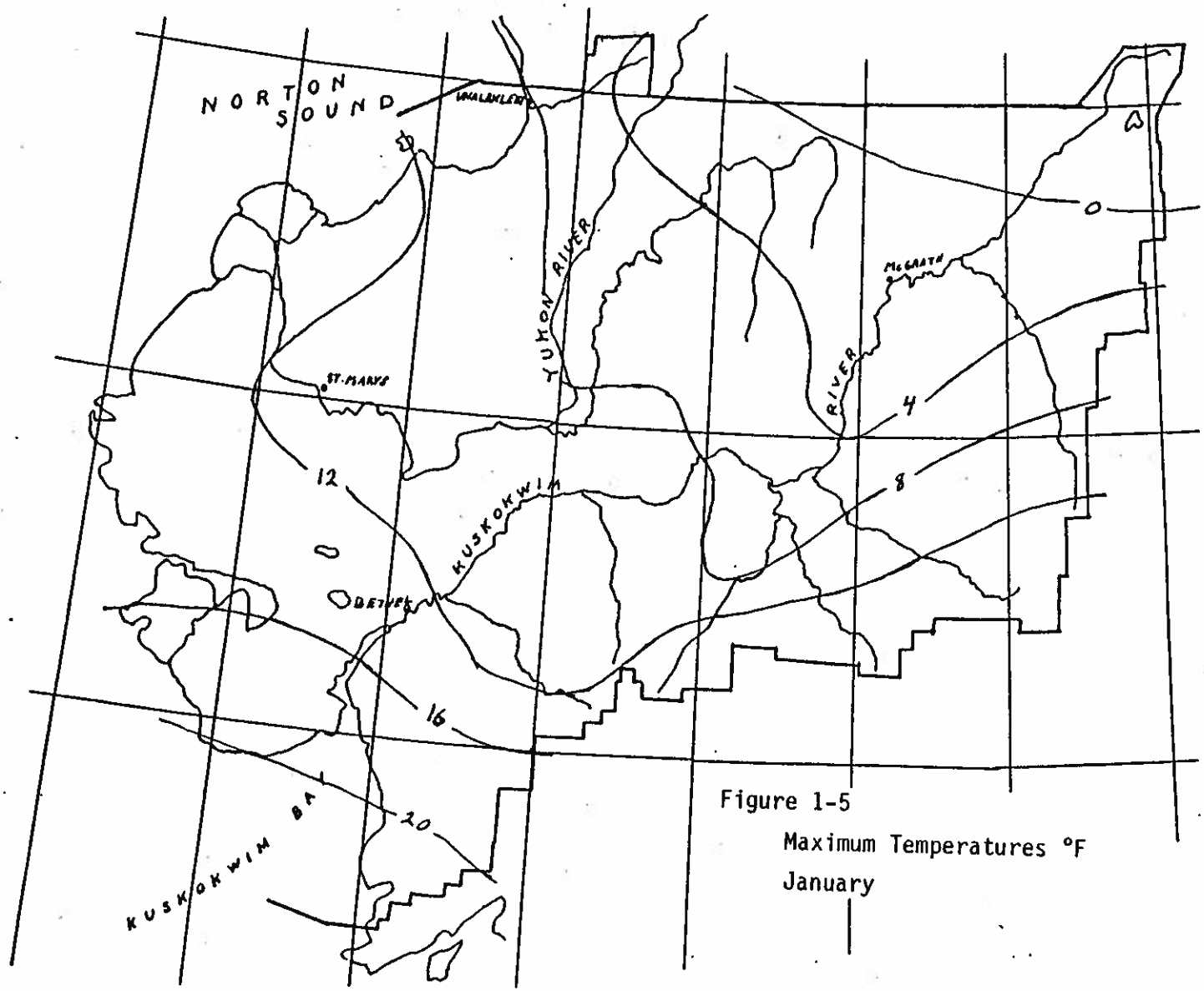

Figure 1-5

Maximum Temperatures °F

January

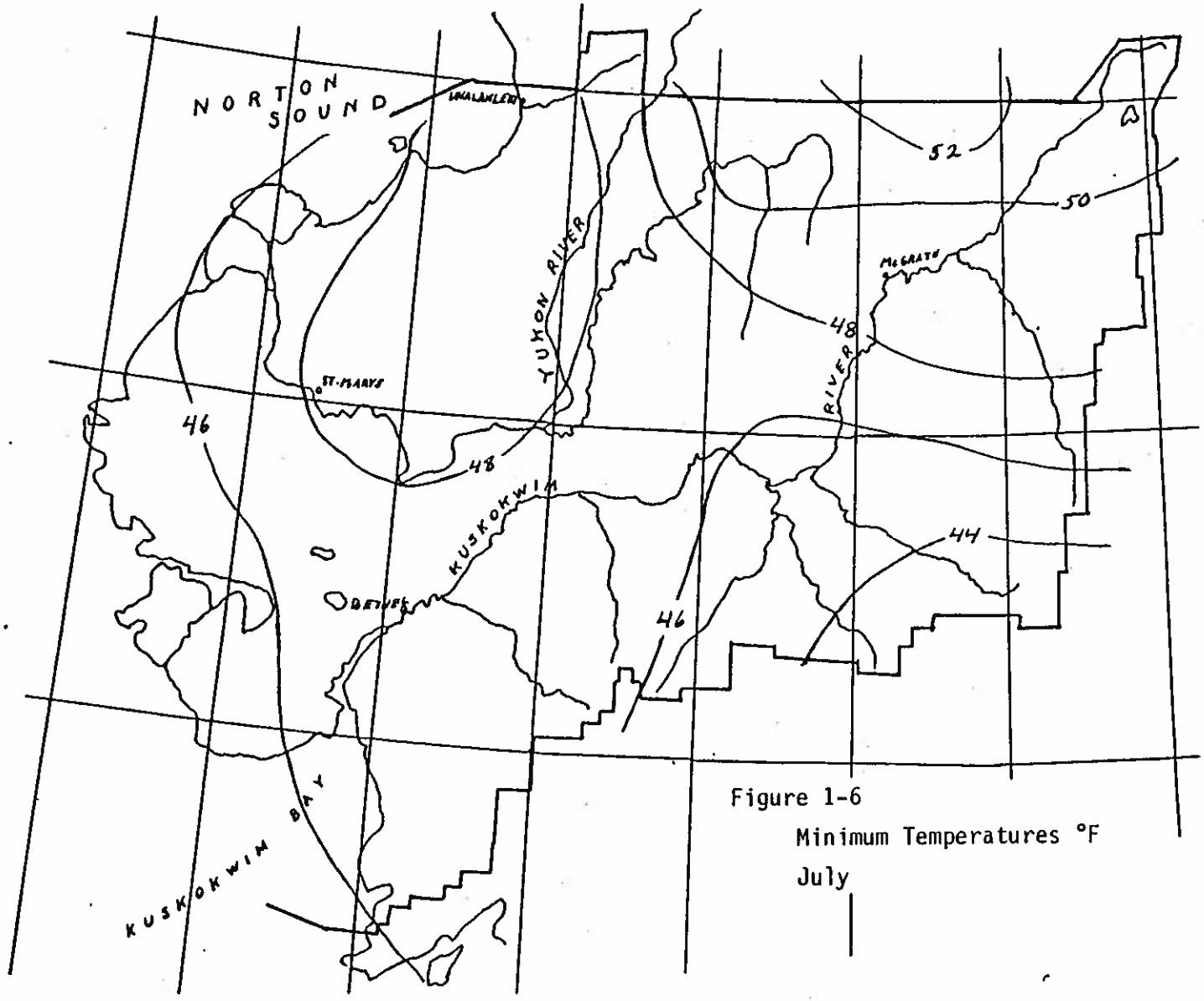

Figure 1-6

Minimum Temperatures °F

July

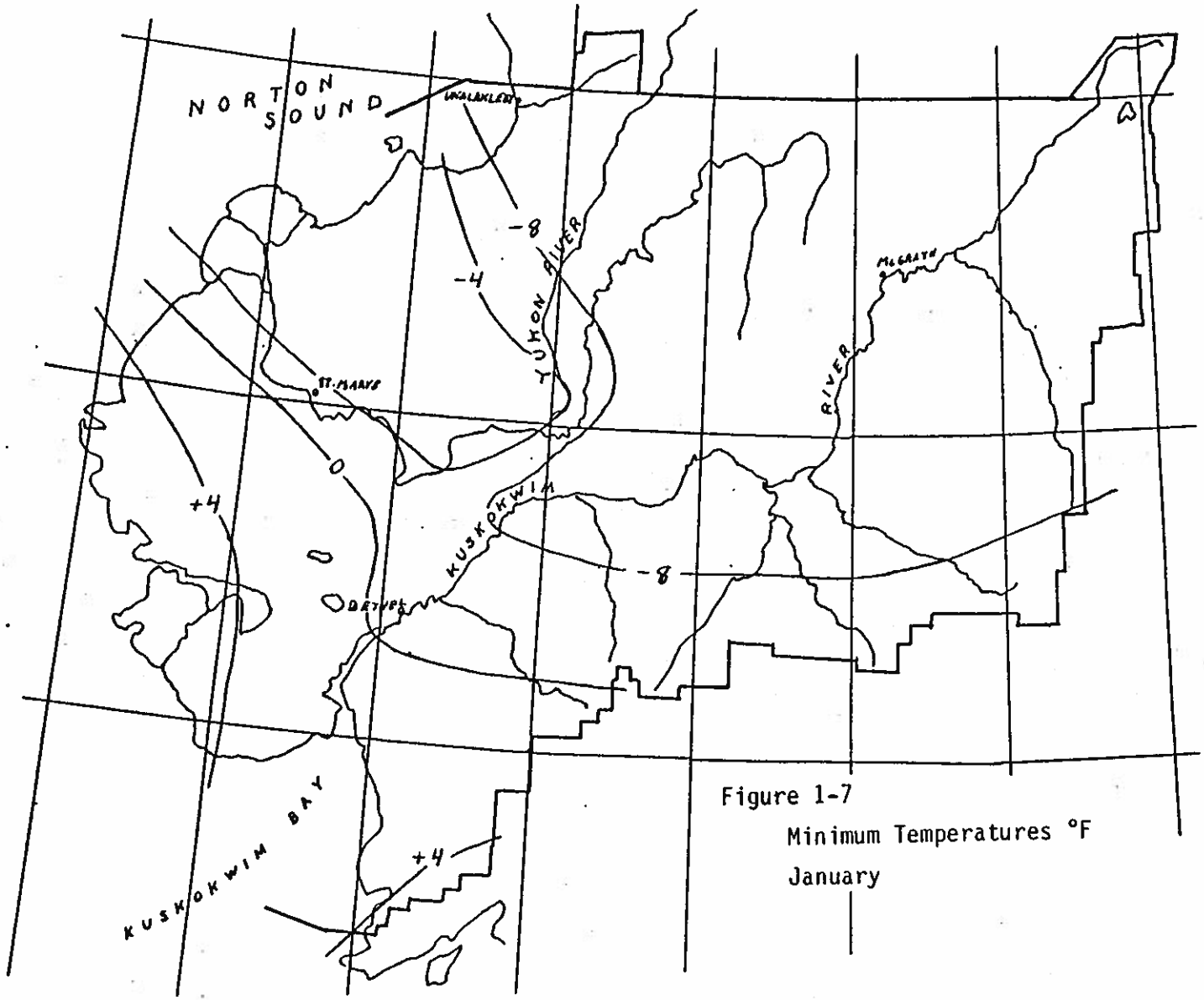

Figure 1-7

Minimum Temperatures °F

January

Table 1-1. Climatic Data for Southwest Alaska.

	Temperature Ranges ° F			Precipitation		Winds kph	
Location	Summer	Winter	Extreme	Total	Snow	M.Winds	Extreme
Cape Romonzof	+37+53°	+6+24°	-25+90°	25	71	24.6 NE	102 NE
Bethel	+39+62°	-3+20	-46+86	16	50	20.5 NNE	100 SSE
Nyac	+37+66	-4+12	-49+87	23	71		
Platinum	+38+57	-7+29	-34+82	22	43		
Minchumina	+42+68	-14+18	-62+89	13	57	9 ENE	89 SW
Farewell	+39+64	-13+20	-57+84	17	56	13.2 SE	
Sleetmute	+37+66	-12+24	-58+90	21	81		
Sparrevohn	+40+61	0°+20	-47+82	24	90	8.7 S	128 ESE
McGrath	+40+68	-18+20	-67+90	17	90	8.0 N	120 S
Crooked Creek	+38+71	-10+24	-59+94	14	53		
Aniak	+37+65	-9+21	-62+92	20	57	12.4 ESE	74 SE

Source: Alaska Regional Profiles, Southwest, Yukon, and Northwest Regions, 1974.

The storm tracks are controlled primarily by the Aleutian low which lies over the Anadyr Gulf near the U.S.S.R. in August and then shifts southward to near the tip of the Aleutian Islands in December. August storm tracks trend northeastward up the Kuskokwim River drainage. December storm tracks trend along the coast toward the Bering Straits.

The natural barrier afforded by the Alaska Range causes some shift in storm tracks, but the most important effect is caused by wind channeling through the mountain passes. The passes are important aerial transportation routes. High winds and turbulence in the passes can be very hazardous for light aircraft. Visibility within the passes is many times restricted due to clouds massing in the mountains.

Figures 1-8 and 1-9 show freezing and thawing degree days for Southwestern Alaska. A degree day is a unit that represents one degree of rise or fall of temperature, in degrees fahrenheit, from a given point (as 32° F) in the mean daily outdoor temperature. Freezing degree days are those with a mean temperature below 32° F. Thawing degree days are those with mean temperatures above 32° F. Therefore, if the mean temperature is 40° F for one day, eight thawing degree days are

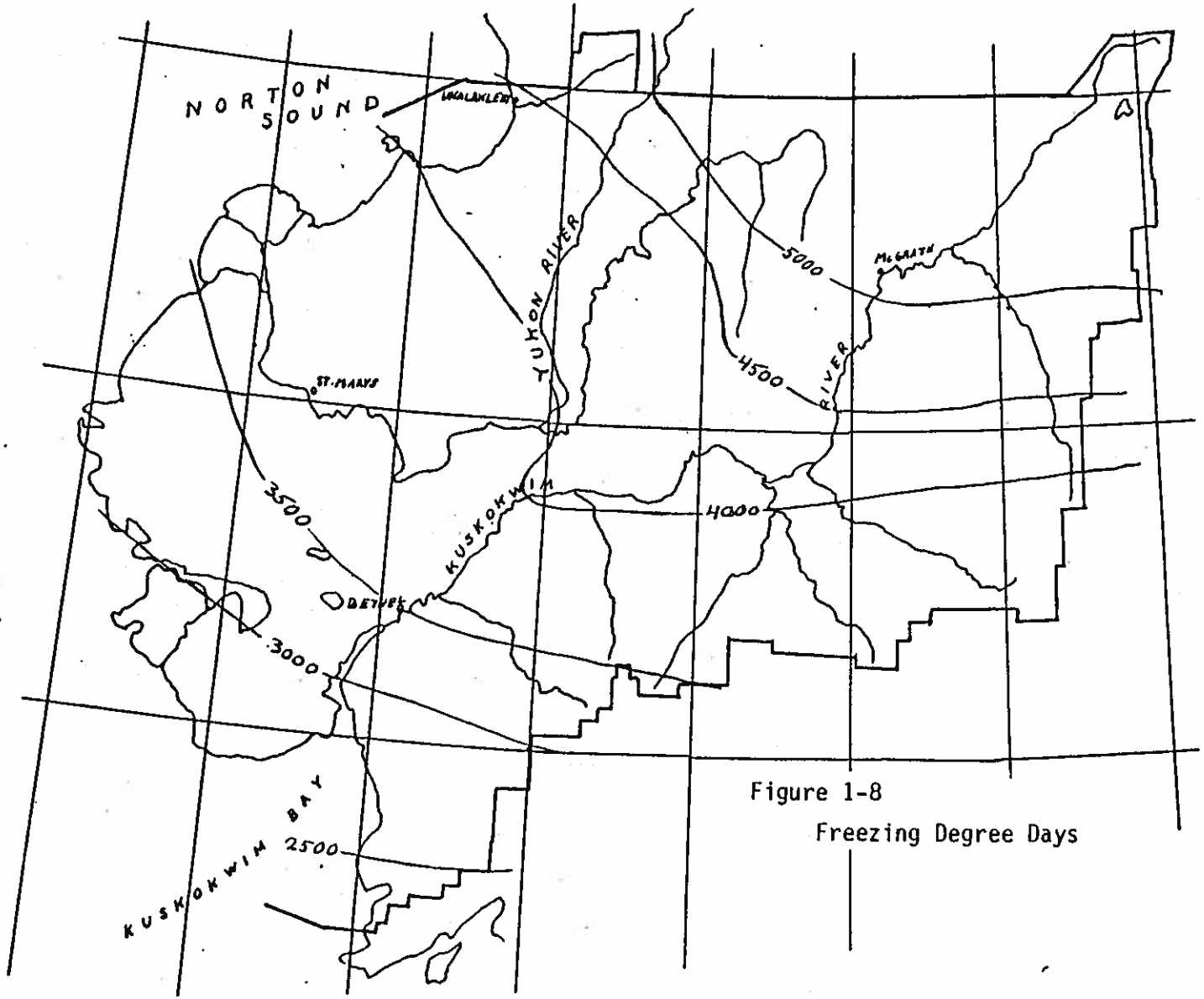

Figure 1-8

Freezing Degree Days

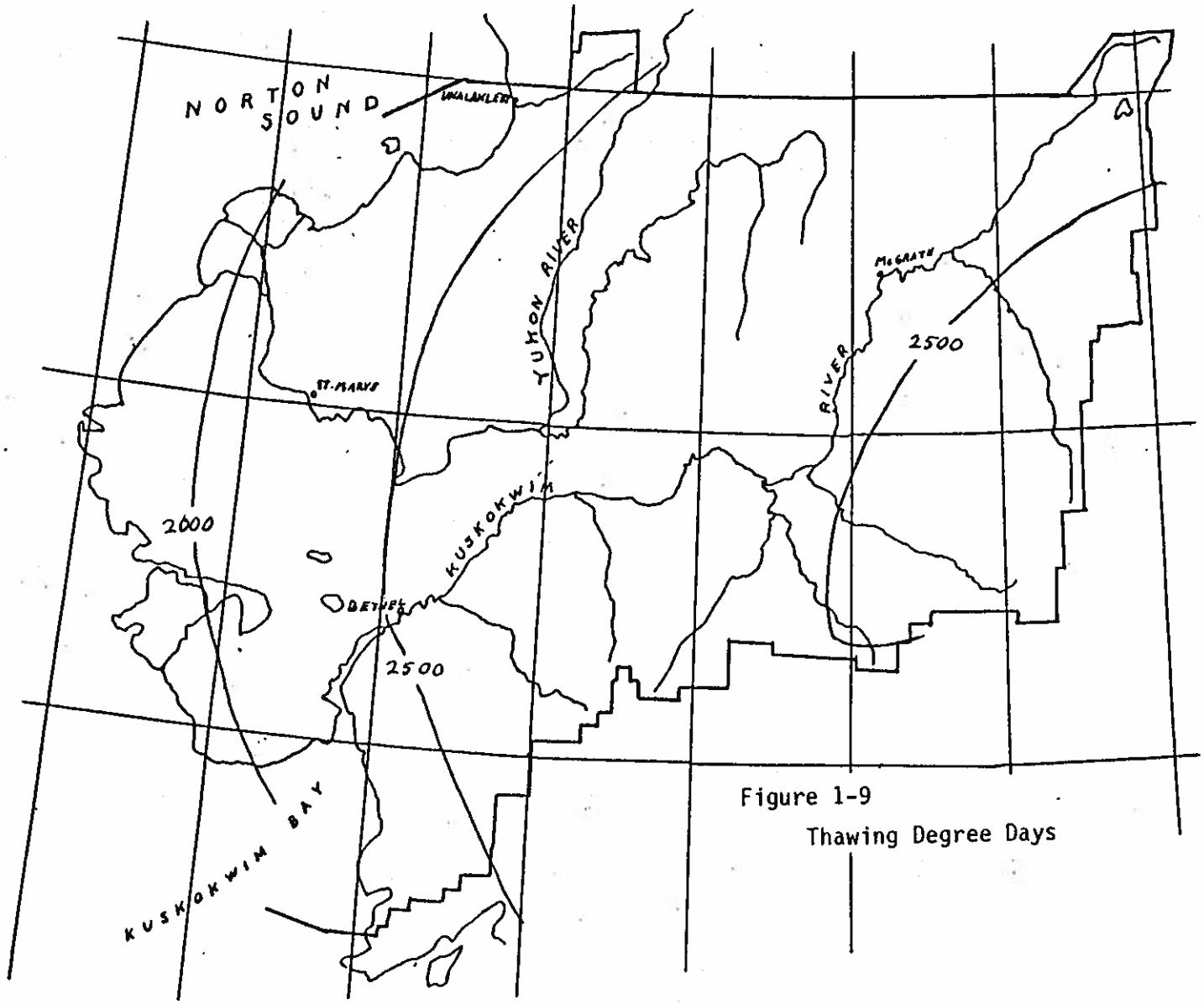

Figure 1-9

Thawing Degree Days

recorded. Annual totals of the freezing and thawing degree days are used to calculate ground and water freezing and thawing in relation to engineering, construction, and other land uses. The southern limit for discontinuous permafrost is about 2,000 degree days. This line is approximately on the Alaska Peninsula. Thawing degree days measure summer duration and temperatures. These factors also affect the presence of permafrost. Permafrost is generally found in areas with lower values for thawing degree days than for freezing degree days.

Lakes and rivers are important in transportation planning in Southwest Alaska. The rivers are used by freight barges and floatplanes. During the winter, aircraft change to skis for landing on snow or ice. Due to the river currents, rivers freeze later and thaw sooner than lakes. Freezeup and break up dates for rivers and lakes are compiled annually by the Environmental Data Service, National Oceanic and Atmospheric Administration.

GROWING SEASON

Most crops in Alaska require a minimum of about 1,500 growing degree days. Growing degree days are based on a mean temperature of 40° F or higher. Frequent midsummer frosts or freezes

may preclude crop production. Table 1-2 shows growing degree days and the length of the growing season for selected stations within the Southwest Planning Area.

Table 1-2. Growing Degree Days and Growing Seasons

	Growing Degree Days	Length of Growing Season Days
Minchumina	1,850	94
McGrath	1,700	97
Sleetmute	1,460	69

Snow survey reports are made by the Soil Conservation Service from February to May. These reports show the depth of snow and the water equivalent of the snow in inches. This information may be used to mitigate surface disturbance, and to predict water supplies and flood hazards. This data is on file at the Anchorage District Office library.

AIR QUALITY

Air quality in Alaska is generally good due to the lack of large industrial complexes and population concentrations. However, there is a high potential for air pollution because

of topographic features and meteorologic conditions in Alaska. Existing industrial sources of pollution are located in separated air basins.

The BLM must comply with state air quality standards when planning prescription burning. Wildfires can degrade the air quality of local communities. Major fires can have regional effects. In cases of wildfire, the Bureau's major control and suppression responsibilities are in protection of human safety, physical developments, and/or natural resources.

Large urban populations concentrate pollution emmissions into limited air basins. In Alaska, per capita energy consumption is among the highest in the world. Atmospheric pollution in Anchorage and Fairbanks is related almost entirely to transportation. Cold weather vehicle starts contribute most to winter air pollution. Due to low population concentrations and the lack of industrial activities, Southwest Alaska experiences insignificant effects on local air quality.

Temperature inversions are local atmospheric phenomena that trap and concentrate atmospheric pollutants within a topographic basin. They are characterized by air that grows

warmer with increasing height, then is "capped" by a stable mass of colder air. Such conditions prevent any vertical dispersion of pollutants and may concentrate them to hazardous amounts (Bach, 1972). An inversion may be broken by solar heating of the atmosphere and the surface of the earth, thereby increasing the instability of the air mass, or it may be broken by the passage of a frontal system which disperses the local air mass.

There are six classes of atmospheric pollutants identified by the Environmental Protection Agency. They are carbon monoxide, hydrocarbons, oxides of nitrogen, oxides of sulfur, oxidants, and particulate matter.

Oxides of nitrogen are formed during all types of combustion processes. Hydrocarbons are released during the handling of petroleum products or through incomplete combustion. Oxides of nitrogen react with hydrocarbons under the influence of sunlight to produce photochemical smog which can cause eye, nose, and throat irritations. Since temperature inversions in Alaska are primarily winter phenomena when there is insufficient sunlight for photochemical reactions, the photochemical smog effect is neglible. Summer air movements generally prevent accumulations of appreciable amounts of pollutants.

Carbon monoxide is formed during incomplete combustion of materials containing carbon. At lower concentrations, it may cause stress in heart patients, slow reaction times, and cause headaches and dizziness. At high concentrations it can cause death.

Total suspended particulate matter (TSP) consists of large particle dust, primarily of nuisance value, and of small particulate matter which can be hazardous to public health. Samplers generally do not discriminate between the two. Due to the high concentrations of fugitive dust during dry weather, the Environmental Protection Agency has designated Alaska a "non-attainment area." The State TSP standard of 60 mg/m^3 for a 24 hour period is often exceeded.

Oxides of sulfur and sulfur components can be injurious to public health, corrosive to building materials, and harmful to other man-made materials. Oxides of sulfur are released during combustion of sulfur-containing coal, gas or fuel oil. Sulfur compounds are emitted during petroleum refining and anaerobic fermentation of sewage or other organic compounds.

There are few major sources of sulfur dioxide (SO^2) in Alaska. The State standard of 365 mg/m^3 twice a year has not been exceeded in four years.

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CHAPTER 2

GEOLOGY
TOPOGRAPHY

GEOLOGY AND TOPOGRAPHY

INTRODUCTION

The Southwest Planning Area is bounded on the east by the Alaska Range; the northern border basically follows the BLM Anchorage District border along latitude 64° N., from Lake Minchumina westward to Unalakleet. The southern border conforms to the McGrath Resource Area border which follows the southern drainage divide of the Kuskokwim River basin. The Bering Sea forms the western border (See the URA base map for boundaries.

The interior of the area consists of northeast trending mountain ranges and hills with intervening lowlands of outwash plains or floodplains. The southern and eastern sections of the Planning Area comprise the Kuskokwim River drainage basin. Some tributaries near the southeastern border head at glaciers in the Alaska Range. The northern and western sections are drained primarily by the lower Yukon River basin downstream of the community of Kaltag and by the Innoko River basin.

TOPOGRAPHY

The general topography of the Southwest Planning Area consists of steep, rugged slopes of the Alaska Range, piedmont lowlands, generally rounded mountain ranges and hills, and the floodplains and deltas of the Lower Yukon and the Kuskokwim Rivers. The mountain ranges and hills trend to the northeast. The eastern and southern portions of the Planning Area are in the Kuskokwim River drainage. The northwestern portion is in the Lower Yukon River drainage.

In the southwestern corner of the Planning Area, the Ahklun Mountains are low, open mountains with 20 to 50 percent gently sloping terrain. More than 75 percent of the gentle slope is in lowlands. Local relief varies from 1,000 to 3,000 feet.

Northeast of the Ahklun Mountains between the Kwethluk and Aniak rivers are the Kilbuck Mountains, high mountains with local relief generally over 3,000 feet. Less than 20 percent of the terrain is gently sloping.

The Kuskokwim Mountains trend northeastward from the Aniak River crossing the Kuskokwim River between Aniak and Sleetmute and continuing along the north side of the Kuskokwim River to

the Mystery Mountains. The southern section of the Kuskokwim Mountains is low, with less than 20 percent in gentle slopes. Local relief is 1,000 to 3,000 feet. The northern section consists of open, low mountains with 20 to 50 percent in gentle slopes. More than 75 percent of this gentle slope is lowland; local relief is 1,000 to 3,000 feet. Bordering the Innoko and Yukon Rivers, the western section consists of open, high hills with 20 to 50 percent in gentle slopes. More than 75 percent of the gentle slope is lowland.

The Alaska Range is located along the eastern border of the Planning Area, and consists of high steep peaks with numerous active glaciers. Less than 20 percent of the terrain is gently sloping. Local relief is greater than 3,000 feet.

Between the Alaska Range and the Kuskokwim River is an outwash plain with scattered hills. Fifty to eighty percent of this piedmont is gently sloping; and fifty to seventy-five percent of the gentle slope is in lowlands.

The Nulato Hills are low, open mountains located between the Yukon River and the Bering Sea. Twenty to 50 percent of the area is in gentle slopes with more than 75 percent of gentle slopes in lowland. Local relief is 1,000 to 3,000 feet.

The Yukon-Kuskokwim delta consists of a vast area of flat lowlands -- about 23,938 square miles (62,000 square kilometers). The delta and the lowlands of the Innoko River consist of 80 percent gently sloping terrain. Relief is minor, 1 to 100 feet; more than 50 percent of the area is covered by water.

Table 2-1 lists significant elevations and minimum elevations for topographic features shown in USGS's quad sheets (1:250,000) within the Southwest Planning Area.

GEOLOGY

During most of Paleozoic time, much of Alaska was submerged under the sea. Thick deposits of marine sediments are found throughout the state. Volcanic activity began during the Mississippian period. Most of Alaska south of the Yukon River became a vast submarine volcanic field during the Permian and Triassic periods. In mid-Jurassic time, a huge batholith added uplift to the Alaska Range. These mountain building activities were followed by an erosion cycle that deposited sediments onto the lowlands.

Table 2-1. Topography.

U.S.G.S. QUAD SHEET	ELEVATION IN FEET
Baird Inlet	
Erchakrtuk Mountain	1,485
Minimum	Sea level
Bethel	
Marvel Dome	4,500
Fisher Dome	4,000
Gemuk Mountain	3,720
Mount Romig	4,000
Minimum	Near sea level
Black	
Various lakes	23
Minimum	Sea level
Holy Cross	
Wolf Creek Mountain	2,455
Two Spot Mountain	1,223
Bonasila Dome	1,807
Minimum	53
Hooper Bay	
Askinuk Mountains	2,342
Minimum	Sea level
Goodnews	
Thumb Mountain	3,000
minimum	Sea level
Iditarod	
Takotna Mountain	3,203
Beaver Mountains	4,055
Lookout Mountain	2,146
Minimum	200

Table 2-1. (continued)

U.S.G.S QUAD SHEET	ELEVATION IN FEET
Kuskokwim Bay	
Various lakes	17
Minimum	Sea level
Kwiguk	
North Peak	1,755
Andreafsky Hills	638
Kusilvak Mountains	2,190
Minimum	Sea level
Lime Hills	
Mount Hesperus	9,828
The Apocalypse	9,345
Snowcap Mountain	8,350
Minimum	400
Marshall	
Kugilvak Mountains	2,190
Minimum	Sea level
McGrath	
Knox Peak	5,970
Terra Cotta Mountains	5,310
Rainy Pass	5,545
Selatna Mountain	1,183
Minimum	300
Medfra	
Novi Mountain	3,396
Von Frank Mountain	4,508
Page Mountain	3,315
Limestone Mountain	2,844
Minimum	394

Table 2-1. (continued)

U.S.G.S. QUAD SHEET	ELEVATION IN FEET
Mt. McKinley	
Lake Minchumina	642
Sischu Mountains	1,808
Snohomish Hills	1,786
Minimum	642
Norton Bay	
Crater Lake VABM	2,883
Portage VABM	1,708
Minimum	Sea level
Nunivak Island	
Nelson Island	1,130
Minimum	Sea level
Ophir	
Twin Mountain	3,595
Mount Hurst	2,882
Old Grouchtop	1,268
Cloudy Mountain	4,234
Minimum	77
Russian Mission	
Mount Chiniklik	2,600
Russian Mountains	3,000
Mount Hamilton	4,200
Minimum	200
St. Michael	
Nulato Hills	2,251
Crater Mountain	640
Minimum	Sea level

Table 2-1. (continued)

U.S.G.S. QUAD SHEET	ELEVATION IN FEET
Sleetmute	
Aghaluk Mountain	2,913
Holokuk Mountain	3,229
Chuilnuk Mountains	3,796
Minimum	128
Taylor Mountains	
Taylor Mountains	3,456
Flat Top Mountain	1,890
Kuskokwim Mountains	2,314
Gemuk Mountain	3,441
Finn Mountain	2,260
Minimum	400
Unalakleet	
Mount McDonald	2,157
The Sisters	1,669
Minimum	Sea level

The Yukon-Kuskokwim area has experienced a series of uplifts and subsidences so that there are interbedded layers of marine and terrestrial sediments. Marine sediments are still deposited on this delta by offshore storms. The highlands of the Planning Area were formed by local uplift and volcanic activity.

Except for alpine glaciation on the Alaska Range and the peaks of the Ahklun and Kuskokwim Mountains, the Planning Area is virtually unglaciated.

Generally the mountain ranges and hills of the Southwest Planning Area are Jurassic to Cretaceous in age and consist of interbedded layers of greywacke and shale with local basaltic flows and intrusives of Cretaceous age. The oldest rocks are Precambrian metamorphics found on the northwest side of the Ahklun Mountains near Goodnews.

Generally, the surface geology consists of undifferentiated, unconsolidated deposits which make up the eastern part of the Nulato Hills. Outcrops of Cretaceous and Tertiary granitic and volcanic rocks are also found. The northern Nulato Hills near the coast contain basalt lava flows of Quarternary age.

The piedmont between the Alaska Range and the Kuskokwim River consists primarily of alluvial plains and terrace deposits. Local outcrops of Tertiary to Paleozoic, or older, bedrock are made up of granites, volcanics, sedimentary, and metamorphic rocks. These consists mainly of schist, quartzite, slate, greenstone, and limestone.

The deltas and floodplains of the Kuskokwim, Yukon, and Innoko Rivers consist primarily of silt and fine sand. Some bedrock knobs of basement rock or volcanic cones protrude through the sediments. A well drilled to 600 feet at Bethel did not reach bedrock.

Limestone outcrops, particularly near the Stony River, may harbor some caves.

Like the mountain ranges, the major fault lines trend generally northeastward with some local cross faults. The Yukon-Kuskokwim delta, the Nulato Hills and Kuskokwim Mountains are in a zone of moderate (4.5 to 6.0 on the Richter scale) earthquake potential. Closer to the Alaska Range is a zone of major (greater than 6.0 on the Richter scale) earthquake potential.

<u>OVERLAYS, GEOLOGY AND TOPOGRAPHY</u>
2-1, Geology and Topography
2-2, Quadrangles 1:250,000

SELECTED REFERENCES
GEOLOGY/TOPOGRAPHY

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CHAPTER 3

SOILS

S O I L S

INTRODUCTION

Soils are produced by the combined effects of parent material, topography, climate, biotic agents, and time. The original characteristics of a soil type may be further altered by the activities of man. Soil types may influence the suitability of an area for a variety of land uses, including agriculture, grazing, commercial forestry, construction, mineral activities, etc.

Soils are classified in a six-level taxonomic system used by soil survey organizations of the U.S. Department of Agriculture. These levels are Order, Suborder, Great Group, Subgroup, Family, and Series.

Only exploratory soil surveys have been completed for most of Alaska, and these are described and mapped at the Subgroup level. In detailed soil surveys, soils are classified at the Series, or lowest level in the system.

Soil limitations are presented in chart form in table 3-1. Limitation ratings vary from slight to very severe for six uses: common crops, commercial forest, recreation, low buildings, highway location, and off-road traffic. These ratings have been made for each soil phase. Soil phases describe slope and textural characteristics. The soil URA III and IV sections analyze the suitability of soils on the Bureau lands within the Planning Area.

The following discussion of soils is from "Resource Inventory, Soils and Watershed Resources," by Neil Michaelson. Three volumes, Northwest Region, Yukon Region, Southwest Region were used. All were published by the Resource Planning Team, Joint Federal-State Land Use Planning Commission.

SOILS SUBGROUPS

The major soil subgroups in the Southwest Planning Area are described briefly in this section. The descriptions are general and nontechnical, and include brief statements on the principal areas of occurrence of the soils and the kind of vegetation they normally support.

Soil associations have been mapped on overlay 3-1: Soils, using the letter symbols that represent the nomenclature of the National Soil Survey System. Slope groups, textural

Table 3-1 . Soil Limitations

Limitation Ratings for

Soil	Phase*	Common Crops	Comm. Forest	Recreation	Low Buildings	Highway Location	Off-road Traffic
EAT	1c	Severe 5,6	Severe 5	Severe 5,6	Severe 5,6	Severe 5,6	Severe 5
	1f	Severe 5,6	V. Severe 5	Severe 5,6	Severe 5,6	Severe 5,6	Severe 5
	1g	Severe 5,6	Mod-Severe 5	Severe 5,6	Severe 5,6	Severe 5,6	Severe 5
	1m	Severe 5,6	Mod-Severe 5	Severe 5,6	Severe 5,6	Severe 5,6	Severe 5
	2m	Severe 5,6	Mod-Severe 5	Severe 5,6	Severe 5,6	Severe 5,6	Severe 5
EFT	1g	Moderate 6,16	Slight	Moderate 6	Mod-Severe 6	Moderate 6	Slight
	1m	Moderate 6,16	Slight	Moderate 6	Mod-Severe 6	Moderate 6	Slight
EOL	2g	V. Severe 1,3	V. Severe 2,3	Severe 3,10	Severe 3,11	Severe 3,11	Mod-Severe 3
EOP	1g	V. Severe 1,2	V. Severe 2	Moderate 10	Moderate 8	Slight	Slight
	2g	V. Severe 1,3	V. Severe 2,3	Mod-Severe 3	Mod-Severe 3,8	Mod-Severe 3	Moderate 3
	1m	V. Severe 1,2	V. Severe 2	Slight	Moderate 12,15	Moderate 12	Moderate 14
EOT	1g	Severe 10,13	Mod-Severe 13	Moderate 10	Slight	Slight	Slight
	2g	V. Severe 3,13	Mod-Severe 13	Mod-Severe 3,10	Moderate 3	Moderate 3	Moderate 3
	1m	Slight	Slight	Slight	Moderate 12	Moderate 12	Moderate 14
EQT	1c	Severe 4,13	Moderate 13	Slight	Slight	Moderate 4	Moderate 17
	2c	Severe 3,13	Moderate 13	Moderate 3	Moderate 3	Severe 3,4	Mod-Severe 3,17
HMV		V. Severe 5,9	V. Severe 5,9	V. Severe 5,9	V. Severe 5,9	V. Severe 5,9	V. Severe 5,12

Table 3-1 . (continued)

Limitation Ratings for

Soil	Phase*	Common Crops	Comm. Forest	Recreation	Low Buildings	Highway Location	Off-road Traffic
HY(B)G		V. Severe 5,9	V. Severe 5,9	V. Severe 5,9	V. Severe 5,9	V. Severe 5,9	V. Severe 5,12
HYP		V. Severe 5,9	V. Severe 2,5	V. Severe 5,9	V. Severe 5,8	V. Severe 8,9	V. Severe 5,12
IAHP	1c	Severe 5,8	V. Severe 5	Severe 5	Severe 5,8	Severe 5,8	Severe 5
	1f	V. Severe 2,5	V. Severe 5	Severe 5	Severe 5,8	Severe 5,8	Severe 5
	1g	V. Severe 5,10	V. Severe 5	Severe 5	Severe 5,8	Severe 5,8	Severe 5
	2g	V. Severe 3,10	V. Severe 5	Severe 3,5	Severe 3,8	Severe 5,8	Severe 3,5
	1m	Severe 5,8	V. Severe 5	Severe 5	Severe 5,8	V. Severe 5,8	Severe 5
	2m	V. Severe 3,5	V. Severe 5	Severe 5	Severe 5,8	V. Severe 5,8	Severe 5
IAP	1c	V. Severe 2,5	V. Severe 2,5	Severe 5	Severe 5,8	Severe 5,8	Severe 5
	1g	V. Severe 5,10	V. Severe 5	Severe 5	Severe 5,8	Severe 5,8	Severe 5
	2g	V. Severe 5,10	V. Severe 5	Severe 3,5	Severe 3,8	Severe 3,8	Severe 3,5
	1m	Severe 5,8	V. Severe 5	Severe 5	Severe 5,8	Severe 5,8	Severe 5
ICP	2g	V. Severe 1,2	V. Severe 2	Severe 3,10	Mod-Severe 3,8	Mod-Severe 3	Severe 3
ICT	1c	Moderate 13	Moderate 13	Slight	Slight	Slight	Moderate 17
	2c	Mod-Severe 3,13	Moderate 13	Moderate 3	Moderate 3	Moderate 3,4	Mod-Severe 3,17
	1g	Moderate 13	Slight-Mod 13	Slight	Slight	Slight	Slight
	2g	Severe 3,10	Moderate 3,13	Moderate 3,10	Moderate 3	Moderate 3	Moderate 3
	1m	Slight	Slight	Slight	Moderate 12	Moderate 12	Moderate 14
	2m	Mod-Severe 3,7	Slight	Moderate 3	Moderate 3,12	Moderate 3,7	Mod-Severe 3,14
IND	2g	V. Severe 2,3	Severe 2,3	Moderate 3	Moderate 3	Moderate 3	Moderate 3
	1m	Moderate 2	Mod-Severe 2	Slight	Slight	Slight	Moderate 14
	2m	Severe 2,3	Mod-Severe 2	Moderate 3	Moderate 3,12	Moderate 3,12	Mod-Severe 3,14

Table 3-1 . (continued)

Limitation Ratings for

Soil	Phase*	Common Crops	Comm. Forest	Recreation	Low Buildings	Highway Location	Off-road Traffic
INT	1c	Mod-Severe 2	V. Severe 2	Slight	Slight	Slight	Moderate 17
	2c	Severe 2,3	V. Severe 2	Moderate 3	Moderate 3	Moderate 3	Mod-Severe 3,17
	1g	Mod-Severe 2	V. Severe 2	Slight	Slight	Slight	Slight
	2g	Severe 2,3	V. Severe 2	Moderate 3	Moderate 3	Moderate 3	Moderate 3
IUL	2g	V. Severe 3,11	Severe 3	V. Severe 3,11	V. Severe 3,11	V. Severe 3,11	Severe 3
	2m	V. Severe 1,3	V. Severe 2,11	Severe 3,11	Severe 3,11	Severe 3,11	Severe 3
IUP	1g	V. Severe 1	V. Severe 2	Slight	Moderate 8	Slight	Slight
	2g	V. Severe 1,3	V. Severe 2	Severe 3,10	Mod-Severe 3,8	Mod-Severe 3	Severe 3
	2m	V. Severe 1,3	V. Severe 2	Mod-Severe 3	Mod-Severe 3,8	Mod-Severe 3	Severe 3
IUT	2g	Severe 2,3	Severe 2	Mod-Severe 3,10	Moderate 3	Moderate 3	Moderate 3
LR		V. Severe 2,10	V. Severe 2	V. Severe 10	V. Severe 11	Severe 11	V. Severe 10
MAP	1g	V. Severe 1,5	V. Severe 2,5	Severe 5	Severe 5,8	Severe 5,8	Severe 5
	2g	V. Severe 1,3	V. Severe 2,5	Severe 3,5	Severe 3,8	Severe 5,8	Severe 3,5
	1m	V. Severe 1,5	V. Severe 2,5	Severe 5	Severe 5,8	Severe 5,8	Severe 5
MBP	1g	V. Severe 1	V. Severe 2	Slight	Moderate 8	Slight	Slight
	2g	V. Severe 1,3	V. Severe 2	Severe 3	Mod-Severe 3,8	Severe 3	Severe 3

Table 3-1 . (continued)

Limitation Ratings for

Soil	Phase*	Common Crops	Comm. Forest	Recreation	Low Buildings	Highway Location	Off-road Traffic
RM		V. Severe 3,11	V. Severe 3,11	V. Severe 3,11	V. Severe 3,11	V. Severe 3,11	V. Severe 3,11
SD		V. Severe 4,13	V. Severe 13	V. Severe 4	V. Severe 4	V. Severe 4	Severe 3,17
SOP	1c	V. Severe 1,13	V. Severe 2,13	Moderate 4	Moderate 8	Moderate 4	Moderate 17
	1g	V. Severe 1	V. Severe 2	Slight	Moderate 8	Slight	Slight
	2g	V. Severe 1,3	V. Severe 2	Severe 3	Mod-Severe 3,8	Severe 3	Severe 3
SOT	1c	Mod-Severe 13	Moderate 13	Slight	Slight	Slight	Moderate 17
	2c	Mod-Severe 3,13	Moderate 13	Moderate 3	Moderate 3	Moderate 3,4	Mod-Severe 3,17
	1g	Moderate 13	Slight-Mod 13	Slight	Slight	Slight	Slight
	2g	Severe 3,10	Moderate 3,13	Moderate 3,10	Moderate 3	Moderate 3	Moderate 3
	1m	Slight	Slight	Slight	Slight	Slight	Moderate 14
	2m	Mod-Severe 3,7	Slight	Moderate 3	Moderate 3	Moderate 3	Moderate 3,14
Sou	1g	Moderate 1	Moderate 2	Slight	Slight	Slight	Slight
	2g	Severe 1,3	Moderate 2	Mod-Severe 3	Moderate 3	Moderate 3	Moderate 3
	1m	Moderate 1	Moderate 2	Slight	Slight	Slight	Moderate 14
	2m	Severe 1,3	Moderate 2	Moderate 3	Moderate 3	Moderate 3	Moderate 3,14

Soil Features Affecting Selected Uses

(1) Short frost-free period
(2) Low soil temperatures throughout growing season
(3) Steep slopes or rough terrain
(4) Soil blowing hazard

*Phase

Slope Group
1 - slopes dominantly less than 12 percent
2 - slopes dominantly steeper than 12 percent

Texture Group
c - sandy
f - clayey
g - very gravelly
m - loamy (medium)

Table 3-1 (continued)

Soil Features Affecting Selected Uses

(5) Wetness (high or fluctuating water table, seepage)
(6) Flooding hazard
(7) Highly erodible materials
(8) Permafrost (perennially frozen ground)
(9) Peat materials
(10) Coarse fragments (stones, boulders)
(11) Shallow depth to bedrock
(12) Low bearing strength
(13) Droughtiness (low water-supplying capacity)
(14) Dusty when dry, soft or slippery when wet
(15) Thermokarst pitting (melting of large underground ice masses resulting in the formation of steep-walled pits)
(16) Complex soil pattern (stream scars)
(17) Loose, unstable sand

Scope Groups

1. Scopes dominantly less than 12%
2. Slopes dominantly steeper than 12%

Textural Groups

c - sandy
f - clayey
g - very gravelly
m - loamy (medium)

Erosion Potential

E-1 Low
E-2 Medium
E-3 High

groups and erosion potential are also indicated on the overlays. These nomenclature symbols and the soils they represent are described in table 3-1.

The description symbols are arranged alphabetically except that symbols that end with the letter T precede other symbols with the same first two letters. For example, the subgroup identified as EOT is described ahead of the EOL and EOP soils. The EOT soils are described most fully, and the others are described in part in terms of differences from the EOT soils.

EAT Soils

These are poorly drained soils that occur in areas south of the permafrost zone. They exist principally in glacial outwash plains, in portions of flood plains where water tables are high most of the time, and in coastal marshes. The vegetation consists principally of sedges, willows, black spruce, and other water-tolerant plants, but in places the soils support Sitka spruce, western hemlock, white spruce, paper birch, and cottonwood.

The soils have a wide range of properties apart from their common characteristic of wetness. The texture ranges from very gravelly sand to clay. Many of the soils are stratified,

but some have no apparent layering. Colors range from gray or bluish gray with no mottling to grayish brown or olive gray with strong mottling. Water tables may be always close to the surface or may fluctuate. The soils may be unfrozen throughout the year or may remain frozen well into the summer, but none are perennially frozen at any depth. Some of the soils have fairly thick accumulations of peaty material on the surface. They do not, however, have a thick upper layer in which a substantial amount of organic matter is mixed with mineral material.

The most extensive areas of EAT soils are at the mouths of receding glaciers along the south and east slopes of the Alaska Range. These soils consist mostly of stratified sand or sand and gravel, and are nearly always saturated. Low brushy vegetation dominates most areas, but strips of forest border some stream channels. On flood plains and on slopes affected by seepage, the EAT soils are generally made up of stratified silty and sandy materials; many have gravelly substrata. These soils commonly have fluctuating water tables and support forests of spruce, birch, and cottonwood. Some are covered with dense stands of grass. In areas along the coasts, especially near the mouths of large rivers, the EAT

soils consist of silty and clayey tidal sediments with buried lenses of peat. The vegetation on these soils consists of sedges and other plants of coastal marshes.

EFT Soils

EFT soils are well-drained soils of recently deposited sediments. The water table is normally deep in these soils, but most of them are subject to periodic flooding. Virtually all consist of alternating layers of sand and silt loam. Many are underlain by a thick deposit of water-worked, very gravelly sand. Most of the soils have gray colors throughout, but many have irregular black and brown streaks caused by burial of organic matter under fresh deposits, by frost heaving, and by uneven oxidation of the soil material. They commonly support forests similar to those of the adjoining uplands, but with a large proportion of cottonwood and willow.

These soils occupy natural levees and low terraces along nearly all major rivers and many of the smaller streams in all parts of Alaska except in areas of continuous permafrost and in the very southwestern part of the state where the dominant soil material is volcanic ash. The natural levees and terraces range in width from less than 100 feet to several miles. They are commonly associated with poorly drained EAT or IAHP soils.

In areas with moderate or high precipitation, the EFT soils are dominantly acid. In interior Alaska, where precipitation is low, they are nonacid. Many of them along the Yukon and Kuskokwim Rivers are calcareous at some depth.

EOT Soils

These well-drained soils exist in virtually all parts of Alaska, in parent materials ranging from recently deposited loess (windlaid silt) to weathered rock and to alluvium with less than 10 inches of fine material over very gravelly sand. They are dominantly gray in color, but some have other colors inherited from the parent rock and some have color variations resulting from uneven oxidation of recently deposited material. Textures range from sandy loam to clay, but these soils are not stratified. Depth to hard bedrock is always greater than 20 inches. They have no permafrost. Most of the EOT soils support forests typical of the area in which they are located.

Very gravelly EOT soils occur on portions of outwash plains that no longer are saturated with glacial outflow water, on low terraces bordering rapidly flowing rivers, on recently

exposed glacial till, and on steep slopes where there is steady downhill movement of material. Silty EOT soils occur mostly in loess blown from the braided beds of rivers that have a heavy silt load. Small increments of fresh silt are added to these soils each year. The loess may overlie older waterlaid material on level terraces along the streams or may mantle rolling hills. Along the Yukon River, the loess is commonly calcareous. EOT soils also occur, in a few places, in recently exposed glacial lacustrine (associated with lakes) deposits or in backwater portions of former flood plains. Soils in these positions may be clayey.

EOL Soils

Although they are otherwise similar to EOT soils, the EOL soils are underlain by consolidated bedrock at depths of 20 inches or less. They have been observed in many hilly and mountainous areas of interior and western Alaska. Most have mean annual temperatures of 32° F or less, and support alpine tundra vegetation. Typically, unvegetated patches, stone stripes, and other features associated with frost action are evident in the soil above the bedrock.

EOP Soils

These soils differ from the EOT soils in that they have mean annual temperatures of 32° F or less. There is no consolidated bedrock within 20 inches of the surface, as in the EOL soils. EOP soils occur at elevations above tree line in many parts of interior Alaska and in tundra areas of northern and western Alaska, but they normally make up only a small proportion of the soils in any single area. Most of them are gravelly and have rapid internal drainage. The permafrost table is commonly much deeper than in associated IAP and IAHP soils.

These soils have a variety of parent materials. Among these are beach ridges bordering the Bering Sea and glacial till and weathered metamorphic rock in interior areas.

Most EOP soils in hilly or mountainous areas are much disturbed by frost action. As much as 80 percent of the soil surface may be occupied by bare frost scars, stone stripes, and other frost features. In places subject to high winds all fine-grained material may have been blown from the upper few inches, leaving a residue of angular, frost-heaved gravel.

EQT Soils

EQT soils are well-drained sandy soils with little or no admixture of finer materials except in the upper 10 inches. They occur principally on sand dunes near the coasts and in places bordering braided rivers and outwash plains, and in a few other areas dominated by sandy parent materials. They exist under a variety of climates. Vegetation on these soils ranges from forest to coastal grasses.

The soils may have gray colors or may be uniformly brown or olive brown.

On dunes that have been stable for some time under a permanent vegetation, they may exhibit incipient development of a dark surface layer characteristic of the IUT soils or of a dark reddish-brown subsurface layer like that in the SOT soils.

HMV Soils

These consist of organic materials in which decomposition has proceeded to the point that most of the plant fibers can be destroyed by rubbing between the fingers. In Alaska, the partially decomposed organic material is derived mostly from

sedges. A layer of fibrous moss peat may exist at the surface, however, and woody fragments may occur at any depth. They contain lenses of volcanic ash of varying thickness. The vegetation is dominantly sedges, with associated mosses and low-growing shrubs. Some areas support clumps of black spruce.

HY (B)G Soils

Normally containing layers of varying thickness of fibrous peat derived from sedges, the HY(B)G soils are only slightly decomposed. Some of the soils contain a few woody fragments. The water table is always close to the surface. They are deeply frozen during the winter and early summer and sphagnum peat is dominant only near the surface. They occur in low-lying areas (muskegs) in the Cook Inlet-Susitna lowland and in a few areas at the head of Bristol Bay. They are not domed. The vegetation consists either of sphagnum moss and low-growing shrubs or of black spruce forest.

HYP Soils

Perennially frozen fibrous peats, HYP soils are extensive in interior and northern as well as western Alaska. As a rule,

they occupy low-lying tracts in areas dominated by mineral soils, but in a few places they are the dominant soils.

Most HYP soils consist of undecomposed or slightly decomposed sedge peat, arranged in horizontal layers. Many of them have surface layers of sphagnum moss peat. There permafrost table is one or two feet below the surface. The peat is at least 16 inches thick and, every case, extends to at least 10 inches below the permafrost table. In some areas it is many feet thick over a mineral substratum.

IAHP Soils

These soils are usually wet, and have 8 to 24 inches of organic matter on the soil surface, commonly in the form of a mat of slightly or partially decomposed remains of mosses, sedges, and associated plants. Because the mat is effective insulation against summer heat, the permafrost table in these soils is normally very shallow. The upper part of the soil that thaws each summer and refreezes during the winter, known as the active layer, is almost constantly saturated in the thaw period. Internal pressures during the refreezing period, solifluction on slopes, and other frost processes result in mixing of the soil material so that any textural layers in the

soil are disrupted and pieces of the organic mat are displaced downward. A common phenomenon is a layer of humus-rich material at the permafrost table, which acts as a floor to the churning process. In many places some of the organic matter is imbedded in the upper few inches of the permafrost, indicating that the depth of thawing was greater at some time in the past.

The soil surface is commonly irregular, with many low mounds, solifluction lobes, and other evidences of soil movement. Along the Bering Sea coast, especially in the Yukon-Kuskokwim delta, isolated low mounds are more common than polygons so prevalent in arctic regions. Around lake basins or on other topographic breaks, the mounds may have coalesced to form a continuous low ridge.

The IAHP soils are very extensive in interior and western Alaska, in both lowland and hilly areas. Textures range from very gravelly sand to clay, and parent materials include volcanic ash, alluvium, loess, lacustrine deposits, and weathered rock. The soils range in reaction from strongly acid to strongly alkaline, depending on the nature of the parent material. Some are calcareous and a few are saline. Colors

are generally gray or olive gray. Many of the soils are mottled, but others in the lowest and wettest positions are not mottled.

In forested areas of the interior, the soils commonly support black spruce, willows, low shrubs, sedges, and mosses. In areas above tree line and along the Bering Sea coast, the vegetation consists primarily of sedge tussocks, mosses, low shrubs, and other tundra plants.

IAP Soils

Although IAHP soils have permafrost at some depth, they do not have thick peaty accumulations on the soil surface. The depth of summer thaw in these soils is greater than in the IAHP soils, and some have a permanently unfrozen zone between the bottom of the seasonally frozen soil and the permafrost table. This occurs particularly where the vegetative cover and any thin organic mat has been removed by fire or clearing.

The IAP soils have many characteristics in common with the IAHP soils, but they normally have somewhat longer periods during which the soil is not completely saturated. Nearly all

are strongly mottled. In the interior they are mostly on alluvial plains, glacial moraines, or outcrops of coarse-grained rock.

ICT soils are well-drained and have, in the upper part of the soil, a brown layer that is the result primarily of the liberation in place of iron oxides from the parent material. The brown layer may begin at the surface of the mineral soil, but more commonly there is a thin darker layer at the surface in which organic matter has accumulated. This layer, however, is not as dark or as thick as those in the IUT or MBT soils. A second thin grayish brown layer may also occur, either at the surface of the soil or between a dark upper layer and the brown layer.

The ICT soils occur below tree line in interior Alaska, in areas where annual precipitation is less than 15 inches. They support a forest dominated by white spruce, paper birch, and quaking aspen. The soils occupy both hilly areas and nearly level areas such as outwash plains and terraces where coarse permeable substrata do not permit the retention of large amounts of water in the subsoil.

These soils are nonacid and have high natural levels of most nutrient elements. Most of them have silt loam or loam textures in the brown layer and any overlying layers, but many are gravelly and many are shallow over a substratum of sand or gravelly sand. Parent materials include loess and weathered or shattered bedrock. Many ICT soils in areas bordering large rivers of the interior are formed in deep loessial deposits, but the loess thins rapidly with distance from the rivers. Some of the soils are calcareous (chalky) below the brown layer.

ICP Soils

With mean annual temperatures of 32° F or less, and most ICP soils have a permafrost table that is many feet deep. They occur on ridges, escarpment edges, steep slopes, and other sites with good surface drainage in both alpine and arctic tundra areas. The soils are almost always gravelly. The native vegetation consists primarily of low shrubs, grasses, and associated tundra plants. In many places the vegetation is interrupted by patches of nearly bare soil. Other ground patterns resulting from frost action, including earth mounds, stone stripes, steps, and polygons are common in areas where these soils occur.

INT Soils

These soils are formed in volcanic ash. They either consist mostly of ash of sand or cinder size, or of fine-grained ash that is less than 25 inches thick over other materials. They generally have dark reddish brown or dark brown colors, and many have buried surface horizons because of repeated deposits of ash.

While these are the dominant soils on the Alaska Peninsula and the Aleutian Islands there are also a few small areas of INT soils in western Alaska. The vegetative cover consists of tall grass, a combination of grass and alder, or of low shrubby growth. The shrubby vegetation dominates at higher elevations and on level areas unprotected from strong winds, especially on the Alaska Peninsula.

IND Soils

Formed in thick deposits of fine-grained volcanic ash, IND soils are typically very strongly acid and very dark in color. Percentages of organic matter are very high in the upper layers and in former upper layers that are now buried under more recent ash deposits. The soil becomes smeary and flows readily when it is rubbed or agitated.

These soils exist mostly in areas that are some distance from active volcanoes, but that receive fallout from major eruptions. They occur in islands south of the Alaska Peninsula, and areas north of Bristol Bay as well as on the Alaska Peninsula. Most of them support stands of tall grass or mixed grass and alder.

IUT Soils

These are well-drained soils with a dark, acid upper layer in the mineral soil that is high in organic matter and is at least moderately thick, and below that a brown layer that has resulted from the liberation in place of iron oxides from the parent material. The soils have no permafrost.

In Alaska, the IUT soils have their greatest extent in low hills of the Norton Sound Highlands west of the Yukon River. They support a sparse forest of white spruce and paper birch with a large proportion of alder. Some areas are covered only with alder, willows, and other brush.

IUL Soils

IUL soils overlie consolidated bedrock at depths of less than 20 inches. Soil temperatures may be either higher or lower than 32° F. In other respects the soils have properties much

like those of the IUT soils. Some support a sparse forest of white spruce and birch, but most are covered only with low-growing shrubs.

IUP Soils

These soils have mean annual temperatures of 32° F or less. They occur in positions with good surface drainage in areas above tree line in interior and western Alaska, and are especially prevalent in the Norton Sound Highlands. The soils are mostly, but not exclusively, formed in gravelly or sandy materials. The permafrost table is commonly much deeper than in associated IAP and IAHP soils. The vegetation is dominated by low shrubs, grasses, lichens, and other tundra plants.

LR land consists of lava flows with little or no vegetation. It occurs only in relatively small areas in western Alaska.

MAP Soils

Usually wet and are perennially frozen at some depth, most MAP soils have a surface mat of peaty material, ranging in thickness from a few inches to more than 12 inches. The mineral soil below the peat mat has a dark upper layer and a mottled

gray lower layer. In many places, especially where the organic mat is thin, the mat is not continuous but is interrupted by patches in which the mineral soil is exposed.

Most MAP soils are formed in materials derived from calcareous rocks. They occur in a few places in interior Alaska, however, they are more common in other areas of the state. The vegetation consists dominantly of sedges, low shrubs, and other tundra plants. Where they occur in interior Alaska they also support black spruce and willows.

MBP Soils

Having mean annual temperatures of 32° F or less, MBP soils are normally thin but a dark, nonacid layer at the surface is at least two inches thick and commonly overlies a dark brown second layer. These soils are fairly extensive on basaltic materials in western Alaska. They are generally very gravelly and occupy positions with good surface drainage. The permafrost table is commonly much deeper than in associated IAP and IAHP sols.

The vegetation consists of low shrubs, grasses, and other tundra plants. The permafrost table in these soils is deep.

RM Land

RM land consists of steep mountains and permanent ice-fields. Some slopes on the mountains support a sparse shrubby vegetation, but most are unvegetated. RM land occurs in all parts of the state, and is very extensive in the principal mountain ranges.

SD Land

SD land consists of shifting sand dunes with little or no vegetation. The principal areas of SD land are in the Kobuk and Koyukuk Valleys.

SOT Soils

Containing a layer in which mixtures of organic matter, aluminum, and iron have been precipitated from percolating water, most of SOT soils have a surface mat of partially to completely decomposed organic litter and a thin gray mineral horizon above the layer in which these materials have accumulated. The top of that layer is normally dark reddish brown in color. The lower part of the layer has dark brown or yellowish brown colors. Plowing, logging, or other disturbance has obscured

the sequence of layers in some soils, but at least the lower part of the layer of accumulation is generally visible. In a few places, a black layer exists in place of the gray layer immediately beneath the organic mat. The soils have no permafrost.

SOT soils are dominant on well-drained uplands in areas with sufficient rainfall so that moisture in excess of that required by the natural vegetation moves completely through the soil, but where precipitation rates are not so high that the upper part of the layer of accumulation contains more than 10 percent organic matter. In Alaska, they occur mostly in areas where mean annual precipitation is between 15 and 25 inches. The principal areas of occurrence are the northwestern foothills of the Alaska Range, the central part of the Kuskokwim Highlands, and areas bordering the Lower Yukon River.

The soils are formed in a variety of parent materials ranging in texture from loam or silt loam to very gravelly sand. They form on sandy materials even where annual precipitation is well below 15 inches. The most common parent material of SOT soils is silty loess or mixtures of loess and volcanic ash of varying thickness over substrata ranging from outwash gravel to compact glacial till. In most areas, the soils support a forest of white spruce, paper birch, and quaking aspen.

SOP Soils

These soils have mean annual temperatures of 32° F or less. They differ from the SOT soils in that the soil layers are very thin and permafrost exists at depths of several feet. These soils are extensive in areas above tree line in interior Alaska. Commonly, the soils are formed in gravelly materials on sites with good drainage characteristics, but they also exist in areas of stabilized sand dunes. They support low shrubs, grasses, and other tundra plants.

SOU Soils

While they resemble the SOT soils, SOU soils have large amounts of organic matter and black to dark reddish brown colors in at least the upper part of the layer of accumulation. These are the dominant soils of well-drained forested uplands along the southern border of the planning area.

The soils are formed in many different parent materials, including glacial till, weathered rocks of all kinds, loess, and volcanic ash. They have all been subject to intense leaching and are strongly acid. Except in the organic litter on the soil surface, they are low in nutrient elements.

OVERLAYS, SOILS

see 14-1, Soil Suitabilities

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CHAPTER 4

VEGETATION

V E G E T A T I O N

INTRODUCTION

This section has been extracted from the Joint Federal-State Land Use Planning Commission's Resource Planning Team's "Resource Inventory" publications for "Ecosystems (Based on Vegetative Types)" by Horace Sanders. The reports for the Northwest, Yukon, and Southwest regions have been used. Plants mentioned in text are listed in table 4-1.

ECOSYSTEMS

Alaska has been divided into nine ecosystems based on vegetation types. They are the Coastal Western Hemlock-Sitka Spruce Forest, the Bottomland Spruce-Poplar Forest, the Upland Spruce-Hardwood Forest, the Lowland Spruce-Hardwood Forest, the High Brush, the Low Brush and Muskeg-Bog, the Moist Tundra, the Wet Tundra, and the Alpine Tundra and Barren. All these systems except Coastal Western Hemlock-Sitka Spruce Forest are present within the Southwest Planning Area.

Table 4-1. Plants Mentioned in Text.
(Nomenclature According to Hulten, 1968)

Equisetaceae	
horsetail	*Equisetum* sp.
Pinaceae	
white spruce	*Picea glauca*
black spruce	*P. mariana*
Sparganiaceae	
bur reed	*Sparganium* sp.
Potamogetonaceae	
pondweed	*Potamogeton* sp.
Gramineae	
pendent grass	*Arctophila fulva*
bluejoint	*Calamagrostis canadensis*
beach rye	*Elymus arenarius*
Cyperaceae	
cottongrass	*Eriophorum* sp.
Juncaceae	
wood rush	*Luzula* sp.
Salicaceae	
balsam poplar (black cottonwood)	*Populus balsamifera*
quaking aspen	*P. tremuloides*
willow	*Salix* sp.
Betulaceae	
dwarf birch	*Betula nana*
resin birch (shrub birch)	*B. glandulosa*

Table 4-1. (continued).

paperbirch	B. papyrifera
American green Alder (Sitka Alder)	Alnus crispa
thinleaf alder	A. incana
Sitka alder	A. crispa
Polygonaceae	
bistort	Polygonum bistorta
Caryophyllaceae	
sandwort	Arenaria sp.
moss campion	Silene acaulis
Saxifragaceae	
currant	Ribes sp.
Rosaceae	
spiraea	Spriaea sp.
raspberry	Rubus sp.
cinquefoil	Potentilla fruticosa
mountain avens	Dryas octopetalia
rose	Rosa sp.
Leguminosae	
Oxytrope	Oxytropis sp.
Elaeagnaceae	
Buffaloberry	Shepherdia canadensis
Onagraceae	
fireweed	Epilobium angustifolium
Haloraagaceae	
mare's tail	Hippuris sp.
Cornaceae	
dogwood	Cornus sp.

Table 4-1. (continued).

Empetraceae	
crowberry	*Empetrum nigrum*
Ericaceae	
Labrador tea	*Ledum palustre*
Lapland rosebay (Rhododendron)	*Rhododendron lapponicum*
alpine azalea	*Loiseleuria procumbens*
bearberry	*Arctostaphylos* sp.
dwarf blueberry	*Vaccinium caespitosum*
blueberry (bog)	*V. uliginosum*
bog cranberry	*Oxycossus* sp.
lowbush cranberry (mountain)	*Vaccinium vitis-idaea*
bog rosemary	*Andromeda polifolia*
mountain heather	*Phyllodoce coerulea*
cassiope	*Cassiope* sp.
Caprifoliaceae	
high bush cranberry	*Viburnum adule*

These are broad classifications, and the border between vegetation types should be considered as a wide band where a variety of plant communities probably occur.

Bottomland Spruce-Poplar Forest

This tall, relatively dense interior forest system is primarily white spruce, locally mixed with birch or balsam poplar. In general, the commercial stands of white spruce are situated on level or nearly level floodplains and low river terraces. Balsam poplar and birch usually occur with white spruce as a successional system. They are replaced at maturity by white spruce. Balsam poplar invades floodplains and deglaciated valleys. On favorable sites the trees grow rapidly to heights of 80 to 100 feet with diameters to 24 inches.

Undergrowth is generally dense, consisting of high and low shrubs including American green alder, thinleaf alder, willow, rose, dogwood, Labrador tea, and berry bushes. The forest floor is usually carpeted with ferns, bluejoint, fireweed, horsetails, lichens, herbs, and moss.

Portions of floodplains are barren during periods of low water, and some periodically flooded backwater areas contain meadows of tall grass with clumps of willow. This system is confined to level or nearly level broad floodplains, low river terraces, and more deeply thawed south-facing slopes.

This vegetation type is found mostly along the Kuskokwim and Yukon Rivers and their main tributaries. On more favorable sites along the Kuskokwim River, individual spruce trees may reach 110 feet, have 24 inch diameters and be 100 to 200 years old.

Upland Spruce-Hardwood Forest

This ecosystem is a fairly dense interior forest composed of white spruce, birch, aspen and poplar. Root depths are shallow. Fire scars are common.

White spruce averaging 30 to 70 feet in height and up to 16 inches in diameter occur in mixed stands on south-facing slopes and well drained soils. This species forms pure stands near streams. Aspen and birch average 50 feet in height. Poplar averaging 70 feet in height and 20 inches in diameter occurs in scattered stands along streams.

Undergrowth consists of mosses with grasses on drier sites and with brush on moist slopes. Typical plants are willow, alder, fern, rose, high- and low-bush cranberry, raspberry, currant and horsetail.

This system is located mostly in the high drainages of the Kuskokwim River and the Nulato Hills area west of the Yukon River.

Lowland Spruce-Hardwood Forest

This ecosystem is a dense to open interior lowland forest of evergreen and deciduous trees, including extensive pure stands of black spruce. Black spruce are slow growing and seldom exceed eight inches in diameter or 50 feet in height. Cones of this tree open after fire and spread abundant seed, enabling black spruce to quickly invade burned areas. The slow-growing stunted tamarack is associated with black spruce in the wet lowlands. Like black spruce, it is of little commercial value, seldom reaching a diameter of more than six inches.

Rolling basins and knolls in the lowlands have a varied mixture of white spruce, black spruce, paper birch, aspen and poplar. Small bogs and muskegs are found in the depressions.

Undergrowth species include willow, dwarf birch, low bush cranberry, blueberry, Labrador tea, crowberry, bearberry, cottongrass, ferns, horsetail, lichens and thick cover of sphagnum and other mosses. Large areas burned since 1900 are covered by willow brush and very dense stands of black spruce saplings.

This system is extensive in the intermontane basins and lowlands. It usually occupies shallow peat, outwash plains, alluvial fans and north slopes. Extensive stands are found on the south side of the upper Kuskowkim River and east of the Yukon River in the area of the proposed Innoko National Wildlife Refuge.

High Brush

These are usually dense to open clumps of deciduous brush. Heights are from 5 to 10 feet, stems, 1 to 3 inches in diameter and sometimes as close as one foot apart. Floodplain - thickets: This subsystem develops quickly on newly exposed alluvial deposits that are periodically flooded. The dominant shrubs are willows and alders. Associated shrubs are dogwood, prickly rose, raspberry, buffaloberry and high bush cranberry.

Birch-alder-willow thickets: This subsystem is found near timberline. It consists of resin birch, American green alder, thinleaf alder, and several willow species. Thickets may be extremely dense, or open and interspersed with reindeer lichens, low heather type shrubs, or patches of alpine tundra ecosystems. Other associated species are Sitka alder, bearberry, crowberry, Labrador tea, spirea, blueberry, and mountain cranberry.

This is the larger of the two brush subsystems. It occurs naturally near tree line and extends in a belt around most of the mountains just below the alpine tundra. In some areas it is well below tree line and associated with widely spaced white spruce. Brush also comes in after fire, serving as a preforest successional stage.

This type is extensive between the Yukon and Innoko Rivers and at the north edge of the Kilbuck Mountains about the Kuskokwim River.

Low Brush, Muskeg-Bog

This system is found where conditions are too wet for tree growth. Bog vegetation consists of varying amounts of sedges, sphagnum and other mosses, bog rosemary, resin birch, dwarf Arctic birch, Labrador tea, willow, cranberry, and blueberry. Localized saturated flats have large patches of cottongrass tussocks. Areas of tall willow, alder brush, and widely spaced dwarf spruce and tamarack are found within and around the marginal higher portions. Bog surfaces often have uneven, string-like ridges. These surfaces are too wet for shrubs.

A major part of this system is found on the low flat areas of the upper Kuskokwim River drainage.

Moist Tundra

Moist tundra ecosystems usually form a complete ground cover and are extremely productive during the growing season. They vary from almost continuous and uniformly developed cottongrass tussocks with sparse growth of other sedges and dwarf shrubs to stands where tussocks are scarce or lacking and dwarf shrubs are dominant.

Associated species are arctagrostis, bluejoint, mosses, alpine azalea, wood rush, mountain-avens, bistort, low-growing willows, dwarf birch, Labrador tea, green alder, Lapland rosebay, blueberry and mountain cranberry.

This system is found mostly along the Izaviknek River in the Yukon Delta, west of the Andreafsky, the lower reaches of the Golsovia and south of the Kilbuck Mountains in the vicinity of the proposed Togiak National Wildlife Refuge.

Wet Tundra

This system is usually found in areas with little topographic relief. Standing water is almost always present in summer, and numerous shallow lakes are common. Dominant vegetation is sedge and cottongrass, usually forming a mat rather than tussocks. A few woody and herbaceous plants occur on the drier sites above the water table. Rooted aquatic plants occur along shorelines and in shallow lake waters.

Associated plants are lichens, mosses, low-growing willows, dwarf birch, Labrador tea, cinquefoil, beach rye, low bush cranberry and occasionally bog cranberry. Characteristic rooted aquatic plants are bur reed, pond weed, pendent grass, and mare's tail.

Annual production of above-ground vegetative dry matter usually ranges between 500 and 1,000 pounds per acre. One study in the northern Arctic reported an average of 775 pounds. Extreme production approaches a ton per acre.

The wet tundra system is extensive in the delta portion of the Lower Yukon and Kuskokwim Rivers. Representative areas of this system are also found along much of the coast.

Alpine Tundra and Barren

This system is found along ridges and on rubble slopes where bedrock is close to the surface, and on porous soils, such as alluvial fans, and the driest parts of the river terraces. The soil is generally coarse and mineral, containing a small amount of humus near the surface. Alpine tundra is most common along the mountain front between 2,000 and 4,000 feet elevation.

The vegetation is somewhat sparse and usually only a few inches high. Plant associations differ from one place to another, but *Dryas octopetala* and lichens are usually of primary importance along with white mountain-avens, and low-

growing herbs, grasses, and sedges. Associated species are resin birch, dwarf arctic birch, cassiope, crowberry, alpine azalea, Labrador tea, mountain heather, moss campion, oxytrope, and sandwort.

Lower producing plant communities on outcrops and talus occur mainly in the higher parts of the foothills and in the mountains from about 2,000 to 4,500 foot elevations. Above 4,500 feet most of the mountains are bare except for rock lichens, but a few flowering plants grow up to about 6,000 feet. The vegetation consists of scattered plants, similar to those found at lower elevations and usually not confined to characteristic plant communities.

Associated species are resin birch, dwarf Arctic birch, cassiope, crowberry, alpine azalea, Labrador tea, mountain heather, rhododendron, arctic willow, dwarf blueberry, and cranberry.

Alpine tundra systems are found on the mountainous and exposed ridges throughout the region.

This type is most often found in the Kuskokwim Mountains and in the Alaska Range.

THREATENED AND ENDANGERED PLANTS

There are currently no threatened or endangered plants listed in the Federal Register for the State of Alaska. Bureau policy, however, recognizes the fact that some plants may be prime for nomination but have not had the nomination process completed. Three species in this category are found in this area. One is listed as proposed endangered and two as proposed threatened.

Endangered status requires that extirpation of a taxon is possible throughout all or a significant portion of its total range. Also, plants occurring in a very limited area or in a restricted, specialized habitat have been considered de facto endangered. The one taxa proposed for endangered status is known from two sites not very distant from each other.

A threatened taxon is one so restricted in its distribution as to be likely to become endangered. This is the vulnerable category of the IUCN Red Data Book. Included here are taxa known from several localities, but these are distant from each other and are not widespread, and the belief is that more will be found elsewhere.

PROPOSED ENDANGERED

Smelowskia pyriformis - Drury and Rollins

Smelowskia pyriformis has the stout caudex, basal leaf cluster, and decumbent stems with several flowers (or fruits) that are seen in other taxa of the genus Smelowskia. It differs from the others found in Alaska most clearly by its pyriform (pear-shaped) fruits and its basal leaves that are pinnately cut to form several deep lobes. Also the stems are both simple and branched, and the petals are cream-colored, not lavender.

This species has been found twice on calcareous screes in the upper Kuskokwim River drainage. It appears to be a well-marked species that is morphologically intermediate between S. ovalis M. E. Jones of the Pacific Northwest and S. borealis.

Since it is known from only two sites, endangered status is suggested.

PROPOSED THREATENED

Papaver alboroseum - Hultén

Pale poppy

The scientific name of this small poppy is derived from the color of its petals: white suffused with pink (mother-of-pearl) and with a yellow basal spot. It tends to be strongly caespitose with glaucescent leaves. The stems are typically bent over and bowlike. The fruit is broadly ovate with stiff, stout, light-colorated hairs, often somewhat tuberculate at the base.

It is known from well drained alpine settings in the Alaska Range, Wrangell Mountains, and St. Elias Mountains, from lowlands in the Cook Inlet region (at Portage Glacier), on Attu in the Aleutian Islands, and at one locality in Kamchatka. References to the species in arctic Alaska by Wiggins and Thomas (1962) are in question, and research is in progress to better define the taxon there.

This species may be only apparently rare and could actually have a more or less continuous distribution in high alpine sites in northern mountains. Until more information is available, threatened status is proposed.

Papaver walpolei - A. E. Porsild

Walpole poppy

This is the most easily recognized of all the Alaskan poppies. It alone has basal leaves that are entire and two- to three-lobed. In addition these leaves are somewhat leathery, dark green above and pale green beneath, with the veins showing conspicuously on the undersurface. The leaves are usually totally glabrous, although hairy ones are seen. The petals are usually white or white with a yellow base, but pale yellow-flowered plants are also found. The fruit is conical and obovate.

Thought for many years to be restricted to the Seward Peninsula, the species has been found more recently on the lower Noatak River, the middle Kobuk River, and at two additional distant locations in Alaska - at Goodnews Bay on the southwestern coast and on the Kongakut River in the extreme northeastern Arctic. It is also known from one locality in the Ogilvie Mountains in the Yukon drainage and from at least two on the Chukotka Peninsula in the Soviet Union, across the Bering Strait from the Seward Peninsula. It is found in coarse, well-drained soils.

Given the distribution pattern that is emerging from recent collections, it is possible that this species will soon be considered sufficiently widespread that the present proposal for threatened status will be unnecessary.

ALASKAN VEGETATION REPRODUCTIVE CHARACTERISTICS

PRESENTED COURTESY OF DR. JOHN ZAZADA
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A key role in the rate of recovery from fire is played by the reproductive mechanisms available to the plants. Rapid regrowth occurs from vegetative reproduction -- when fire-scarred plants are able to send out shoots from roots, rhizomes, or buds on the lower stems. However, intense burning can reduce, or in some cases eliminate, the ability of trees and shrubs to reproduce in this way. In these instances, regeneration must be from seed on the site or from unburned forests adjacent to the burn. Seed regeneration grows more slowly than vegetatively produced regeneration. The reproductive characteristics of the most common trees and shrubs are summarized below. (See tables 4-2 and 4-3.)

Vegetative Reproduction

Vegetative reproduction is of critical importance to rapid recovery of plant cover following disturbance. Intense fire or severe disturbance can result in significantly slower rates of recovery and increased potential for soil movement. Although no good comparisons of seedling growth and growth

Table 4-2. Vegetative Reproduction of Trees and Tall Shrubs

SPECIES	SOURCE OF REPRODUCTION	REMARKS & GENERAL RESPONSE CHARACTERISTICS
Quaking Aspen	Roots which occur at organic matter/mineral soil interface or in mineral soil. Usually not deeper than 2-5 inches in mineral soil.	Produces root suckers on roots of all sizes. Density of suckers will depend on amount of aspen in pre-burn forest. One to 3 year old stands may contain 50,000 to 100,000 stems. On good sites in the interior, and in the absence of severe browsing, dominant stems can be up to 15 feet tall at age 3. Relatively vigorous stands up to at least 150 years old produce abundant suckers.
Paper birch	Sprouts originate from buds at base of tree (root collar).	Sprouts occur on trees of all sizes. Ability to sprout will depend on fire intensity and stand age. Preliminary results of studies on upland sites indicate that in stands that are 120 years or older, sprouting will occur on fewer than 50% of trees. Early growth similar to aspen.
Balsam poplar	Reproduces from roots and buds at base of tree.	Species most abundant on river flood plains. However, where it occurs on upland sites it appears to regenerate almost as vigorously as aspen and birch.
White spruce Black spruce Tamarack		Vegetative reproduction immediately following fire, does not occur. These species, especially black spruce, reproduce vegetatively by layering. This is a process in which lower branches become overgrown with moss and eventually produce roots. The uncovered tip of the branch forms a tree.
Willow	Sprouts originate from buds at stem base.	Ability to resprout in all stages of vigor--this includes the most decadent old clumps in black spruce which appear to have little living tissue. Intense burning can completely destroy willows.

Table 4-3. Vegetative Reproduction of Low Shrubs 1/

SPECIES	RELATIVE DEPTH UNDER-GROUND PARTS	SOURCE OF REPRODUCTION	REMARKS & GENERAL RESPONSE CHARACTERISTICS
Prickly Rose	Deep	Extensive rhizomes in the lower part of the organic layers and mineral soil.	Produces new shoots at intervals along the rhizomes after fire as well as from base of fire-killed above ground stem. Spreads rapidly after disturbance.
Highbush cranberry	Deep	Extensive rhizomes mainly in lower organic layer and mineral soil.	Similar to rose.
Buffalo-berry	Deep (?)	Rhizomes extending to mineral soil.	
Currants (all species)	(?)	Rhizomes extending to mineral soil.	
Raspberry	Medium-deep	Extensive rhizomes in mineral soil.	Can spread very rapidly following disturbance. Frequently originates from seed following disturbance of mature forest.
Blueberry	Medium	Depending on species may have buried stems or rhizomes. Occur mostly in organic layers in black spruce type.	Initial sprouting after fire occurs at the base of fire-pruned aerial stems. Sprouts from buried stem become evident later than those from fire-pruned aerial stems.
Labrador tea	Medium	Buried stems.	Response in interior Alaska similar to bluberry.
Beauverd spirea		Sprouts at base of fire-pruned stems. Reported to spread from rhizomes.	Occurs in multi-stemmed clumps.
Rusty menziesia	Medium	Rhizomes and basal sprouting.	

Table 4-3. (continued)

SPECIES	RELATIVE DEPTH UNDER-GROUND PARTS	SOURCE OF REPRODUCTION	REMARKS & GENERAL RESPONSE CHARACTERISTICS
Shrub birches		Sprout from base of fire-pruned stems.	
Red-osier dogwood	(?)	Rhizomes and basal stem sprouts.	
Bunch-berry	Shallow - medium	Rhizomes located in organic layer.	
Twinflower	Shallow	Rhizomes in organic layer and at organic/mineral interface.	Appears to be adversely affected by mineral disturbance of surface organic layers.
Bearberry	Shallow	Rhizomes and layering.	
Lowbush	Shallow	Extensive rhizome system in surface organic layers.	Extensive rhizomes with shoots produced at intervals.
Cloudberry/ Nagoon berry	Shallow	Rhizomes.	

1/ Information on these species is limited. Only the most common species have been included.

of vegetatively produced regeneration are available, vegetative reproduction is at least two times greater than seedling growth. In aspen, where some comparative observations are available, growth of dominant suckers during the first year can be five to eight times greater than that of seedlings on the same site.

Seed Reproduction

Table 4-4 displays germination characteristics for selected shrubs with seed reproduction.

Low Shrubs. Relatively little information is available regarding seed reproduction and periodicity of seed crops for these species. Seed regeneration of low shrubs is not normally a significant factor in rate of recovery immediately following fire. The reason for this is that vegetative parts are mostly destroyed. Seed reproduction can also be important for species which have seeds buried in the organic layers and mineral soil.

Because mature seed-producing plants of these species are either totally destroyed or killed by fire, there is not an immediate source of seed available. However, because of rapid vegetative reproduction and improved environmental conditions, abundant flowering and seed production can occur 3 to 5

Table 4-4. Seed Reproduction of Selected Shrubs

SPECIES	SEEDS/FRUITS	GERMINATION CHARACTERISTICS
Prickly rose (Rosa acicularis)	1	Appears to require a sequence of winter-summer-winter after seed maturation for germination to occur. A seed crop produced in any given year may require a number of years to germinate even under adequate conditions.
Highbush cranberry (Viburnum edule)	1	Germination requirements as or more complex than those of any species in Alaska. Period of cold (winter) followed by warm (summer) results in root development. Seedling shoot initiation (completion of germination) requires another winter.
Buffloberry (Shepherdia canadensis)	1	Seeds able to germinate completely summer after maturation.
Currants (Ribes spp.)	1	Germination of some seeds can occur in spring following dispersal; however, seeds may remain dormant for many years.
Raspberry (Rubus idaeus)	Multiple	Small number of seeds may germinate the year after dispersal; however, can remain dormant for a long period.
Blueberry (Vaccinium uliginosum and others)	Multiple	Able to germinate completely the summer after dispersal.
Lowbush cranberry (Vaccinium vitis-idaea)	Multiple	Similar to blueberry.
Red-osier dogwood (Cornus stolonifera)	1 (maybe 2 embryos in a seed)	Capable of germination the summer after dispersal.
Bunchberry (Cornus canadensis)	Same as red-osier dogwood	
Nagoon-berry (Rubus arcticus)	Multiple	Germination of seeds can occur the summer after dispersal; evidence indicates that seed germinates over several years.

Table 4-4. Seed Reproduction of Selected Shrubs (continued).

SPECIES	SEEDS/FRUITS	GERMINATION CHARACTERISTICS
Cloudberry (*Rubus chamaemorus*)	Multiple	Similar to Nagoon-berry.
Bearberry (*Arctostaphylos uva-ursi*)	Multiple	Germination occurs slowly over a period of years.

years after burning. A major source of general and specific information can be found in USDA Handbook No. 450, "Seeds of Woody Plants in the United States."

For the purpose of briefly summarizing data on low shrub seed production, the data are divided into species with fleshy fruits (berries) and those with dry fruits.

Low Shrubs With Fleshy Fruits (berries). Fruits and seeds of these species are consumed by various animals in large quantities. In the process, seeds may be destroyed, cached or they may pass through the animal. Predation by animals is important in the dispersal of these seeds. Because the berries are heavy, they would not move far from the plant if dependent on wind or gravity. Animals may move the seed long distances from the parent plant.

The unaltered seeds of these species have a seed coat which is frequently described as hard, stony and/or impermeable. This type of seed coat makes these seeds highly resistant to various weather and biological variables. Because of this resistance, these seeds can probably exist for long periods of time in the soil and organic layers. Germination can occur

after a disturbance such as fire. Raspberry appears to be the best example, that we currently know about in Alaska, of species regenerating from buried seed.

It is difficult to generalize about seed bed conditions for these species. Certainly, many of them germinate and grow on mineral soil. However, because of their importance as a food for predators and their relatively resistant seed coat, they are often found germinating in organic matter and unique micro-sites (e.g. animal feces, seed caches). The important thing to remember is that organic matter is a poor germination media only because it dries out rapidly and heats up when exposed to the sun. When kept moist, it can be a good seed bed -- this frequently is the case an inch or more below the organic surface. Maturation of these species' seeds occurs in late summer or fall.

Low Shrubs With Dry Fruits. Seeds of these species are very small (up to 5,000,000 seeds/lb). Seed coats are thin membranes -- markedly different from those of the fleshy fruited low shrubs. Size and shape of seed indicate that wind is the dispersal agent. Each fruit produces many seeds.

There has been little experience with the germination of seeds and seedling establishment of these species. However, the size of the seed and nature of the seed coat suggest that they are more similar to trees and tall shrubs than to fleshy-fruited low shrubs. Thus, a mineral soil seed bed which provides a more stable supply of moisture and less temperature fluctuation than organic matter is probably necessary for optimum germination and early seedling growth.

Germination of these species occurs fairly rapidly under normal temperature regimes after winter stratification. If the seed does not germinate during the first or second growing season it probably loses its viability.

Seeds mature in late summer and fall, with dispersal occurring shortly after.

Species included in this group are:

Labrador tea (*Ledum groenlandicum* and *L. decumbens*)
Beauverd spirea (*Spirea beauverdiana*)
Rusty menziesia (*Menziesia ferruginea*)
Resin birch (*Betula glandulosa*)

OVERLAYS, VEGETATION
4-1, Vegetation and Endangered Plants

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CHAPTER 5

WATER RESOURCES

WATER RESOURCES

INTRODUCTION

The total drainage of the Southwest Planning Area covers approximately 102,100 square miles. The Planning Area contains four distinct drainage areas: the Kuskokwim watershed, approximately 58,000 square miles and second largest watershed in Alaska; the Unalakleet watershed, approximately 3,100 square miles; the Lower Yukon drainage south of the 64th parallel, approximately 38,000 square miles; and the Nowitna River basin south of the 64th parallel, approximately 3,000 square miles.

The Planning Area lies in the region of discontinuous permafrost. Present day glaciation is limited to the Alaska Range on the eastern watershed of the Kuskokwim drainage.

An important feature of the region is the Yukon-Kuskokwim Delta, a depositional lowland formed by the highly glaciated upper Yukon and Kuskokwim Rivers. Ninety-five percent of the

sediments deposited, or approximately 100 million metric tons per year derive from the Yukon. The delta comprises a vast wetland and is an important breeding and rearing area for fish and game, as well as serving floodplain and sediment removal functions. The delta is 40 to 50 percent wet, containing ponds and lakes many thousands of acres in size.

UNALAKLEET RIVER SUBREGION

The Unalakleet River is the principal stream of the subregion, its drainage basin comprising about two thirds of the total surface area of the subregion. Table 5-1 lists the river's major tributaries and their features.

Groundwater availability is generally low throughout the subregion due to the presence of permafrost, low annual precipitation and the long period of subfreezing temperatures. Gravel beneath the large streams presents the best possibility of water supply. Developed wells in the Norton Sound physiographic region generally provide less than 10 gallons per minute (gpm) recharge (Dorris, 1973).

Table 5-1. Unalakleet River Basin Major Tributaries

Name	Tributary to	Location of Outlet	General Direction of Flow	Drainage Area in sq. mi.	Length of Main Stream Miles	Estimated Av. An Flow cfs
Unalakleet	Norton Sound	Unalakleet	West	2,080	65	2,000
South R.	Unalakleet R.	Mile 5	North	498	50	480
North R.	Unalakleet R.	Mile 5	South	124	30	120
Chiroskey	Unalakleet R.	Mile 25	North	310	35	300
Old Woman	Unalakleet R.	Mile 60	North	306	40	294
North Fork	Unalakleet R.	Mile 49	South	234	35	216

There are no guaging stations, snow courses, or other water resource projects in the sub-basin, although a series of aerial snow markers are planned for the Nulato Hills for FY81 in support of the BLM natural resource inventory effort.

LOWER YUKON SUBREGION

The Lower Yukon sub-basin comprises those lands to the south of the 64th parallel and draining into the Yukon River or the Bering Sea between Cape Stephens to the north and Hazen Bay to the south, an area of approximately 21,700,000 acres. The subregion is bounded by the Nulato Hills to the west and Kuskokwim Mountains to the east. Topographic relief is from sea level to approximately 3,000 feet in the Kuksokwim Mountains. The drainages are dendritic in pattern and drain generally in a southerly to westerly direction. All tributaries to the Lower Yukon are non-glacial.

The principal streams are the Yukon and its tributaries -- the Andreafsky, Chuilnak, Nonasila, Anvik and Innoko rivers. Near its mouth the Yukon divides into three main channels -- Apoon Pass into Norton Sound and Kwikpak and Kwikluak Passes into the Bering Sea. Table 5-2 lists and provides selected data on tributaries to the Lower Yukon.

Table 5-2. Principal Streams, Yukon Sub-basin

River	Tributary to	At River Mile	Drainage Area Square Mile	Length Miles
Yukon	Bering Sea			
Andreafsky	Yukon	94	1,360	105
E. Fork Andreafsky	Andreafsky	5	835	122
Chuilnak	Yukon	116	1,989	33
Atchuelinguk	Chuilnak	34	1,447	97
Reindeer	Yukon	123	329	70
Talbiksok	Yukon	205	208	56
Innoko	Yukon	280	10,900	463
Reindeer	Innoko	14	477	49
Iditarod	Innoko	144	3,194	297
Kluklaklatna	Innoko	283	1,172	49
North Fork Innoko	Innoko	368	1,116	49
Bonasila	Yukon	313	1,275	93
Anvik	Yukon	325	1,700	126
Khotol	Yukon	440	821	61

Of the numerous lakes in the subbasin only a few are upland, and some of these lack outlets. Natural regulation of flows afforded by the lakes is small, nor are they favored with potential outlet dam sites allowing storage for power development. All lakes of greater than 10 square miles surface area occur in the delta lowlands (see table 5-3).

Groundwater availability is limited by permafrost. In the southern part of the subbasin, wells in valleys, even relatively small ones supply groundwater year round. A well was developed in fractured bedrock at Cape Romanzof. Groundwater obtained near the coast is generally higher in mineral content than that from inland sources and is subject to salt water intrusion. Groundwater in the northern portion of the subregion can be developed chiefly near the major stream courses. Availability varies from less than 10 gpm in the northern mountainous areas to as much as 100 gpm in the lowlands.

Springs are lacking in the southern portion of the subregion due to lack of topographic variation. There are a few known springs in the northern area although data on them are lacking.

Table 5-3. Lakes With Areas of 10 Square Miles or Larger

Lake	Area (Sq. Mi.)	Quadrangle	Latitude	Longitude
Kuskokwim Drainage				
Dall	100	Baird Inlet	60°15'	163°45'
Aropuk	57	Marshall	61°15'	163°45'
Nunavakpak	53	Baird Inlet	60°45'	162°40'
Kagnasuk	52	Baird Inlet	60°55'	163°40'
Whitefish	33	Russian Mission	61°20'	160° 0'
Takslesluk	31	Marshall	61°05'	162°55'
Unnamed	28	Baird Inlet	60°55'	164° 0'
Unnamed	20	Baird Inlet	60°05'	164° 0'
Unnamed (may be salt water)	20	Russian Mission	61°40'	160°25'
Kyigayalik	19	Baird Inlet	61° 0'	162°30'
Telaquana	16	Lake Clark	60°55'	153°55'
Unnamed	16	Bethel	60°30'	161°40'
Unnamed	16	Marshall	61° 0'	163°45'
Unnamed	15	Kuskokwim	59°55'	163°15'
Unnamed	14	Baird Mountain	60°20'	164°25'
Unnamed	14	Baird Mountain	60°50'	163°30'
Unnamed	14	Kuskokwim	59°50'	163°30'
Whitefish	13	Lake Clark	71° 0'	156° 0'
Unnamed	12	Baird Inlet	60°25'	164°10'
Unnamed	12	Kuskokwim Bay	59°50'	163°25'
Unnamed	11	Baird Inlet	60°25'	164°10'
Unnamed	11	Baird Inlet	60°55'	162°20'
Kukaklik	10	Russian Mission	61°40'	160°30'
Kulik	10	Russian Mission	61°45'	160°40'
Unnamed	10	Baird Inlet	60°20'	162° 0'
Unnamed	10	Baird Inlet	60°25'	162° 0'
Unnamed	10	Baird Inlet	60°55'	162°10'
Unnamed	10	Kuskokwim Bay	59°55'	163°15'

There are no Bureau projects in the subregion, and snow courses are lacking. The U.S. Geological Survey maintains the sole guaging station in the subregion at Pilot Station on the Yukon River. The period of record is 1975 to present.

KUSKOKWIM RIVER SUBREGION

The Kuskokwim River basin comprises those lands draining into Kuskokwim Bay and into Etolin Strait south of Hazen Bay, excepting that portion of the North Fork drainage north of the 64th parallel. The watershed encompasses approximately 37,120,000 acres. The subregion is bounded by the Kuksokwim Mountains to the northwest, and the Alaska Range, Nushagak Hills, and Kilbuck Mountains to the southeast. Topographic relief is from sea level to 4,500 feet in the Kuskokwims and Kilbucks, and to 17,400 feet in the Alaska Range (Mt. Foraker). The drainages are generally dendritic in pattern and drain in a northwesterly to southwesterly direction. Those streams flowing to the Kuskokwim from the Alaska Range are glacial. All others are non-glacial and generally clear flowing.

The basin lies mostly in the transitional climatic zone; however, the southern portion is more maritime. The extreme eastern portion of the subbasin lies in the continental climatic zone.

Table 5-4 lists and provides selected data about the Kuskokwim and its major tributaries. Table 5-5 provides stream profiles. Table 5-6 provides data on major, non-tributary streams of the subregion.

The coastal lowlands, Stony River lowlands, and Upper Kuskokwim lowlands are pockmarked with many thousands of lakes varying in size from less than one to many thousands of acres. Lakes of greater than 10 square miles surface area are listed in Table 5-3. Potential outlet damsites allowing storage for power development are rare in the subregion (Army Corps of Engineers, 1964).

Groundwater in excess of 10 gpm is available throughout the delta, as well as in the vicinity of larger streams in the subregion (Dorris, 1973). Potable water is available beneath relatively thick permafrost away from the river in the Bethel area, but conditions such as this may not be true in inland localities.

Table 5-4. Tributaries of Kuskokwim River

River	Tributary to	At River Mile	Drainage Area Square Mile	Length in Miles
Kuskokwim	Kuskokwim Bay		50,000	540
Tundra	Kuskokwim	48	1,950	91
Kwethluk	Kuskokwim	82	1,300	138
Kisaralik	Kuskokwim	97	1,470	100
Aniak	Kuskokwim	198	2,230	89
Crooked Creek	Kuskokwim	264	343	18
George	Kuskokwim	282	1,400	75
Holitna	Kuskokwim	309	4,180	128
Hoholitna	Kuskokwim	30	2,410	60
Stony	Kuskokwim	334	3,300	180
Swift	Kuskokwim	349	2,420	105
Tatlawiksuk	Kuskokwim	351	813	60
Takotna	Kuskokwim	468	2,180	100
Middle Fork Kuskokwim	Kuskokwim	512	3,130	119
Big River	Middle Fork	7	1,150	119
Pitka Fork	Middle Fork	17	700	65
Windy Fork	Middle Fork	38	345	61
South Fork Kuskokwim	Kuskokwim	540	3,070	152
North Fork Kuskokwim	Kuskokwim	540	2,070	260
East Fork	North Fork	7	940	145
Tonzina	East Fork	72	870	67
McKinley Fork	North Fork	108	1,400	86

Source: Yukon and Kuskokwim River Basins, Interim Report No. 7, Harbors and Rivers in Alaska, Survey Report, U.S. Army Engineer District, Alaska, Corps of Engineers, December 1, 1959, Page 2.

Table 5-5. Kuskokwim Mainstream and Tributary Gradients

Location	River Mile	Approximate Elevation	Slope Per Mile In Upstream Reach
Mouth	0.0	0.0	0.15
Bethel	67.	10.	0.79
McGrath	467.	325.	0.76
Middle Fork	513.	360.	2.6
North & South Forks	540.	430.	
North Fork	0.	430.	1.2
Mile 227	227.	700.	6.3
Mile 275	275.	1,000.	54.5
Mile 297	297.	2,200.	
South Fork	0.0	430.	2.6
Mile 58	58.	580.	29.7
	153.	3,400.	
Middle Fork	0.0	360.	7.7
Mile 83	83.	1,000.	105.2
Mile 102	102.	3,000.	
Holitna	0.0	135.	0.7
Mile 122	122.	225.	

Source: Yukon and Kuskokwim River Basins, Interim Report No. 7, Harbors and Rivers in Alaska, Survey Report, U.S. Army Engineer District, Alaska, Corps of Engineers, December 1, 1959, p. 25.

Table 5-6. Relatively Large Rivers of the Kuskokwim Area

River	Length In Miles	Mouth	Quadrangle
Kuskokwim	540	Kuskokwim Bay/Bering Sea	Baird Inlet
Eek	108	Eek Channel	Baird Inlet
Kanetok	75	Kuskokwim Bay	Goodnews
Goodnews	60	Goodnews Bay	Goodnews
Ninglick	44	Connects Baird Inlet to Bering Sea	Baird Inlet
Kolavinarak	40	Connects Baird Inlet to Etolin Strait	Baird Inlet
Toksook	35	Kangirluar Bay	Baird Inlet

Source: Dictionary of Alaska Place Names, Donald J. Orth, Geological Survey, Professional Paper 567, United States Government Printing Office, 1971.

Although many springs are known to exist within the subregion, data on them are not available.

With the U.S. Soil Conservation Service, the BLM monitors and maintains nine snow courses in the upper Kuskokwim River drainage. The site locations are as follows: Big Lake on Big River; Moore Creek airstrip at Moore Creek Mine; Tatalina airstrip at Tatalina Radar Station; McGrath airstrip at McGrath; Farewell Lake near Farewell Lodge; Porkypile airstrip at Porkypile Mine; Slow Fork Lake on Slow Fork River; Minchumina airstrip at Lake Minchumina; and Towahmina Lake near Telida.

The courses at Porkypile and Big Lake are scheduled for relocation due to wind drift problems. The U.S. Geological Survey maintains a guaging station at Crooked Creek with period of record from 1951 to present and has recently installed a station on the Kisaralik River east of Bethel above Upper Falls (summer 1980). In addition, discharge records for the Kuskokwim at McGrath are available for water years 1963 through 1973.

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CHAPTER 6

ANIMALS

A N I M A L S

INTRODUCTION

Within the Southwest Planning Area, 40 species of fish, two species of amphibians, 187 of birds, and 49 of mammals have been identified as occurring either throughout the entire region or in part of it. Many species are peripheral to the area, displaying either casual or seasonal use, or existing in isolated pockets. Tables 6-1 through 6-4 on the following pages summarize the life history, habits, and significance of each species in the southwest area.

FISHERIES

The Yukon River and Kuskokwim River are the major drainages of the area. The Yukon River drains into the Bering Sea through the vast Yukon Delta and the Kuskokwim River empties into Kuskokwim Bay. The Unalakleet River and numerous small coastal streams drain the western edge of the planning area into

Norton Sound. Both the Yukon and Kuskokwim Rivers are of major importance for commercial and subsistence fishing with the Unalakleet being important to a lesser degree. Table 6-1 lists the fish species that occur in the area along with their distribution, abundance, habitat, reproduction requirements, food types and significance of the species.

WILDLIFE

Two species of amphibians occur in the area. Table 6-2 lists them and their required habitat.

Birds that inhabitat the area are listed in table 6-3, along with their habitat and nesting requirements, food types and species significance. The peregrine falcon is the only endangered species found in the area. "Raptor Surveys and River Profiles in the Kuskokwim, Unalakleet and Yukon River Drainages, Alaska by Dotson and Mindell listed in the references (birds) gives more specific information as to their population and habitat condition.

Table 6-1. Fish of the Southwest Planning Area. (Includes fresh-water and some important marine species).
Nomenclature from List of Common & Scientific Names of Fishes From the United States & Canada, and Keys to the Fresh-water Fishes of Alaska.

SPECIES	*DISTRIBUTION AND ABUNDANCE (In Planning Area)	HABITAT	REPRODUCTION	FOOD	**SIGNIFICANCE
Order Petromyzontiformes Family Petromyzontidae					
Lampetra japonica Arctic Lamprey	Not common KD, YD, UD	Ocean, coastal waters, and river systems; larval stage inhabit mud bottoms of streams	Anadromous and resident; spawns on gravel-bottom streams, May to early June	Larval forms (ammocete) or resident forms non-parasitic	CP
Order Clupeiformes Family Clupeidae					
Clupea harengus pallasi Pacific herring	Seasonally abundant	Marine	Spawns in schools on kelp beds	Plankton	FF, C, SB
Order Salmoniformes Family Salmonidae Subfamily Coregoninae					
Coregonus laurettae Bering cisco	Common YD, UD	Coastal waters, river systems, brackish lagoons	Anadromous; spawns in early autumn	Crustaceans	SB, CP, FF
Prosopium coulteri Pygmy whitefish	Not common YD	Freshwater rivers and lakes	Resident: Spawning takes place in shallow water, in streams or lakes	Crustaceans and aquatic insect larvae	FF, CP

*Distribution and Abundance
KD = Kuskokwim Drainage
YD = Yukon Drainage
UD = Unalakleet Drainage

**Significance
C = Commercial
SP = Sport
SB = Subsistence
CP = Competitor with sport species
FF = Forage fish

Table 6-1. (continued)

SPECIES	*DISTRIBUTION AND ABUNDANCE (In Planning Area)	HABITAT	REPRODUCTION	FOOD	**SIGNIFICANCE
Prosopium cylindraceum Round whitefish	Locally abundant KD, YD, UD	Freshwater lakes, rivers and streams; prefers shallow areas of lakes and swift currents in clear head-water regions	Resident: spawns in fall in shallows of lakes, river mouths, and occasionally in rivers	Bottom feeding; Benthic inverte-brates	SB, CP, FF
Coregonus pidschian (Humpback) whitefish	Locally abundant KD, YD, UD	Lakes, rivers, and brackish areas; slow moving waters	Anadromous and resi-dent; spawns in fall in lake shoal areas	Bottom feeder; small invertebrates and fish	SB, CP, FF
Coregonus nasus Broad whitefish	Common KD, YD, UD	Rivers, lakes, inshore marine	Spawns in rivers in July and August	Bottom organisms	FF, SB
Coregonus autumnalis Arctic cisco	Locally common KD	Anadromous - leaves sea or estuaries in spring and summer to spawn in freshwater rivers, then moves back to sea.	Spawns over gravel beds, often in swift flowing water. Eggs are broadcast and abandoned.	Crustaceans, fish	FF, SB
Coregonus sardinella Least cisco	Locally common KD, YD, UD	Rivers and lakes, brack-ish waters. Migratory and nonmigratory popu-lations	Spawn in September and October	Plankton, aquatic and terrestrial insects	FF, SB
Stenodus leucichthys Inconnu	Locally common KD, YD, UD	Ocean, and larger streams, ascends streams in summer to spawn	Anadromous and resident; spawns in summer	Insect larvae, planktonic crus-taceans, fish	SP, SB
Subfamily Salmoninae					
Salmo gairdneri Rainbow trout (steelhead)	Locally abundant KD, YD	Rivers, streams and lakes; cool, clear water	Anadromous and resi-dent; spawns March to August (mostly mid-April to late June) in small rivers, inlets and outlets of lakes	Various inverte-brates, small fishes	SP

Table 6-1. (continued)

SPECIES	*DISTRIBUTION AND ABUNDANCE (In Planning Area)	HABITAT	REPRODUCTION	FOOD	**SIGNIFICANCE
Salvelinus namaycush Lake trout	Locally abundant KD, YD, UD	Deep lakes and associated outlet streams	Spawn over large boulder or rubble on lake shoals in the fall	Various invertebrates, other fishes	SP, SB
Salvelinus alpinus Arctic char	Locally and seasonally abundant - KD, YD, UD	Inshore marine waters, lakes and rivers	Anadromous and resident; spawns in autumn over gravel or rocky shoals in lakes or quiet river pools	Various invertebrates and vertebrates	SP
Salvelinus malma Dolly Varden	Locally and seasonally abundant - KD, YD	Cold lakes, gravelly to muddy rivers and oceans	Anadromous and resident; spawns from Sept. to Nov. in rivers of moderate current on gravel bottoms	Various invertebrates and small fish	SP
Oncorhynchus keta Chum salmon	Locally and seasonally abundant - KD, YD, UD	Ocean, large rivers, short coastal streams, intertidal areas	Anadromous; spawning migration July to Sept. on tidal flats, headwater spring areas, riffle areas	Adults do not feed in fresh waters; fry: aquatic insects and other invertebrates	C, SP, SB
Oncorhynchus gorbusha Pink salmon	Locally and seasonally abundant - KD, YD, UD	Ocean, short coastal streams, intertidal areas	Anadromous; June to Sept. in rivers and tributary streams, usually close to ocean; gravel bottoms	Fry: Varied, mostly invertebrates; adults do not feed in fresh waters	C, SP, SB
Oncorhynchus tshawytscha Chinook salmon (King)	Locally and seasonally abundant - KD, YD, UD	Ocean, large rivers, and streams	Anadromous; spawning migration May to Aug.; gravelly stream beds, usually in main channels	Adults do not feed in fresh water; fry and juveniles: insects and other invertebrates	C, SP, SB

Table 6-1. (continued)

SPECIES	*DISTRIBUTION AND ABUNDANCE (In Planning Area)	HABITAT	REPRODUCTION	FOOD	**SIGNIFICANCE
Oncorhynchus kisutch Coho salmon (Silver)	Locally and seasonally abundant - KD, YD, UD	Ocean, coastal waters, and small coastal gravelly streams; similar tributaries along larger rivers	Anadromous; spawning migration, Aug. to Nov., small streams tributary to larger rivers, riffle areas below pools	Adults do not feed in fresh water; fry and juveniles: invertebrates and various aquatic insects	C, SP, SB
Oncorhynchus nerka Sockeye salmon (Red)	Locally and seasonally abundant - KD, YD, UD	Ocean, coastal waters, rivers and streams; some lakes where juveniles rear	Anadromous and resident; spawning migration July to October, mostly streams and rivers tributary to lakes; coarse gravel bottoms in riffle areas and some lake shore spawning	Adults do not feed in fresh water; fry and juveniles: plankton and aquatic insects	C, SP, SB
Subfamily Thymallinae					
Thaymallus arcticus Arctic grayling	Abundant - KD, YD, UD	Lakes, rivers, and streams; clear water, close to shore, large lakes, stream mouths	Spawns April to June, usually small streams, gravel or rocky bottoms; spring spawning migration	Aquatic insects and small fish	SP
Family Osmeridae					
Sprinchus thaleichthys Longfin smelt	Locally and seasonally abundant	Fresh water; rivers and coastal waters	Anadromous; spawning winter months, streams close to the ocean	Invertebrates	FF
Hypomesus olidus Pond smelt	Locally and seasonally abundant - KD, YD, UD	Mostly lakes and streams; some brackish waters	Spawns April to June in fresh water ponds	Plankton	FF, SB

Tab;e 6-1. (continued)

SPECIES	*DISTRIBUTION AND ABUNDANCE (In Planning Area)	HABITAT	REPRODUCTION	FOOD	**SIGNIFICANCE
Osmerus eperlanus Boreal smelt (Rainbow)	Seasonally abundant KD, YD, UD	Coastal waters, rivers and streams	Anadromous and resident; spawns in the spring	Various invertebrates, small fish	FF, SB, C
Family Umbridae					
Dallia pectoralis Alaska blackfish	Locally common KD, YD, UD	Weed-choked lowland ponds and backwater stream areas	Spawns May to August, mostly June	Various invertebrates	SB, CP, FF
Family Esocidae					
Esox lucius Northern pike	Common - KD, YD, UD	Shallow lakes, bays, and slow-moving vegetated rivers	Spawn in spring on mud and dense aquatic vegetation	Voracious carnivore aquatic insects, fish birds, and small mammals	SP, SB
Order Cypriniformes					
Family Cyprinidae					
Couesius plumbeus Lake chub	Not common KD, YD	Freshwater lakes, rivers and streams; clear to muddy water	Spawns May through August	Insects, zooplankton	CP, FF
Family Catostomidae					
Catostomus catostomus Longnose sucker	Common; widespread KD, YD, UD	Freshwater lakes, rivers and streams	Spawns April to late May in streams or lakes	Benthic invertebrates	CP
Order Percopsiformes					
Family Percopsidae					
Percopsis omiscomaycus Trout - perch	Unknown KD, YD	Freshwater streams and rivers and lakes	Probably spawns in lakes and streams with rocky or sandy bottoms	Aquatic insects, larvae	

Table 6-1. (continued)

SPECIES	*DISTRIBUTION AND ABUNDANCE (In Planning Area)	HABITAT	REPRODUCTION	FOOD	**SIGNIFICANCE
Order Gadiformes Family Gadidae					
Lota lota Burbot	Common - KD, YD, UD	Freshwater lakes, rivers, and streams	Spawns in streams or lake shoals, under ice at night in mid-winter Feb. through April	Fry and fingerlings: various invertebrates and plant materials; adults: almost entirely other fish; voracious carnivore	SB, SP
Gadus macrocephalus Pacific cod	Scarce in fresh water	Ocean; sometimes enters coastal rivers	Ocean breeding in late winter	Various fish	C
Eleginus gracilis Saffron cod	Scarce in fresh water KD, UD	Ocean; sometimes enters coastal rivers	Ocean breeding	-	C
Order Gasterosteiformes Family Gasterosteidae					
Gasterosteus aculeatus Threespine stickleback	Locally abundant KD, UD	Freshwater and marine; coastal marine shore areas; lakes, rivers, and streams; slow moving water	Anadromous and resident; spawns usually June or July in dense vegetation	Invertebrates and fish eggs and fry; bottom fauna; carnivorous	CP, FF
Pungitius pungitius Ninespine stickleback	Locally common KD, YD, UD	Freshwater and marine; coastal marine shore areas, rivers, and tundra ponds	Anadromous and resident; spawns spring and summer in dense vegetation	Aquatic insects and small crustaceans, fish eggs; carnivorous	CP, FF
Order Perciformes Family Cottidae					
Leptocottus armatus Pacific staghorn sculpin	Often quite abundant	Coastal marine water, tidepools; enters freshwater	Ocean breeding in February	Various invertebrates	SP

Table 6-1. (continued)

SPECIES	*DISTRIBUTION AND ABUNDANCE (In Planning Area)	HABITAT	REPRODUCTION	FOOD	**SIGNIFICANCE
Cottus cognatus Slimy sculpin	Abundant KD, YD	Deeper waters of lakes and cooler streams; mostly freshwater, rocky bottoms	Spawns in spring in in shallow water	Various invertebrates, small fish, and aquatic vegetation	FF
Cottus aleuticus Coastrange sculpin	Common KD	Freshwater, coastal streams and rivers, gravel bottoms, some brackish water; lake bays	Spawns in streams Feb. to mid-June on undersurface of rocks	Aquatic insects, benthic invertebrates, salmon eggs, salmon fry	CP, FF
Order Pleuronectiformes Family Pleuronectidae					
Platichthys stellatus Starry flounder	Common	Ocean; brackish water	Ocean breeding	Various invertebrates and small fish	C
Liopsetta glacialis Arctic flounder	?	Marine	Ocean breeding	Various invertebrates and small fish	C
Pleuronectes quadrituberculatus Alaska plaice	?	Marine	Ocean breeding	Various invertebrates and small fish	C
Hippoglossus stenolepis Pacific halibut	?	Marine	Ocean breeding	Various invertebrates and small fish	C

Table 6-2. Amphibians of the Southwest Planning Area

SPECIES	HABITAT
Order Anura	
Family Bufonidae - Toads	
Bufo boreas - Boreal Toad	Open, nonforested areas adjacent to freshwater; breeds in muskeg, ponds, streams, rain pools, and ditches
Family Ranidae - True Frogs	
Rana sylvatica - Wood Frog	Forest, muskeg, tundra; breeds in shallow bodies of water; resident of grassland, open forest, often found away from water

Table 6-3. Birds of the Southwest Planning Area
Nomenclature follows the AOU Check list of North American Birds (5th ed., 1957), the 32nd Supplement to the Check list published in Auk 90:411, and the 33rd supplement in Auk 93:875.

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Order: Gaviiformes				
Family: Gaviidae (Loons)				
Gavia immer Common Loon*	Interior lakes and ponds; coastal waters	On islets or edges of lakes or ponds	Small fish and animals *	
Gavia adamsii Yellow-billed Loon	Interior lakes and ponds coastal waters	On islets or edges of lakes or ponds	Small fish and other aquatic animals	
Gavia arctica Arctic Loon*	Freshwater lakes and ponds	On islets, small peninsulas or on the margins of lakes	Small fish and other aquatic animals	
Gavia stellata Red-throated Loon*	Freshwater lakes and ponds	On islets or low shore of small lakes	Small fish and aquatic animals	
Order: Podicipediformes				
Family: Podicipedidae (Grebes)				
Podiceps grisegena Red-Necked Grebe*	Freshwater lakes	On floating masses of vegetation	Fish and other aquatic animals	
Podiceps auritus Horned Grebe*	Ponds or lakes with emergent vegetation	On floating platforms of vegetation	Small fish, aquatic insects and occasionally vegetation	
Order: Procellariformes				
Family: Hydrobatidae (Storm Petrels)				
Oceanodroma furcata Fork-tailed Storm Petrel	Breeding: lakes, lava on islands Nonbreeding: pelagic	In holes in ground	Fish and seal oil	
Family: Procellariidae (Fulmars)				
Fulmarus glacialis Northern Fulmar*	Breeding: steep, inaccessible cliffs Nonbreeding: pelagic	On rocks or ground	Small fish, cephalopods	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Order: Pelecaniformes Family: Phalacrocoracidae (Cormorants)				
Phalacrocorax auritus Double-crested Cormorant	Coastal bays and lagoons; Nonbreeders, sometimes use freshwater lakes	In colonies on high, steep, inaccessible, rocky cliffs	Fish and other small marine animals	
Phalacrocorax pelagicus Pelagic Cormorant*	Coastal bays and sounds	In colonies on high, steep, inaccessible, rocky cliffs	Fish and other small marine animals	
Order: Ciconiiformes Family: Ardeidae (Herons and Bitterns)				
Ardea herodias Great Blue Heron*	Tidal slopes, river mouths, marshes	In SE and occasionally wanders as far north as Cook Inlet	Fish and other aquatic life	
Order: Anseriformes Family: Anatidae (Swans, Geese, and Ducks)				
Trumpeter swan Olor columbianus Whistling Swan (Tundra)	Ponds, lakes, bays and large rivers	Mainly north of Arctic Circle on tundra lakes	Aquatic plants and seeds	
Branta canadensis Canada Goose*	Lakes, bays, marshes, grain fields	On islets, occasionally in trees or on cliffs	Grasses, seeds and aquatic plants	S
Branta bernicla Black Brant	Mudflats, tundra near ocean inlets and beaches	On islets, marshy area, on shore of tundra lake	Grasses, sedges Winter: eelgrass	
Philacte canagica Emperor Goose	Coastal littoral and marshes	In tundra along NW coast of Alaska (outside of planning area)	Shellfish	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Anser albifrons White-fronted Goose*	Lakes, bays, marshes and fields	On tundra	Grasses, seeds and aquatic plants	S
Chen caerulesceus Snow Goose	Marshes, grainfields ponds, bays	On tundra	Grasses, seeds and aquatic plants	S
Anas platyrhynchus Mallard*	Marshes, ponds, rivers, lakes, and bays	Among grass or reeds	Aquatic plants, seeds, grasses, and small aquatic animals	S
Anas strepera Gadwall*	Lakes, ponds, rivers, and marshes	In thick grass or underbrush	Aquatic plants	S
Anas acuta Pintail*	Marshes, ponds, lakes, and salt bays	On dry ground along sloughs or ponds	Seeds and tubers of aquatic plants	S
Anas crecca Green-winged Teal*	Marshes, lakes, ponds, rivers, bays	In grass or marshes	Aquatic plants, seeds	S
Anas discors Blue-winged Teal	Fresh ponds and marshes	On ground among grasses near water	Aquatic plants, seeds, grass mollusks and other inverte-brates	S
Anas formosa Baikal Teal				A
Anas americana American Wigeon*	Interior marshes	On ground usually near water	Aquatic plants and seeds	S
Anas penelope European Wigeon	Interior marshes	On ground usually near water	Aquatic plants and seeds	S
Anas clypeata Northern Shoveler*	Shallow, freshwater mud-bottomed ponds	On ground in grasses and sedges	Aquatic plants, seeds, and small animals	S

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Aythya collaris Ring-necked Duck	Marshes, wooded ponds, bottomlands, swamps	On floating islets in marshes	Aquatic plants and seeds	
Aythya valisneria Canvasback*	Inland ponds	In rushes in marshes	Aquatic plants and some invertebrates	S
Aythya marila Greater Scaup*	Ponds and lakes	In tufts of grass near the shores of small ponds	Seeds, tubers and aquatic insects	S
Aythya affinis Lesser Scaup*	Inland ponds	In tall grass	Aquatic plants grasses and aquatic insects	S
Bucephala clangula Common Goldeneye	Wooded streams and lakes	In tree cavities	Aquatic invertebrates	S
Bucephala islandica Barrow's Goldeneye*	Wooded streams and lakes	In tree cavities	Aquatic invertebrates	S
Bucephala albeola Bufflehead*	Interior lakes and ponds	In cavities of trees or banks	Aquatic invertebrates and plants	S
Clangula hyemalis Oldsquaw*	Wet tundra. Winter: along coast in bays	On tundra near small ponds or on small islands	Aquatic invertebrates and some plants	S
Histrionicus histrionicus Harlequin Duck*	Turbulent streams	On ground near streams or in cavities in trees or stream banks	Aquatic invertebrates	S
Polysticta stelleri Steller's Eider	Coastal bays	On flat coastal tundra in moss	Crustaceans, mollusks, aquatic insects, and some plants	S

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Somateria mollissima Common Eider*	Salt water, rocky coasts	On ground in tundra near ocean	Crustaceans and mollusks	S
Somateria spectabilis King Eider	Tundra ponds and along coast. Winter: at sea	On small islets along coast or near tundra ponds and lakes inland	Mollusks, crustaceans	S
Lampronetta fischeri Spectacled Eider	Coastal bays	Down-lined hollows in tundra	Mollusks	S
Melanitta perspicillata Surf Scoter	Winter: ocean surf and salt bays. Summer: fresh lakes in tundra	On ground usually under shrubs	Mollusks, crustaceans	
Oidemia nigra Common Scoter*	Winter: salt bays Summer: freshwater lakes	On ground in clumps of grass or among shrubs	Mollusks and crustaceans	S
Lophodytes cucullatus Hooded Merganser	Wooded lakes, ponds or rivers	In cavities in tree stumps	Small fish, crustaceans, and aquatic invertebrates	
Mergus serrator Red-breasted Merganser*	Ponds, lakes near saltwater	On ground near ponds usually under trees or shrubs	Fish	S
Order: Falconiformes				
Family: Accipitridae (Hawks, Eagles and Harriers)				
Accipiter gentilis Goshawk*	Interior woodland, edge of forest, open glades, timberline	In tree, 35' to 70' level	Mainly birds, some small mammals	S
Accipiter striatus Sharp-shinned Hawk*	Open woods, thickets, brushy areas	In conifers 30' to 60'	Mainly birds, some small mammals	S
Buteo jamaicensis Red-tailed Hawk*	Open river valleys, ridges, glades	In trees or on cliffs	Rodents and lagomorphs	S

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Buteo lagopus Rough-legged Hawk	Tundra	On cliffs in Arctic; may use trees along rivers	Rodents and lagomorphs	S
Aquila chrysaetos Golden Eagle*	Open mountains, foothills, canyons	On cliffs or in trees	Rabbits and large rodents	S
Haliaeetus leucocephalus Bald Eagle*	Coast, lakes, and rivers	In old growth, timber - spruce-hemlock, cottonwood	Fish	S
Circus cyaneus Marsh Hawk	Marshes, open areas	On ground in marshes or in shrubby open land	rodents and small birds	
Family: Pandionidae (Osprey)				
Pandion laliaetus Osprey	Rivers, lakes, coast	On trees	Fish	
Family: Falconidae (Falcons)				
Falco rusticolus Gyrfalcon	Open tundra alpine areas, and along waterways	On cliffs	Chiefly birds	
Falco peregrinus Peregrine Falcon	Coasts along waterways, alpine and open tundra, meadows, ridgetops, shorelines	On cliffs	Chiefly birds	E
Falco columbarius Merlin	Open woodland	On cliffs, in trees, shrubs, on ground along major waterway	Birds	

American kestrel

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Order: Galliformes				
Family: Tetraonidae (Grouse and Ptarmigan)				
Canachites canadensis Spruce Grouse	Spruce forests	On ground under conifers	Insects, seeds, and berries	
Bonasa umbellus Ruffed Grouse	Coniferous and mixed woodland and forest, river bottom thickets	In moss/duff at bases of trees or logs	Insects, seeds, buds, berries	
Family: Tetraonidae (Grouse and Ptarmigan)				
white tailed Ptarmigan *Lagopus lagopus* Willow Ptarmigan	Willow flats, tundra, muskeg	On ground	Willow and alder shoots, insects	
Lagopus mutus Rock Ptarmigan	Alpine tundra	On ground	Leaves, buds, berries, and insects	
Pediocetes phasianellus Sharp-tailed Grouse	Spruce thickets and willow flats riperian zones	On ground	Buds and sprouts of plants; berries	
Order: Gruiformes				
Family: Gruidae (Cranes)				
Grus canadensis Sandhill Crane	Tundra marshland; river deltas in migration	On mounds in marshes	Rodents, insects, roots, seeds	
Family: Rallidae (Coots)				
Fulica americana American Coot				
Family: Haematopodidae (Oystercatchers)				
Haematopus bachmani Black Oystercatcher	Rocky coasts, sea islets; feed mostly in intertidal zone	On rocks or gravel	Bivalves, oysters, crabs	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Family: Charadriidae (Plovers)				
Charadrius semipalmatus Semipalmated Plover	Breeding: shores of streams, ponds, lakes and along coast, gravelly tundra. Migration: mudflats	On beaches or dunes	Small marine life	
Charadrius vociferus Killdeer	Open grasslands, shorelines, cultivated land	On ground in gravelly or turfy spots	Invertebrates	
Pluvialis dominica American Golden Plover	Mudflats, shores, shortgrass areas, plowed and harrowed fields	On ground, on dry tundra or on beaches	Invertebrates	
Squatarola squatarola Black-bellied Plover	Migration: tidal flats beaches and moist fields	On ground	Invertebrates	
Family: Scolopacidae (Sandpipers and allies)				
Aphriza virgata Surfbird*	Breeding: above timber-line on lichen-grown rockslides. Migration: near surf on coastal headlands and reefs	On rocky ground	Small marine life	
Arenaria interpres Ruddy Turnstone	Breeding: tundra, cliffs Migration: intertidal	On ground beside rocks or vegetation	Small marine life, insects	
Arenaria melanocephala Black Turnstone	Breeding: tundra near water. Migration: inter-tidal, kelp covered, rocky coastal promontories; gravelly beaches and hard flats	On tundra	Invertebrates	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Capella gallinago Common Snipe	Breeding: forest to tundra transition in boggy areas	On ground in meadow marshes or muskeg	Earthworms	
Numenius phaeopus Whimbrel	Breeding: moist, hummocky terrain with grasses and low heath. Migration: margins of fresh and salt water especially estuaries and tidal creeks; fields and grassland	On tundra	Invertebrates	
Numenius tahitiensis Bristle-thighed Curlew	Breeding: dry, rocky upland tundra. Migration: pelagic	On tundra	Invertebrates	
Bartramia longicauda Upland Sandpiper	Breeding: in rank grasses in clearings, in spruce muskeg. Migration: grasslands	On tundra, on grass	Invertebrates	
Actitis macularia Spotted Sandpiper	Breeding: fresh water bodies	On ground along streams	Invertebrates	
Tringa solitaria Solitary Sandpiper	Breeding: vicinity of lakes and ponds in muskeg Migration: mudflats, muddy ditches, pond edges	In trees, in old nests of other birds	Insects, their larvae and other invertebrates	
Heteroscelus incanus Wandering Tattler	Breeding: alpine zone on gravelly areas along mountain streams. Migration: bars and rocky areas of the intertidal zone	On gravel bars	Invertebrates	
Tringa melanoleucos Greater Yellowlegs	Breeding: muskeg to edges of tundra. Migration: mudflats, river bars, tidal marshes and ponds	On ground in open terrain near water	Invertebrates	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Tringa flavipes Lesser Yellowlegs	Breeding: natural clearings, burned areas with scattered stumps and fallen tree trunks Migration: sheltered portions of marshes, tidal flats, ponds	On ground	Invertebrates	A
Calidris canutus Red Knot	Breeding: rocky to well-vegetated tundra near water. Migration: intertidal, tidal zone of marine coasts and river deltas	On gravel	Invertebrates	
Calidris ptilocnemis Rock Sandpiper	Breeding: mossy tundra Migration: rocky shores	On mossy tundra	Invertebrates	
Calidris acuminata Sharp-tailed Sandpiper	Breeding: wet tundra in Siberia. Migration: along coastal marshes		Invertebrates	
Calidris melanotos Pectoral Sandpiper	Breeding: grassy tundra Migration: meadows, vegetated margins of still and moving waters	On ground	Invertebrates	
Calidris bairdii Baird's Sandpiper	Breeding: dry tundra with scant vegetation Migration: shallow flooded areas with scattered emergent vegetation	On dry tundra	Invertebrates	
Calidris minutilla Least Sandpiper*	Breeding: near grassy or sedgy. Migration: sheltered grassy areas, edges of estuaries, salt marshes, and lagoons	On tundra	Invertebrates	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Calidris alpina Dunlin	Breeding: wet tundra Migration: open muddy or wet sandy expanses (flats, shores, river bars, margins of sand and impoundments)	On wet tundra	Invertebrates	
Calidris pusillus Semipalmated Sandpiper	Breeding: tundra near ponds or pools. Migration: mudflats, intertidal zone, river and lake shores	On damp tundra	Invertebrates	
Calidris mauri Western Sandpiper	Breeding: tundra near pools or ponds. Migration: mudflats, intertidal zone, river bars, and lake shores	On dry tundra	Invertebrates	
Calidris alba Sanderling	Migration: generally marine shores	On stony tundra	Invertebrates	
Limnodromus griseus Short-billed Dowitcher*	Breeding: Muskeg Migration: mudflats, inland and along coasts	On tussocks in wooded muskeg	Invertebrates	
Limnodromus scolopaceus Long-billed Dowitcher	Breeding: grassy, sedgy areas usually near shallow water. Migration: grassy margins of shallow fresh water (less affinity for saline environments than short-billed)	On ground	Invertebrates	
Limosa fedoa Marbled Godwit	Breeding: grassy prairies. not far from water. Migration: mudflats, beaches, margins of lagoons	On grassy flats	Invertebrates	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Limosa haemastica Hudsonian Godwit	Breeding: wet bogs and marshes in open expanses within the forest edge and on nearby moist tundra Migration: beaches, mud flats and shallows (fresh, brackish and salt water	On tundra	Invertebrates	
Limosa lapponica Bar-tailed Godwit	Breeding: wet mossy or hummocky tundra and drier heath-covered sites Migration: beaches, flats, intertidal zone	On tundra	Invertebrates	
Family: Phalanopodidae (Phalaropes)				
Phalaropus fulicarius Red Phalarope	Breeding: tundra, river flats near sea. Migration: pelagic	On tundra	Invertebrates	
Lobipes lobatus Northern Phalarope*	Breeding: wet grassy or sedge terrain with pools, boreal clearings. Migration: any waters	On marshy tundra	Invertebrates	
Family: Stercorariidae (Jaegers)				
Stercorarius pomarinus Pomarine Jaeger	Breeding: tundra Migration: open sea, coastal bays and sounds	On tundra	Invertebrates	
Stercorarius parasiticus Parasitic Jaeger*	Breeding: tundra Migration: off and along coast	On tundra	Invertebrates	
Stercorarius longicaudus Long-tailed Jaeger*	Breeding: tundra marshes, high open passes in McKinley Park. Migration and winter: open ocean	On slight elevations on flat or rolling open tundra	"Pirates" from gulls and terns; rodents, small birds, insects	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Family: Laridae (gulls and terns)				
Larus hyperboreus Glaucous Gull	Breeding: coasts and tundra Migration and winter: coastal waters	On cliffs or on slight elevations on tundra	Bird eggs, refuse, carrion	
Larus glaucescens Glaucous-winged gull*	Coast, ocean bays, beaches, dumps	On rocky cliffs on grassy tops of small islands	Carrion, refuse	
Larus argentatus Herring Gull	Coast, rivers, lakes	On ground, on cliffs and occasionally in trees	Carrion, refuse	
Larus canus Mew Gull*	Breeding: marshes, lakes Winter: coastal waters	On ground near water or occasionally on stumps or in trees	Small fish, insects, refuse, carrion	
Larus philadephia Bonaparte's Gull*	Muskeg	On flat branches of low coniferous trees	Insects, small fish	
Rissa tridactyla Black-legged Kittiwake*	Open ocean, bays	On ledges of steep cliffs	Small fish	
Sterna paradisaea Arctic Tern*	Breeding: marshes, tundra, lakes. Migration: open ocean	On ground; on gravel, sand, or moss	Small fish and	
Sterna aleutica Aleutian Tern*	Breeding: islands, coastal areas. Migration: open ocean	On ground in matted, dry grass	Probably small fish	
Xema sabini Sabines gull*				

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Family: Alcidae (Auks, Murres, and Puffins)				
Uria aalge Common Murre*	Breeding: rocky ledges and islands. Winter: ocean and large bays	On bare rocks on sea cliffs or rocky islands	Fish, crustaceans	
Uria lomvia Thick-billed Murre*	Breeding: rocky ledges and islands. Other: oceans and large bays	On bare rocks on sea cliffs or rocky islands	Fish, crustaceans	
Cepphus columba Pigeon Guillemot*	Rocky coasts, ocean	In crevices, burrows, rocks, in sea cliffs; underneath piers	Small fish, mollusks,	
Brachyramphus brevirostre Kittlitz's Murrelet	Breeding: coastal cliff Other: ocean, glacier waters	On grass covered ledges on steep cliffs	Fish	
Synthliboramphus antiguum Ancient Murrelet	Breeding: islands Nonbreeding: coastal waters	In crevices or burrows	Fish	
Ptychoramphus aleutica Cassin's Auklet				A
Cyclorrhynchus psittacula Parakeet Auklet*	Breeding: coastal cliffs Nonbreeding: open sea	Under loose piles of boulders; cliffs		
Aethia cristatella Crested Auklet	Breeding: islands with cliffs and spires Nonbreeding: open sea	Similar to Parakeet Auklets	Small crustaceans	
Fratercula corniculata Horned Puffin*	Breeding: cliffs and bluffs. Nonbreeding: pelagic	In burrows on summits of mountains of inaccessible islands, or rock crevices	Small fish	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Lunda cirrhata Tufted Puffin*	Breeding: cliffs and bluffs of small islands Nonbreeding: pelagic	In burrows, on grassy tops of small islands	Small fish	
Order: Columbiformes Family: Columbidae (Pigeons and doves)				
Columba livia Rock Dove*	Cities and towns	On buildings	Seeds, refuse	
Order: Strigiformes Family: Strigidue (typical owls)				
Bubo virginianus Great Horned Owl*	Wooded regions	In hollows in trees, old nests of other large birds	Rodents, rabbits and other small mammals	
Nyctea scandiaca Snowy Owl	Tundra	On ground, usually on high points	Lemmings, hares and other small mammals	
Surnia ulula Hawk Owl*	Boreal forests	Natural cavities in trees; cliffs		
Strix nebulosa Great Gray Owl*	Dense forests	In tops of evergreens	Small mammals	
Asio flammeus Short-eared Owl*	Tundra, grasslands and marshes	On ground	Small rodents	
Aegolius funereus Boreal Owl*	Forests	In holes in trees	Mice, small birds, insects	
Aegolius acadicus Saw-whet Owl	Heavy forests and occasionally more open country	In deserted woodpecker nests	Mice, small rats and other rodents	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Order: Coraciiformes Family: Alcedinidae (Kingfishers)				
Magaceryle alcyon Belted Kingfisher*	Rivers, ponds, along the coast	In burrows in river banks	Fish	
Order: Piciformes Family: Picidae (Woodpeckers)				
Colaptes auratus Common Flicker*	Forested areas	In holes in trees	Ants and other insects	
Picoides villosus Hairy Woodpecker*	Forested areas	In holes in trees	Insect larvae	
Picoides pubescens Downy Woodpecker*	Willow and alders	In holes in trees	Insect larvae	
Picoides arcticus Black-backed Three-toed Woodpecker	Forested areas	In holes in conifers	Insects	A
Picoides tridactylus Northern Three-toed Woodpecker	Forested areas	In holes in conifers	Insects	
Order: Passeriformes Family: Tyrannidae (Flycatchers)				
Sayornis saya Say's Phebe*	Brushy country	Cliffs, under bridges, about barns, houses, caves	Insects	
Empidonax traillii Alder Flycatcher*	Alder and willow thickets in stream bottoms	In bushes or saplings	Insects	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Nuttallornis borealis Olive-sided Flycatcher*	Spruce forest	In evergreens	Insects	
Family: Alaudidae (Larks, swallows)				
Eremophila alpestris Horned Lark*	Higher ridges above tree line	In depression in the tundra	Insects	
Tachycineta thalassina Violet-green Swallow*	Open forest; widespread when foraging	In holes, cavities and crevices	Insects	
Iridoprocne bicolor Tree Swallow*	Open country near water	Holes in trees, under eaves of buildings	Insects	
Riparia riparia Bank Swallow*	Marshes, fields, streams lakes	Holes in banks	Insects	
Hirundo rustica Barn Swallow*	Open or semi-wooded country often near human habitation	Under bridges, barns	Insects	
Petrochelidon pyrrhonota Cliff Swallow*	Open to semi-wooded country, often near human habitation	On buildings, bridges	Insects	
Family: Corvidae (Jays, magpies and crows)				
Perisoreus canadensis Gray Jay*	Boreal coniferous forest	Usually in spruce tree	Berries, insects	
Cyanocitta stelleri Steller's Jay*	Moist hemlock-Sitka spruce forests. Winter: denser portions of forests, along beaches and tidal flats	In conifers	Fruits, nuts, seeds, insects, young birds	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Pica pica Black-billed Magpie*	Breeding: shrub, thickets Winter and fall: beaches and tidal flats	In trees or bushes	Insects, carrion	
Corvus corax Common Raven*	Coasts, garbage dumps; widespread when foraging	In trees or on cliffs	Bird eggs, refuse, carrion	
Family: Paridae (Chickadees)				
Parus atricapillus Black-capped Chickadee*	Mixed and deciduous forest	In holes in dead wood of stubs or branches	Insects	
Parus hudsonicus Boreal Chickadee*	Spruce and mixed spruce alder and willow forest	In holes in trees	Insects	
Family: Sittidae (Nuthatches)				
Sitta canadensis Red-breasted Nuthatch	Coniferous forest	In rotten stubs or branches of dead trees	Insects and their larvae	
Family: Cinclidae (Dippers)				
Cinclus mexicanus Dipper*	Mountain streams	On rock or narrow ledges near water	Aquatic insects, small fish	
Family: Turdidae (Thrushes)				
Turdus migratorius American Robin*	Woodlands and shrub thickets	In trees	Fruit, insects and worms	
Ixoreus naevius Varied Thrush*	Woodlands and shrub thickets	In bushes or small trees	Insects, berries and seeds	
Catharus guttatus Hermit Thrush*	Woodlands and shrub thickets	On or near ground	Insects and berries	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Catharus ustulatus Swainson's Thrush	Mixed deciduous-spruce woodlands	In bushes or small trees usually near water	Insects and berries	
Catharus minimus Gray-checked Thrush*	Mixed woods; shrub thickets	In bushes or low trees	Insects and berries	
Oenanthe oenanthe Wheatear*	Mountain ridges above timberline	Crevices under rocks or in heaps of stones	Insects	
Family: Sylviidae (Oldworld Warblers and kinglets)				
Phylloscopus borealis Arctic Warbler*	Dwarfed willow forest	On tundra	Insects	
Regulus calendula Ruby-crowned Kinglet* Golden-crowned kinglet	Coniferous forest	In conifers	Insects, spiders	
Family: Motacilledae (Pipits)				
Anthus spinoletta Water Pipit*	Breeding:dry tundra Migration: beaches, rocky shoreline, salt marshes, grasslands	On ground	Insects	
Motacilla alba White Wagtail				
Motacilla flava Yellow Wagtail				
Family: Bombycillidae (Waxwings)				
Bombycilla garrula Bohemian Waxwing*	Wet muskeg	In trees	Insects and berries	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Family: Laniidae (Shrikes)				
Lanius excubitor Northern Shrike*	Marshes, openings in woodlands or shrub thickets	In trees or bushes	Small birds, insects, and small mammals	
Family: Sturnidae (Starlings)				
Sturnus vulgaris Starling	Beaches	In holes in trees	Insects, berries, seeds	
Family: Parulidae (Wood Warblers)				
Vermivora celata Orange-crowned Warbler*	Woodlands and shrub thickets	On ground, in cavities, in banks	Insects	
Dendroica petechia Yellow Warbler*	Willow and alder shrubs	In bushes	Insects	
Dendroica coronata Yellow-rumped Warbler*	Mixed deciduous spruce woodland	In coniferous trees	Insects	
Dendroica townsendi Townsend's Warbler	Coniferous forests, mixed deciduous-spruce woodland	In conifers	Insects	
Dendroica striata Blackpoll Warbler*	Coniferous forest	In conifers	Insects	
Seiurus noveboracensis Northern Waterthrush*	Shrub thickets along watercourses	On ground	Insects	
Geothlypis trichas Common Yellowthroat				A
Wilsonia pusilla Wilson's Warbler*	Alder and willow thickets	On or near ground in willow thickets	Insects	

~~Arctic Warbler~~ (~~Phylloscopus borealis~~)

~~Golden Crowned Kinglet (rare)~~

~~Ruby Crowned Kinglet~~

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Setophaga ruticilla American Redstart				C
Family: Icteridae (Blackbirds)				
Agelaius phoeniceus Red-winged Blackbird*	Marshes	On grass, reeds, small bushes above water	Insects, small fruits	A
Euphagus carolinus Rusty Blackbird*	Swampy muskegs, willow thickets along waterways	In bushes	Insects, seeds	
Family: Fringillidae (Grosbeaks, Finches, Sparrows, and Longspurs)				
Pinicola enucleator Pine Grosbeak*	Coniferous forests	In conifer trees	Insects, fruits and seeds	
Leucosticte tephrocotis Gray-crowned Rosy Finch*	Mountain tops above timberline	In rocky cliffs	Seeds and fruits	
Carduelis hornemanni Hoary Redpoll	Shrub thickets	On ground or in bottom of dense willows	Seeds	
Carduelis flammea Common Redpoll*	Shrub thickets, mixed deciduous spruce woodland, towns	On ground or in bottom of dense willows	Insects and seeds	
Loxia leucoptera White-winged Crossbill	Coniferous forests	In conifers	Conifer seeds	
Passerculus sandwichensis Savannah Sparrow	Tundra, marshes, shrub thickets	On ground	Seeds and insects	
Junco hyemalis Dark-eyed Junco*	Coniferous forests, shrub thickets, mixed deciduous spruce woodlands	On ground	Seeds	

Table 6-3. (continued)

SPECIES	HABITAT	NESTS	FOOD	SIGNIFICANCE
Spizella arborea Tree Sparrow*	Willow thickets	On ground or in low bushes	Seeds	
Zonotrichia leucophrys White-crowned Sparrow*	Shrub thickets, mixed deciduous spruce forests	On or near ground	Seeds	
Zonotrichia atricapilla Golden-crowned Sparrow*	Willow and alder thickets	On ground	Seeds	
Zonotrichia albicollis White-throated Sparrow				A
Passerella iliaca Fox Sparrow*	Shrub thickets, spruce forests, mixed deciduous spruce forests	On or near ground	Insects and seeds	
Melospiza lincolnii Lincoln's Sparrow	Shrub thickets, marshes	On ground		
Calcarius lapponicus Lapland Longspur*	Tundra, marshes, tidal flats	On ground	Insects and seeds	
Plectrophenax nivalis Snow Bunting*	Tundra, cliffs	On ground	Insects, seeds	

* Breeding record published for this species within the planning area

Significance

S - Sport Value
C - Casual
A - Accidental
E - Endangered

Table 6-4. Mammals of the Southwest Planning Area

SPECIES	HABITAT	FOOD	SPORT OR COMMERCIAL VALUE
Order Insectivora			
Family Soricidae - Shrews			
Sorex cinereus Masked shrew	Moist situations in forest, open country, brushland	Insects and other small animals	
Sorex vagrans Vagrant shrew	Marshes, bogs, wet meadows, along streams in forest	Insects, spiders, earthworms	
Sorex palustris Water shrew	Along cold, small streams with cover on banks and in bogs	Small aquatic organisms	
Sorex obscurus Dusky shrew	Marshes, coniferous forest	Insects, invertebrates, small rodents	
Sorex arcticus Arctic shrew	Tamarack and spruce swamps	Insects and other invertebrates	
Microsorex hoyi Pygmy shrew	Wooded and open areas, wet or dry	Insects and small rodents	
Order Chiroptera			
Family Vespertilionidae - Vespertilionid Bats			
Myotis lucifugus Little brown myotis	Roosting: caves, mine tunnels, hollow trees or buildings. Feeding: near water or forests	Insects	
Order Primates			
Family Homidae - Man			
Homo sapiens Man	All habitat types	Omnivorous	

*Introduced

Table 6-4. (continued)

SPECIES	HABITAT	FOOD	SPORT OR COMMERCIAL VALUE
Order Lagomorpha			
Family Leporidae			
Lepus americanus Snowshare hare	Swamps, forests, thickets	Buds, bark, succulent vegetation, twigs	X
Lepus othus Alaskan hare	Forests, thickets	Buds, bark, succulent vegetation, twigs	X
Order Rodentia			
Family Sciuridae - Squirrels			
Marmota caligata Hoary marmot	Talus slopes, alpine meadows	Herbaceous plants	
Spermophilus undulatus Arctic ground squirrel	Tundra and brushy meadows	Variety of plants; meat	
Tamiasciurus hudsonicus Red squirrel	Spruce or mixed hardwood forests, swamps	Seeds, nuts, eggs, fungi	
Family Castoridae - Beavers			
Castor canadensis Beaver	Streams or lakes with trees or shrubs on bank	Bark and small twigs	X
Family Cricetidae-New World Rats and Mice			
Clethrionomys rutilus Northern red-backed mouse	Tundra, damp forest floors, alpine conditions	Green vegetation	
Microtus pennsylvanicus Meadow vole	Low moist areas or high grasslands with rank growths of vegetation; near streams, lakes, swamps, forests	Grasses, sedges, seeds, grain, bark	
Microtus oeconomus Tundra vole	Moist to wet tundra	Vegetation	

Table 6-4. (continued)

SPECIES	HABITAT	FOOD	SPORT OR COMMERCIAL VALUE
Microtus miurus Alaska vole	Tundra, high well-drained slopes	Vegetation	
Microtus xanthognatus Yellow-cheeked vole	Spruce forest and bordering tundra		
Ondatra zibethicus Muskrat	Marshes, edges of ponds, rushes, water lilies, open water, lakes and streams	Clams, frogs, fish, aquatic vegetation	
Lemnus sibiricus Brown lemming	Tundra and alpine meadows	Vegetation	
Synaptomys borealis Northern bog lemming	Wet meadows, muskeg, heath, sedges	Vegetation	
Discrotonyx groenlandicus Collared Lemming	Tundra	Vegetation	
Family Zapodidae - Jumping Mice			
Zapus hudsonicus Meadow jumping mouse	Low meadows	Seeds, insects, fruits	
Family Erethizontidae - New World Porcupines			
Erethion dorsatum Porcupine	Forested areas, sometimes brushy areas	Buds, inner bark, small twigs	
Order Carnivora			
Family Canidae - Canids			
Canis latrans Coyote	Open woodlands, brushy or boulder-strewn areas	Omnivorous	

Table 6-4. (continued)

SPECIES	HABITAT	FOOD	SPORT COMMERCIAL VALUE
Canis lupus Gray wolf	Forests and tundra	Birds and mammals	X
Vulpes vulpes Red fox	Mixture of forest and open country preferred	Small mammals, insects, berries	X
Alopex lagopus Arctic fox	Coastal tundra	Scavenger: small mammals, birds, berries	X
Family Ursidae - Bears			
Ursus americanus Black bear	Forested areas	Berries, carrion, nuts, tubers, insects	X
Ursus arctos Grizzly bear and relatives		Meat, berries, small rodents	X
Family Mustelidae			
Martes americana Marten	Spruce and hemlock forest	Red squirrels and other small rodents	X
Mustela erminea Ermine	Brushy or wooded areas near water	Small mammals, birds	X
Mustela rixosa Least weasel	Meadows, fields, brushy areas, open woods	Small rodents	X
Mustela frenata Longtail weasel	Occurs in all habitat types near water	Small mammals	X
Mustela vison Mink	Along streams and lakes	Eggs, fish, small mammals, birds	X

Table 6-4. (continued)

SPECIES	HABITAT	FOOD	SPORT COMMERCIAL VALUE
Gulo gulo Wolverine	Mountains near timberline to tundra	Any meat, berries, larvae, eggs	X
Lontra canadensis River otter	Along streams and lake borders	Fish and aquatic invertebrates	X
Enhydra lutris Sea otter	Kelp beds, rocky shores	Abalones, sea urchins	X
Family Felidae - Cats			
Lynx lynx Lynx	Forested areas, swamps	Snowshoe hare, rodents, birds	X
Order Pinnipedia - Pinnipeds			
Family Otaridae - Eared Seals			
Callorhinus ursinus Northern fur seal	Ocean	Fish and squid	X
Eumetopias jubatus Northern sea lion	Ocean	Fish and squid	
Family Phocidae - Hair Seals			
Histriophoca fasciata Ribbon seal	Coastal water and ice packs	Fish and squid	
Phoca vitulina Harbor seal	Coastal waters, mouths of rivers, inland lakes	Fish, shellfish, squid	
Pusa hispida Ringed seal	Coastal waters	Marine invertebrates	X
Erignathus barbatus Bearded seal	Coastal waters, bays, mouths of rivers	Marine invertebrates	X

Table 6-4. (continued)

SPECIES	HABITAT	FOOD	SPORT COMMERCIAL VALUE
Order Artiodactyla			
Family Cervidae - Cervids			
Alces alces Moose	Forests with lakes and swamps	Woody plants, saplings, bark aquatic vegetation	X
Rangifer tarandus Caribou	Tundra, partially open coniferous forest	Lichens, herbs, grass, moss	X
Family Bovidae Bovids			
Bison bison Bison*	Woodlands and openings	Grasses, some browse	X

*Introduced

The mammals that occur in the area are listed in Table 6-4, along with their habitat requirements and food types. The table also highlights those that have a sport or commercial value.

OVERLAYS, ANIMALS

See Chapters 15 and 16,
Wildlife Habitat and Fisheries

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CHAPTER 7

FIRE

F I R E

INTRODUCTION

The fire season starts during the latter part of May, peaks in early July and runs through September. Fires that occur in late May generally start before green-up, and these fires are associated with human activity near areas of habitation. Most fires are caused by lightning strikes and are spread throughout the planning unit. Tables 7-1 and 7-2 summarize fire actions for the years 1976-1980 by cause and size respectively. Fire incidence is shown on overlay 7-2, Fire Incidence.

FIRE TYPES

Lightning Fires

The lightning-caused fire period generally runs from June through August. A cycle of lightning-caused fires was not established from historical records.

Table 7-1. Fire Occurrence by Cause

Year	Lightning-Caused No.	Lightning-Caused Acres	Man-Caused No.	Man-Caused Acres	Unknown-Caused No.	Unknown-Caused Acres	Total Fires No.	Total Fires Acres
1976	68	3,310	5	39	5	2	78	3,351
1977	47	374,442	5	17	5	461	57	374,920
1978	14	408	7	92	2	3	23	503
1979	23	779	14	209	5	105	42	1,093
1980	5	223	4	117	1	10	10	350

Source: BLM Alaska State Office, Fire Management (970)

Table 7-2. Five Year Fire Occurrence by Size

	Size Class																			
	A		B		C		D		E		F		G		TOTAL	
Year	No	(ac)	No	(ac)	No	(ac)	No	(ac)	No	(ac)	No	(ac)	No	(ac)	No	(ac)
1976	20	(0)	36	(89)	19	(662)	0	(0)	2	(600)	1	(2,000)	0	(0)	78	(3,351)
1977	18	(0)	23	(58)	10	(202)	1	(100)	1	(350)	2	(2,650)	2	(371,560)	57	(374,920)
1978	4	(0)	11	(34)	7	(194)	1	(275)	0	(0)	0	(0)	0	(0)	23	(503)
1979	10	(0)	14	(40)	15	(563)	3	(490)	0	(0)	0	(0)	0	(0)	42	(1,093)
1980	0	(0)	4	(15)	4	(135)	2	(200)	0	(0)	0	(0)	0	(0)	10	(350)

Note:
A = 0 - .25 ac.
B = .26 - 9 ac.
C = 10 - 99 ac.
D = 100 - 299 ac.
E = 300 - 999 ac.
F = 1000 - 4999 ac.
G = 5000 over ac.

Source: BLM Alaska State Office, Fire Management (970)

Greatest burned acreage per fire is attributed to lightning-caused fires, with more than half of all such fire starts becoming larger than Class A (quarter acre or less). This can be attributed to the remoteness and distribution of the areas where lightning fires occur. Lightning starts often come in groups spanning 3 to 5 days, causing 20 to 40 fires. No lightning belts could be identified from a study of past records. Lightning-caused fires occurred throughout the study area.

Man-Caused Fires

In this planning area, man-caused fires made up from 6 percent (1976) to 11 percent (1979) of all fires that BLM responded to in the last five years. Generally, man-caused fires are associated with villages or recreationists if in remote areas. Debris burning, smoking and equipment operation are major sources. Man-caused fires are usually smaller than lightning-caused fires. This is attributed to early response by local residence, proximity to communication and the vegetation type that men are usually associated with. These are the grass-lands and river bottom hardwoods that do not present the fuel problem that black spruce forests support.

FIRE BEHAVIOR

Wind and fuel moisture content appear to be the most important determinants of fire behavior. The large fires studied showed a higher correlation with wind-related problems than with any other factor, such as terrain or fuel types. If fires occur in periods of high winds, the fires are generally large. This is substantiated by the fact that most fire report narratives refer to wind-related problems on larger fires. Fuel moisture content, especially in the carrier or fine fuels, is probably as important as the wind. When there is little moisture in fuels, one can expect fires to spread rapidly and burn intensely. Black spruce stands will demonstrate extreme rates of spread with as little as 10-mile-per-hour winds. Since lightning fires are associated with thunderstorms they are more affected by the winds from these storms rather than from the gradient winds. In drought years no wind need be present to produce large, intense fire activity. If a fire starts on any given day, the chance for additional fires is very high. Days with multiple fire starts require greater numbers and wider dispersion of initial attack crews, as well as a variety of delivery systems to get personnel and equipment to the fires.

FIRE MANAGEMENT

The historic lead role for identifying values requiring protection from wildland fire has been assumed by fire control personnel. These values have mostly related to areas of human use and habitation and to commercial timber values, with little or no consideration for benefits that may occur from wildland fire. This is a result of raising the Bureau's "value-at-risk" system to determine relative values of areas. The system averages values of a variety of resources therefore negating any benefit that would be recorded for a single resource.

The State of Alaska is starting to assume protection responsibilities in some areas. Within the southwest area, BLM still maintains the responsibility for fire suppression on most lands administered by BLM and USFWS. This is shown on overlay 7-2 Fire Management. The state has responsibility for about 5.5 million acres of their land north of the Tikchik area. BLM protects about 1.1 million acres of state land west of McGrath and 2.4 million acres north of State-owned land. There are also a little over one million acres which have been designated "not protected" due to low fire incidence.

OVERLAYS, FIRE
- 7-1 Fire Incidence
- 7-2 Fire Management

SELECTED REFERENCES
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CHAPTER 8

LIMITING PHYSICAL FACTORS

L I M I T I N G P H Y S I C A L F A C T O R S

INTRODUCTION

In the Southwest Planning Area there are numerous physical factors that can limit the suitability of parts of the region for certain activities. Limiting physical factors include earth movements, flooding, permafrost, marshes and bogs, unstable soils, exteme slopes, and climatic factors. Some of these factors are shown on overlay 8-1.

CLIMATE

Localized summer thunderstorms may cause lightning struck wildfires. High winds from these storms may increase the spread of wildfires.

Although winds throughout the region are generally mild, local conditions may generate potentially dangerous winds.

Downslope movement of cold, dense air masses is a major cause of local high velocity winds along the piedmont of the Alaska Range. Such winds can topple trees, cause structural damage, and increase fire damage and wind chill. These factors should be carefully considered when prescribed burning is for the improvement of wildlife habitat. Overlay 8-1 shows wind channels for the Planning Area.

Winters in the Southwest Planning Area are harsh. The danger of exposure is increased by high winds and the resulting windchill. General climatic data is found in the Climate section of this URA, Chapter 1, but local conditions should be consulted before planning winter operations.

UNSTABLE SOILS

Seasonally frozen ground, or the active layer, is the upper layer of soil that is subject to freezing and thawing (Price, 1972). During spring breakup, off-road travel is difficult, impossible in some cases, and definitely undesirable because it causes severe surface damage that results in erosion. Surface disturbance can be mitigated by the restriction of travel to times when the ground surface is sufficiently frozen to support the weight of vehicles and other equipment. Added surface protection can be provided by a layer of snow.

Permafrost is permanently frozen ground found beneath the active layer (Price, 1972). It occurs primarily as soil or other material or bedrock which remains frozen year-round. Composition can range from almost pure ice through a mixture of ice and soil or rock to very dry, yet frozen, sand. Horizontal ice lenses and vertical ice wedges are features associated with permafrost. The thickness of permafrost in Southwest Alaska may vary from less than one foot to more than 100 feet. Discontinuous permafrost is found throughout Southwestern Alaska with the exception of coastal areas. It may be found in patches or wedges and is controlled by such local factors as soil, water, aspect, and microclimate.

The presence of permafrost can limit the potential uses of an area and must be considered in planning. Disruption of permafrost by the activities of man can cause severe environmental damage which can be expensive to control and rehabilitate. The active layer provides insulation from summer temperatures.

If this layer is disturbed, the underlying permafrost may be disrupted causing subsidence, increasing erosion, and adding to the sedimentation of streams.

In areas of discontinuous permafrost, access roads, rights-of-way, and other activities may be routed to avoid areas known to have permafrost characteristics. Fine-grained soils, such as those high in silt, are subject to permafrost effects and require land-use planning to mitigate surface damage and to plan for resource utilization. Basically, removal or disturbance of the surface layer may enhance thawing of permafrost, leading to subsidence, slumping, mass wasting, and ponding.

The presence of permafrost in Bethel requires that all buildings be constructed on pilings and insulated so as not to thaw the permafrost. Utilities in this area are contained in above-ground insulated utilidors. Even with insulation and arctic engineering, annual maintenance is required for the repair of structural damage caused by frost heaving and changes in the local thermal regime.

Muskeg is found throughout lowland areas. The impermeable nature of the underlying permafrost found there prevents percolation of surface water. These boggy areas restrict vehicular and foot travel and make the floodplains and deltas of the rivers especially difficult areas to travel. Major lowland boggy occurrences are shown on overlay 8-1.

In Alaska, winter travel over frozen ground or on lake and river ice mitigates surface disturbance, providing proper precautions are taken. Some precautions may include consideration for types of vehicles, depth of snow removal, choice of route, season of use, etc. During breakup, i.e. ground thaw, cross-country travel by medium or heavy equipment may be restricted. Accurate climatic data may be used to calculate periods when such restrictions are to be enforced.

FLOODING

The Yukon-Kuskokwim Delta and the lowlands of the Innoko River are prone to frequent floods. Flooding is caused by spring snowmelt, river ice jams, and heavy rainfall. Runoff is increased in areas when shallow permafrost prevents infiltration of rain or snowmelt. Storm waves from the Bering Sea may cause coastal flooding of the Yukon-Kuskokwim Delta and upstream on the Kuskokwim River.

In 1971, heavy snowfall in the Alaska Range was the source of heavy spring flooding in the Kuskokwim drainage. This was followed by heavy rains in August. McGrath recorded its third

highest flood on record. Lime Village on the Stony River was also badly flooded. In 1972, Alskanuk and Emmonak on the Yukon River were evacuated. In 1975, the delta was again flooded extensively.

Flood potential may be increased through urbanization and resource development that increases runoff and erosion, or alters stream channels. Floodplain management and good engineering practices are necessary to mitigate flood damage and the potential for flooding.

Erosion along stream and river banks is caused by movement of water and ice. The amount of erosion is also affected by the composition of the stream banks. Shorelines of solid rock or large rubble are less susceptible to erosion than loose unconsolidated materials. Shoreline erosion is a major problem in many communities of southwest Alaska. Present shoreline stabilization techniques are generally temporary methods used to allow enough time for moving facilities inland or to higher ground.

GEOLOGY

Slopes greater than 15 percent generally limit use of the land. Avalanches and snowslides are frequent hazards on steep slopes and in narrow valleys. Slope movement due to frost creep or solifluction may restrict development on slopes.

Major earth faults in southwest Alaska trend generally to the northeast with smaller, local cross-faults (see overlay 8-1). A narrow zone along the Alaska Range is of major earthquake potential (greater than 6.0 on the Richter scale). The remainder of the area is in a zone of moderate potential (4.5 to 6.0 the Richter scale).

Moderate damage from a major earthquake can be expected in the Southwest Planning Area. Potential damage due to ground breakage, local subsidence, and slope movement is increased in lowland areas that have extensive, unconsolidated glaciofluvial sediments.

The potential for volcanic activity within the area is presently low, although various mountains in the Alaska Range have been recently active and there are a few known geothermal regions within the area.

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CHAPTER 9

DEVELOPMENTS FACILITIES & SERVICES

DEVELOPMENTS, FACILITIES AND SERVICES

INTRODUCTION

The communities of the Southwest Planning Area consist mostly of scattered Native villages, regional transportation centers, and mining communities. Bethel is the most populous community, and is the major transportation hub for the region.

Transportation within the region is dependent upon coastal, river, and aerial routes. Short, local roads connect some nearby villages, but of present there are no regional roads.

Easements across Native land provide access to BLM-administered lands. In this region, trail or road easements usually provide access from rivers. Site easements provide trailhead access or overnight campsites.

COMMUNITIES

The planning area is included in the State's unorganized borough. Within the borough there is one first class city and 46 second class cities. Twenty-six villages are unincorporated. These communities are displayed on overlay 9-1, Population Centers.

First class cities must have 400 or more permanent residents. When not in an organized borough they must provide planning, platting, zoning, taxation, and education. Other powers for services (such as police, water, sewer, etc.) can be added by city council action. St Marys, incorporated in 1967, is the only first class city (table 9-1).

Second class cities must have 25 or more residents. When not in an organized borough, they may provide planning, platting, and zoning but are not required to do so by law. They also may add other powers for services (such as police, water, sewer, etc.) by city council action. A second class city does not have the power of education; therefore, the city does not constitute a school district. Table 9-1 lists the 46 second class cities.

There are 26 unincorporated towns. Four are recognized under ANCSA as Native groups. These are Minchumina, Medfra, Flat, and Deacons Landing (table 9-1). Four (Medfra, Flat, Ophir, and Nyak) are specifically related to strip mining.

Twenty-seven villages are recognized as either villages or groups under ANCSA. These are indicated in table 9-1.

The total approximate population in the McGrath Resource Area is 18,720. This figure was derived from the 1980 State Department of Revenue population figures, the 1970 census population data, and the 1973 ANCSA Native enrollment data. Where no data were available, estimates were made.

Population centers that occur in the McGrath Resource Area are shown on overlay 9-1.

FEDERAL GOVERNMENT FACILITIES

BLM maintains a field office at Bethel and seasonal fire stations at Minchumina, McGrath, and Aniak.

FAA maintains airfields with facilities at Unalakleet, Minchumina, McGrath, Farewell, Aniak, St. Marys, Hooper Bay, and Bethel. Of these, Hooper Bay, Bethel, St. Marys, and McGrath have hardened surface runways at least 1,500 feet in length.

Table 9-1. Village and Government Populations by Region

Villages	Location	Current Population	Census	Cities Class 1st	Cities Class 2nd	Communities Date Incorporated	Communities Recognized Under ANCSA
(Bering Straits)							
Unalakleet		632 L1*	1980		X	1974	
Stebbins		309 L1	1980		X	1969	
St. Michael		282 L1	1980		X	1969	
		1,233 total					
(Doyon)							
Shageluk	Upper Yukon	223 L1	1980		X	1970	
Grayling	Upper Yukon	181 L1	1980		X	1969	
Anuik	Upper Yukon	102 L1	1980		X	1969	
Holy Cross	Upper Yukon	302 L1	1980		X	1968	
		808 total					
McGrath	Kuskokwim River	382 L1	1980		X	1975	
Takotna	Kuskokwim River	36 L2	1970		X		ANCSA
Nikolai	Kuskokwim River	152 L1	1980		X	1970	
Telida	Kuskokwim River	12 L2	1970				ANCSA
		582 total					
Minchumina**	Kuskokwm River	25	Estimate				ANCSA
Medfra**	Kuskokwim River	25	Estimate				ANCSA
Ophir	Kuskokwim River	25	Estimate				
Flat**	Kuskokwim River	25	Estimate				ANCSA
Deacon's Landing**	Kuskokwim River	25	Estimate				ANCSA
		125 total					

*L1 - 1980 State Revenue Population Figures
L2 - 1970 census
L3 - ANCSA December 1973 Native enrollment

**Native groups

Table 9-1. (continued)

Villages	Location	Current Population		Census	Cities Class 1st	Cities Class 2nd	Communities Date Incorporated	Communities Recognized Under ANCSA
(Calista)								
Russian Mission	Yukon River	167	L1	1980		X	1970	
Ohogamute	Yukon River	22	L3	1973		X		ANCSA
Marshall (Fortuna Ledge)	Yukon River	263	L1	1980		X	1970	
Pilot Station	Yukon River	301	L1	1980		X	1969	
St. Marys/Andreafsky	Yukon River	520	L1	1980	X		1967	
Pitkas Point	Yukon River	70	L2	1970				ANCSA
Mountain Village	Yukon River	543	L1	1980		X	1967	
		1,886	total					
Emmonak	Coastal	545	L1	1980		X	1964	
Alakanuk	Coastal	527	L1	1980		X	1969	
Sheldons Point	Coastal	143	L1	1980		X	1974	
Kotlik	Coastal	305	L1	1980		X	1970	
Bill Moore's Slough	Coastal	46	L3	1973				ANCSA
Hamilton	Coastal	35	L3	1973				ANCSA
Chuloonawick	Coastal	27	L3	1973				ANCSA
Scammon Bay	Coastal	232	L1	1980		X	1967	
Paimute	Coastal	22	L3	1973		X		ANCSA
Hooper Bay	Coastal	610	L1	1980		X	1966	
Chevak	Coastal	468	L1	1980		X	1976	
Newtok	Coastal	154	L1	1980		X	1976	
Mekoryuk	Coastal	174	L1	1980		X	1969	
Tununak	Coastal	299	L1	1980		X	1975	

Table 9-1. (continued)

Villages	Location	Current Population		Census	Cities Class 1st	Cities Class 2nd	Communities Date Incorporated	Communities Recognized Under ANCSA
Umkumiut	Coastal	27	L3	1973				ANCSA
Toksook Bay	Coastal	336	L1	1980		X	1972	
Nightmuit	Coastal	135	L1	1980		X	1974	
Chefornak	Coastal	206	L1	1980		X	1974	
Kupnuk	Coastal	325	L2	1970		X		ANCSA
		4,616	total					
Platinum	Kuskokwim Bay	58	L1	1980		X	1975	
Goodnews Bay	Kuskokwim Bay	248	L1	1980		X	1970	
Kongiganak	Kuskokwim Bay	190	L2	1970				ANCSA
Kwigilligak	Kuskokwim Bay	148	L2	1970				ANCSA
Quinhagak	Kuskokwim Bay	448	L1	1980		X	1975	
		1,092	total					
Tuntutuliak	Kuskokwim River	158	L2	1970				ANCSA
Eek	Kuskokwim River	307	L1	1980		X	1970	
Mapakiak	Kuskokwim River	313	L1	1980		X	1970	
Napaskiak	Kuskokwim River	240	L1	1980				
Oscarville	Kuskokwim River	41	L2	1970				ANCSA
Bethel	Kuskokwim River	3,854	L1	1980		X	1953	
Kwethluk	Kuskokwim River	444	L1	1980		X	1975	
Akiachak	Kuskokwim River	354	L1	1980		X	1974	
Akiak	Kuskokwim River	216	L1	1980		X	1970	
Tuluksak	Kuskokwim River	258	L1	1980		X	1970	
Kasigluk	Kuskokwim River	260	L2	1980		X		ANCSA
Nunapitchuk	Kuskokwim River	390	L2	1970				ANCSA

Table 9-1. (continued)

Villages	Location	Current Population		Census	Cities Class 1st	Cities Class 2nd	Communities Date Incorporated	Communities Recognized Under ANCSA
Atmautluak	Kuskokwim River	200	L1	1980		X	1976	
Nyak	Kuskokwim River	25						
Lower Kalskag	Kuskokwim River	218	L1	1980		X	1969	
Upper Kalskag	Kuskokwim River	166	L1	1980		X	1975	
Aniak	Kuskokwim River	355	L1	1980		X	1972	
Chuathbaluk	Kuskokwim River	127	L1	1980		X	1975	
Napaimute	Kuskokwim River	47	L3	1973				ANCSA
Crooked Creek	Kuskokwim River	59	L2	1970				ANCSA
Georgetown	Kuskokwim River	41	L3	1973				ANCSA
Red Devil	Kuskokwim River	81	L2	1970				ANCSA
Sleetmute	Kuskokwim River	109	L2	1970				ANCSA
Stoney River	Kuskokwim River	74	L2	1970				ANCSA
Lime	Kuskokwim River	26	L2	1970				ANCSA
Farewell	Kuskokwim River	25		Estimate				
		8,388	total					
		18,720	grand total					

Emergency facilities are maintained at Sparrevohn Air Force Station south of McGrath.

The U.S. Department of Health and Human Services maintains the only hospital within the McGrath Resource Area, at Bethel. The hospital is an Alaska Native field hospital, one of six field hospitals located in the State of Alaska. The main hospital is located in Anchorage.

TRANSPORTATION

Transportation is primarily by small aircraft and river boat, with snowmachines being important for winter travel. Bethel, Unalakleet, St. Marys, McGrath, and Aniak have major airports.

The Yukon and Kuskokwim rivers are the main waterways. Ocean barge traffic puts in at St. Marys and other villages along the Yukon and at Bethel on the Kuskokwim River. Barge traffic goes up the Kuskokwim as far as Medfra and Nikolai. Small skiffs are an important means if transportation during summer.

The 89 airfields (including float plane areas) that are shown on aeronautical charts have been identified on table 9-2. These plus myriad small lakes and rivers and tundra and

Table 9-2. Airfields

Name	Class*	Owner	Length In Feet	Surface
Chevak	SP-A	State	2,000	Water
Chevak	S-B	State	2,300	Dirt
Scammon Bay	S-B	Village of Scammon Bay	2,800	Dirt/Gravel
Scammon Bay	SP-B	Village of Scammon Bay	1,000	Water
Cape Romanzof	Military	USAF	2,623	Gravel
Sheldon Point	SP-A	Public Domain	15,000	Water
Alakanuk	S-A	State	2,500	Gravel
Mountain Village	S-B	State	2,100	Gravel
Mountain Village	SP-A	State	5,000	Water
St. Marys/Andreafsky	T-A	State	6,000	Gravel
Pilot Station	S-B	State	1,700	Dirt/Gravel
Marshall	S-A	State	1,275	Gravel
Russian Mission	S-B	State	1,400	Dirt/Gravel
Russian Mission	SP-B	Public Domain	3,000	Water
Holy Cross	T-C	State	3,550	
Anvik	T-C	State	3,650	Gravel
Hamilton	S-A	State	1,800	Turf
Stebbins	S-B	State	1,990	Gravel/Dirt
Minchumina	T-B	Federal	1,000/2,700	Gravel
Unalakleet	T-A	State	6,004	Gravel
Mekoryuk Municipal	T-B	State	3,550	Gravel
Tununak	S-B	State	2,400	Gravel
Newtok	S-A	State	2,500	Turf
Newtok (Sea)	SPB	Public Domain	5,000	Sea
Toksook Bay	S-A	State	1,960	Gravel & Dirt

*Class

T - Trunk (3,500 feet up)
- T-A - CAB jet
- T-B - CAB prop
- T-C - No CAB service

S - Secondary (3,500 feet down)
- S-A - CAB prop
- S-B - CAB utility

SP-A - Seaplane dock, float or ramp facility

SP-B - No seaplane facility

MIL - Military airport

Table 9-2. (continued)

Name	Class	Owner	Length In Feet	Surface
Nightmute	S-A	State	2,500	Gravel
Nightmute (Sea)	SPA	Private	4,000	Sea
Chefornak	S-A	State	2,900	Dirt
Chefornak (Sea)	SPA	Public Domain	4,000	Sea
Kipnuk (Sea)	SPA	Public Domain	3,000	Sea
Kipnuk	S-A	State	2,600	Dirt
Kwigillingok	S-A	State	2,500	Dirt
Kwigillingok (Sea)	SPB	Public Domain		Sea
Kongiganak	S-A	State	2,200	Dirt
Tuntutuliak	S-B	State	2,500	Gravel
Tuntutuliak (Sea)	SPA	Prvate	2,000	Sea
Cape Newenham AFS	MIL	USAF	4,100	Gravel
Platinum Mine	S-B	Private	2,000	Gravel
Platinum	T-B	State	4,068	Gravel
Goodnews Bay	S-A	State	1,550	Gravel
Wattamuse	S-B	Public Domain	2,500	Gravel
Quinhagak (Sea)	SPB	Public Domain	5,000	Sea
Quinhagak	S-A	State	1,960	Gravel
Eek	S-A	State	1,700	Turf
Eek (Sea)	SPA	Private	5,000	Sea
Akolmuit	S-B	State	2,500	Gravel
Nunapitchuk	SPA	Public Domain	3,000	Sea
Atmautluak	S-B	State	2,500	Gravel
Napakiak (Sea)	SPB	Public Domain	10,000	Sea
Napakiak	S-A	State	2,500	Turf
Napaiskak	S-A	State	2,500	Turf
Napaiskak (Sea)	SPA	Public Domain	15,000	Sea
Bethel	T-A	State	6,400	Asphalt
Bethel (H)	H	Public Domain	700	Dirt
Arthur Dale Lake	SPB	Public Domain	1,000	Sea
Bethel (Sea)	SPA	Public Domain	3,000	Sea
Hanger Lake	SPB	State	2,600	Sea
Kwethluk	S-A	State	1,880	Gravel & Dirt
Akiachak (Sea)	SPB	Public Domain	5,000	Sea
Akiachak	S-A	State	2,000	Dirt
Akiak	S-A	State	2,200	Turf
Canyon Creek	S-B	Private	1,200	Gravel
Cripple Creek	S-B	Unknown	2,000	
Marvel Creek	S-B	Private	1,900	Gravel
Nyac	T-B	Private	3,656	Gravel
Tuluksak	S-A	State	2,500	Turf
Kalskag	S-A	State	2,200	Gravel
Aniak	T-A	State	5,000	Gravel

Table 9-2. (continued)

Name	Class	Owner	Length In Feet	Surface
Aniak (Sea)	SPA	Public Domain	3,000	Sea
Little Russian Mission	S-B	State	2,500	Gravel
Taylor Creek	S-B	Public Domain	1,500	Gravel
Red Devil	T-B	State	4,000	Gravel
Sleetmute	S-A	State	2,000	Gravel
Stony River No. 2	S-A	State	2,400	Gravel & Dirt
Sparrevohn AFS	MIL	USAF	4,100	Gravel
White Mountain Mine	S-B	Private	2,400	Gravel
Tatitna	S-B	State	1,500	Turf
Farewell	T-B	Federal	5,000	Gravel
Farewell Lake (LS)	S-B	Public Domain	2,000	Gravel
Farewell Lake	SPB	Public Domain	5,000	Sea
Purkeypile Mine	S-B	Private	2,850	Gravel
Telida	S-B	Public Domain	1,100	Turf
Nikolai	S-B	Private	950	Dirt
Medfra	S-A	State	2,200	Turf
McGrath (Sea)	SPB	Public Domain	3,000	Sea
McGrath	T-A	State	5,619	Asphalt
Tataline AFS	MIL	USAG	3,800	Gravel
Takotna	S-A	State	1,600	Gravel
Moore Creek	S-B	Private	900	Gravel & Dirt

aircraft on skis comprise the air travel system available in almost every part of the planning area. Wien Air Alaska and Sea Airmotive both provide scheduled air transportation to the area from Anchorage or Fairbanks.

Roads in the area are minimal. The 50-mile long Ophir Road from Sterling Landing to Ophir is the longest. It connects the mining area of Ophir to the Yukon River.

An old road running north out of Medfra is about 10 miles, long and contains bridges in a state of disrepair.

The villages of Mountain Village and St. Marys are connected by a road about 20 miles long.

An historical portage between the Yukon River near Russian Mission and the Kuskokwim River near Lower Kalsag has been used in the past. Today, however, there are plans to replace with a road between Paimiut on the Yukon River and Kolmakof on the Kuskokwim.

Roads, navigable rivers, and airports are shown on overlay 9-2.

EASEMENTS

Under the Alaska Native Claims Settlement Act (ANCSA) the Bureau was required to reserve easements to public lands. There are 66 villages and three regional corporations in the area that are receiving interim conveyances and have easements attached to the lands. No summary currently exists of these easements. Easements are of various types. Sixty foot roads, 100 foot roads, 25 foot trails, and campsites make up the bulk of all easements.

COMMUNICATIONS

The communications network of Alaska depends heavily on military microwave and troposcatter systems contracted through Alascom. Communications from outside Alaska are relayed via satellite through the Bartlett Earth Station near Talkeetna. A marine cable serves Southeast Alaska, and land lines serve some communities along the Alaska Railroad and some major highways. Radio telephones and radio networks serve the remote areas of the state (Federal-State LUPC, 1974).

Telephones which are operated by Alascom are located in 61 villages in the Planning Area. These are listed on table 9-3.

Table 9-3. Telephones Operated by Alascom

Akiak
Akiakchak
Alakanuk
Aniak
Anvik
Atmauiluak
Bethel
Cape Romanzof
Chauthbaluk
Chefornak
Chevak
Crooked Creek
Eek
Emmonak
Farewell
Goodnews Bay
Grayling
Holy Cross
Hooper Bay
Kalsag
Kasigluk
Kipnuk
Kongiganak
Kotlik
Kwethluk
Kotlik
Lake Minchumina
Lime Village
Lower Kalsag
Marshall
McGrath
Mountain Village
Napakiak
Napaskiak
Newton
Nightmute
Nikolai
Nunapitchuk
Oscarville
Pilot Station
Platinum
Quinhagak
Red Devil
Russian Mission
Scammon Bay
Shageluk
Sheldons Point
Sleetmute
Sparrevohn
Stebbins
St. Marys
St. Michael
Stony River
Takotna
Tataline
Telida
Toksook Bay
Tuluksak
Tuntutuliak
Tununak
Unalakleet

BLM operates a radio network in the area. Three base stations are located in Aniak, McGrath and Minchumina, with antennaes on Mt. Hamilton, Cloudy Mountain, and Minchumina and a repeater on Telida Mountain between McGrath and Minchumina. Portable field radios are generally able to maintain adequate communications with these base stations within a radius of 40 miles. Additionally, BLM has the capability of putting "drop in" repeaters in locations where needed to support field projects. These repeaters are usually removed at the end of the field season.

OVERLAYS, DEVELOPMENTS, FACILITIES, AND SERVICES

9-1. Village Population

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CURRENT SITUATION AND OPPORTUNITIES

CHAPTER 10

LANDS

L A N D S

INTRODUCTION

There are approximately 72,000,000 acres in the Southwest Planning Area. The land status in the region is currently tenuous. The State of Alaska; Calista Corporation; Bering Straits Native Corporation; Doyon, Ltd; Cook Inlet Region, Inc., and their associated villages are all entitled to large tracts of land within the Planning Area, yet little land has been conveyed to them (see table 10-1 for land ownership in the Planning Area).

In addition, the Alaska National Interest Land Conservation Act of December 2, 1980, has created vast acreages of national wildlife refuges, national monuments, national parks and national park preserves in the Planning Area.

Upon analysis of this presently uncertain land status, it appears that BLM is likely to retain management authority over six parcels of land totaling approximately 12 million acres.

Table 10-1. Major Land Owners

State of Alaska

State Tentatively Approved and Patent - 11,773,000
State Selected - 9,585,000
23,385,000 acres

Native Corporations (ANCSA)

Calista Villages	12(a) Entitlement	12(a) Selected	12(a) IC's and Pat.	12(b) Village Ent.	12(b) Selected	Regional Subsurface In Lieu	14(h)(8) Entitlement Regional Surface	12(c) Regional Selections surface and sub-surface.. no valid selections made
12(a) Calista	5,644,800 ac	7,687,156 ac	726,145.14 ac	Min. 431,601 ac Max. 591,147 Upon signing of D(2) 570,131.93 ac	1,643,312 ac	85,000 ac	Ent. 211,728 ac Sel. 279,572	
14(H)(2) Groups	16,534 ac	---	---					
Total Entitlement	5,655,040 ac							
12(a) Bering Straits	391,680 ac	Unalakleet 216,614 Stebbins 139,535 St. Michaels 145,811 501,960		Min. 222,125 Max. 304,235 293,420.32 ac	Unalakleet 113,182 Stebbins 55,741 St. Michaels 37,667 206,590 ac sel.		Ent. 108,966 ac See computer printout. 253,000 ac (on map)	No valid selections made
12(a) Doyon Villages 14(H)(2) Groups	714,240 ac 8,000 ac	Anvik 109,430 ac Grayling 97,596 ac Holy Cross 158,649 ac McGrath 120,110 ac Nikolaoi 86,976 ac Shageluk 118,368 ac Takotna 80,806 ac Telida 93,583 ac 865,518	204,137.39 ac	Min. 296,769 Max. 406,568 392,018.71 ac	63 -- 488 -- -- -- -- --		Ent. 146,583 ac None selected in McGrath RA	Min. 8,281,526ac Approx. Max. 8,415,339 8,348,432.
Total	12,430,294 ac	9,054,634 ac	930,282.53 ac	1,255,570.96 ac	1,850,445 ac	85,000 ac	Ent. 467,277 ac Sel. 532.572	8,348,432.50 ac

Table 10-1. (continued)

Federal Government

Togiak National Wildlife Refuge - 1,368,000 acres
Yukon Delta National Wildlife Refuge - 15,217,000 acres**
Innoko National Wildlife Refuge - 3,564,000 acres
Lake Clark National Park - 228,000 acres
Lake Clark National Park Preserve 345,000 acres
Denali National Park Preserve - 668,000 acres

Bureau of Land Management

12,272,000 acres*

Split Interest

BLM Surface and Calista Regional Corporaton Subsurface
("In Lieu" subsurface) - 85,000 acres

*Includes Split Interest
**Excludes State and Native Corporation land and includes the former Hazen Bay National Wildlife Refuge, Clarence Rhodes National Wildlife Refuge, and Nunivak National Wildlife Refuge.

LAND SELECTIONS AND WITHDRAWALS

STATE OF ALASKA

The Alaska Statehood Act of 1958 authorized the State to receive title to over 103 million acres of land during its first 25 years of statehood. To this date the State has selected approximately 113 million acres from the whole state. The various State agencies identified and prioritized tracts of land that would be valuable for resources they had expertise in managing and analyzing. Generally, in the Southwestern Planning Area, the State has selected, or identified for selection, lands that are important for economic growth, such as minerals or forestry products, or are highly valued for recreation.

At present the State has received tentative approval or patent to about 11,773,000 acres of land within the Planning Area and has filed selections for about 9,585,000 acres more, for a total of 21,385,000 acres (see overlay 10-1).

ALASKA NATIVE CORPORATIONS

The Planning Area's boundaries encompass the lands of the Calista Corporation and portions of Doyon Ltd.; Bering Straits

Native Corporation and Cook Inlet Region, Inc., Native regional Corporations (see overlay 10-2).

The Native Village Corporations within these regions are entitled to receive approximately 13 million acres in the Southwest Planning Area under the Alaska Native Claims Settlement Act of 1971, section 12(a). Section 12(a) refers to the first round village selections. The 13 million acres does not include Native primary places of residence, historical sites, or cemetery sites.

ANCSA 12(a) land entitlement for the villages within the Calista Region totals 5,644,800 acres selected. Some 767,145 acres of this amount have been interim conveyed and patented.

ANCSA 12(a) land entitlement for villages within the Doyon Region that lie within the planning unit totals 714,240 acres. However, the villages have been allowed to select 865,518 acres, of which 204,137 acres have been interim conveyed and patented. Approximately 151,000 acres are overselected.

Land entitlement under ANCSA 12(a) for the villages within the Bering Straits Regional Corporation and within the planning unit totals 391,680 acres. However, 501,960 acres have been selected of which 204,137 acres are interim conveyed and patented. Approximately 110,000 acres are overselected.

Native village Corporation land entitlement under ANCSA section 12(b) totals approximately 1,250,000 acres for the above three regions, excluding Cook Inlet Region. Section 12(b) refers to second-round village selections. Of this total, only a portion of the lands are physically within the Planning Area (see Table 10-1 for a breakdown of acreages within the Planning Area).

Regional Corporation Selections

Doyon Region's surface and subsurface land entitlement under ANCSA section 12(c) is approximately 8,349,000 acres. Section 12(c) refers to regional corporation selections.

There are no valid 12(c) selections in the Calista and Bering Straits regions, although Bering Straits has selected approximately 86,000 acres in the Planning Area. Cook Inlet Region, Inc., (CIRI) has selected about 1,866,000 acres in the southeast portion of the Planning Area where the State has also selected and where the Lake Clark National Park and Park Preserve was created December 2, 1980.

Under ANCSA section 14(h), the Secretary is authorized to withdraw and convey 2 million acres of unreserved and unappropriated public lands locate outside the areas withdrawn under sections 11 and 16.

Under section 14(h)(8), any portion of the two million acres not conveyed by this subsection are to be allocated and conveyed to the regional corporation on the basis of population.

The Calista Regional Corporation is entitled to 211,728 acres under 14(h)(8). The corporation has selected approximately 279,572 acres, all of which lie within the Southwest Planning Area.

The Bering Straits entitlement under 14(h)(8) is 108,966 acres. However, 253,000 acres have been selected. These lands all lie within the Southwest Planning Area.

The entitlement for Doyon Region is 146,583 acres, all of these have been selected outside the Planning Area.

"In-lieu" Subsurface Lands

Section 12(a)(1) of the Alaska Native Claims Settlement Act provided for the regional corporation to select the subsurface estate in a portion equal to the surface selected by the village corporation. When a village corporation selects the surface estate to lands within the National Wildlife Refuge System, the regional corporation for that region cannot

receive title to the subsurface but may select "in lieu" subsurface estate, in an equal acreage from other lands withdrawn by ANCSA section 11(a) within the region, if possible.

Included in this Planning Area are these "in lieu" lands, of which the majority fall within the Yukon Delta National Wildlife Refuge, with smaller portions remaining under BLM jurisdiction to the south and northeast of the refuge. BLM will retain only the surface ownership of these portions, while the regional corporation (Calista) will own the subsurface. In-lieu lands total 85,000 acres.

The regional mineral "in lieu" lands within the Southwest Planning Area on public lands are:

The Goodnews block totals approximately 34,000 acres.
The NYAC block totals approximatey 26,000 acres.
The Sleetmute block totals approxmately 16,000 acres.
The Anvik River block totals approximately 9,000 acres.

Native Group Selections

Land entitlement under ANCSA 14(h)(2) for Native groups within the Calista region is approximately 10,240 acres, of which none have been interim conveyed and patented. There are only

two Native groups in the Calista Region. The Nagamut group is located at Nagamut on the Holitna River and the Nunivak group is located on Nunivak Island.

Land entitlement under ANCSA 14(h)(2) for the Doyon Region Native groups that are within the Planning Area amounts to 8,000 acres of which none have been interim conveyed or patented. Native groups in the Doyon Region are at Minchumina, Medfra, Flat, and Deacon's Landing.

Statewide there is a large percentage of lands that have been selected but that were not authorized for transfer by Congress. These are over-selections by village and regional corporations, and the extent of these over-selections cannot be determined because the eligibility and entitlement is not known for certain and because the land formula used to determine conveyance is very complex.

PROJECTED BLM-ADMINISTERED LANDS

The land that BLM is most likely to administer has been identified by overlaying the State Selection Map, Native selection maps and maps described in the National Interest Lands Conservation Act. When overlaid, these maps show six relatively

distinct unselected parcels. These have been grouped into six planning blocks called the Goodnews, the NYAC, the Anvik River, the Sleetmute, the Lime Village and the Minchumina (see overlay 10-1).

The Goodnews block (block 1) consists of approximately 312,000 acres.

The NYAC block (block 2) consists of approximately 429,000 acres.

The Anvik River block (block 3) consists of approximately 4,132,000 acres.

Iditarod George

The Sleetmute block (block 4) consists of approximately 3,700,000 acres.

Upper Kuskokwim

The Lime Village Block (block 5) consists of approximately 2,772,000 acres.

The Minchumina block (block 6) consists of approximately 927,000 acres.

Haines 650,000

LAND USES OF PROJECTED BLM-ADMINISTERED LANDS

Goodnews Bay Block

This block of public land is located near the villages of Goodnews Bay and Platinum. It is surrounded by Togiak National Wildlife Refuge on the north, east, and south, and by Kuskokwim Bay on the west.

Local villagers use this block for subsistence hunting and fishing activities, in addition to some commercial salmon fishing.

The Goodnews Bay Mining Company has numerous mining claims south of Platinum village in addition to their platinum mine.

An undetermined but small amount of commercial recreation use occurs on the upper portion of the Goodnews River. Here an outfitter has been operating out of Goodnews Lake for the past

several years, offering guided fishing trips. It is not known if his use extends into the planning block.

Intervillage travel between Platinum and Goodnews Bay is by boat in summer and by snowmachine in winter. Travel to northern villages is by boat, snowmachine and aircraft. Subsistence activities in the area require the use of boats or snowmachines; there are no roads in the block, except for the road connecting Platinum Village with the platinum mine.

Except for the platinum mining area these lands have undergone minimal development.

NYAC Block

This block is located south of the Kuskokwim River (from Aniak) and about 60 miles east of Bethel. The Yukon Delta National Wildlife Refuge surrounds it on the north, west, and south; and State land on the east.

No Native villages occur in this block; however, the small mining community of NYAC is located in the west central area.

Villages along the Kuskokwim River to the north and west use this block to a certain extent for subsistence purposes.

A small portion of this block is used by the Tuluksak Dredging Company and one other mining company for gold dredging operations at NYAC.

The only roads in this block of land are at NYAC, primarily associated with the mines. There are no roads connecting the villages along the Kuskokwim to these public lands, but a few trails exist, some defined and some not. One defined trail exists from the barge landing on the Tuluksak River to NYAC mine. In the past, the mine brought in supplies this way from the barges, but this use has all but stopped. More recently, due to expanded airstrip facilities at the mine, any heavy equipment and supplies are flown in on C-130 Hercules aircraft.

A BLM radio transmitter site is located on Mt. Hamilton. It provides communications for BLM resource and fire personnel.

Other than the NYAC mining area itself, this block has had minimal development.

Anvik River Block

This block extends from north of Unalakleet Village and south nearly to Russian Mission Village on the Yukon River. It is bounded on the west by Norton Sound and Yukon Delta National Wildlife Refuge, on the south and east generally by Native corporation selections, and on the north by public land managed by the Fairbanks District Office of BLM.

Land in the north half of this block consists mostly of the Unalakleet, North, and Chiroskey River drainages. It is primarily used by Unalakleet villagers for subsistence purposes such as hunting, fishing and berry picking. Some commercial salmon fishing occurs around the mouth of the Unalakleet River. This use is expanding each year.

At least one guide has an established base of operations in the area, offering guided salmon fishing trips on the Unalakleet River, and a small amount of floatboating occurs.

No roads occur on public lands in the northern portion, so villagers travel cross-crountry on snowmachines through the area and from Unalakleet northeast to Kaltag, and southwesterly to Stebbins and St. Michaels over existing trails.

Several roads occur on Native corporation land from Unalakleet to the old airforce site and to the musk ox farm. Intervillage travel is by boat in summer, and by snowmachine or air in winter.

The Iditarod Historic Trail passes through the northern part of the block between Kaltag and Unalakleet.

The central portion of this block generally consists of the Anvik River drainage. This area is primarily used by Anvik, Grayling, and Holy Cross villagers for subsistence fishing, hunting, and wood gathering.

No roads occur in this area of public land. A few trails exist and most travel is by snowmachines in winter and by boat in the summer. Intervillage travel is by these same methods as well as by air.

On the east side of the block near Shageluk a few scattered townships result from the "odd-odd, even-even" Native corporation selection patterns. Again, these public land areas are used for subsistence purposes. There are no roads in this area; however, the Iditarod Race Trail passes through public land east of Shageluk.

The southern portion of this block lies just to the north of the Yukon River near Russian Mission Village. The public lands are primarily used by villagers, to a certain extent for subsistence activities. Some mining claims exist north of Russian Mission where the old Kako Mine, and Stuyahok mines are. There has also been some mining in the vicinity of Wolf Creek Mountain. None of these mines are presently active.

There are no roads but there are several trails in the area. A snowmachine trail is currently in use between Russian Mission and Marshall. Trails exist to Stuyahok, and Kako but they receive much less use. Generally, travel throughout this block is by boat in summer and snowmachine or aircraft in winter; intervillage travel is the same.

This block has had minimal development except around the villages and mining areas.

Sleetmute Block

This block of land generally lies north of the Kuskokwim River between Aniak Village and Sleetmute Village. A small piece lies south of the Kuskokwim surrounding Red Devil Village.

State land borders the block on the north, east and south, while the Yukon Delta National Wildlife Refuge adjoins it on the west.

This block is primarily used for subsistence activities by by villagers who live along the Kuskokwim River, and also by miners in the area. Mining claims exist throughout the area, and mining has occurred in the past near Flat and Willow Creek, DeCourcy Mountain, and at Red Devil. Currently, the Buckstock Mine is operating on the George River northeast of Georgetown.

No roads exist in the Sleetmute block; however, a number of trails are utilized. Most are used for subsistence activities in winter or for transportating heavy equipment to the mines in the block. In summer, waterways are mostly used for access. Intervillage travel is by boat, snowmachine, or aircraft. The Iditarod Historic Trail passes through a short portion of public land northeast of Flat.

Lime Village Block

The Kuskokwim River curves around the northern half of this block of public land which extends from Lime Village on the Stony River north to McGrath and Nikolai. It is bounded on

the north by State and Native corporation lands, and on the east, south, and west by State land. Lime Village has selected a parcel of land from the southern part of the block. Sparrevohn Air Force Station is located just inside the extreme southwest corner of the block. Farewell Lake Lodge, and Farewell Airstrip and Flight Service Station (FAA operated) are to the northeast of the block just outside public lands.

The block is used primarily by villagers from Lime Village, Stony River, McGrath, and Nikolai for subsistence activities, with most use occurring in the northern half. These people fish for salmon on the Pitka Fork and the Salmon River during the summer, and hunt and trap in the same area during fall and winter.

The Farewell Lake Lodge and Farewell airstrip are used as staging areas for sport hunting by two outfitters who work out of the Farewell area. Some of the hunting takes place on public land for moose and bison in the northeast corner of the block.

The old White Mountain Mine is located just outside the east boundary near the center of the block, but no mining claims are known to exist within the block. Some prospecting has

occurred, however, on the extreme eastern edge in the vicinity of T. 19 N. and T 20 N., and some claims have been staked on State land just east of Farewell.

There are no roads in this block, but there are a few subsistence trails. Therefore, boats are generally used for access during summer and snowmachines in winter. For intervillage travel, aircraft are also used.

Both the Iditarod Historic Trail and the Iditarod Race Trail pass through the northern portion of the block. Two old historic roadhouse sites are still in existence on public land along this section of the trail.

In the extreme southern portion, villagers use public land in addition to their Native-selected land for some subsistence activities. There are also some land entry claims... several of these form a base of operations for guided hunting trips in the area.

Minchumina Block

This block, located in the very northeastern corner of the Planning Area, is bounded on the south and west by State land

and some Native corporation land. The Nowitna National Wildlife Refuge lies to the north, along with some public land on the north and east managed by Fairbanks District Office of BLM.

This block is used to an unknown extent by Lake Minchumina people and possibly by villagers from the Telida area for subsistence activities.

BLM operates a fire station during the summer at Lake Minchumina (just outside the block), utilizing the old FAA buildings and airstrip for fire suppression activities. A BLM radio transmitter site is located on Sischu Mountain, 25 miles west of Lake Minchumina on public land.

There is no record of any mining claims or mining activity within the block itself, but some prospecting has occurred just to the southwest.

No roads exist in the area, but there are several trails generally providing access from the Yukon River.

This block, except for some use at Lake Minchumina by locals and BLM fire personnel, has had little other use or development.

INTERRELATIONSHIPS

The Calista Region, Doyon Region, Bering Straits Region, Cook Inlet Region and their associated villages have selected lands in large blocks along the Yukon River, Kuskokwim River, along the seacoasts of western Alaska and in the southeast corner of the Planning Area. The State of Alaska has also selected large blocks of land within the Planning Area. The Alaska National Interest Lands Conservation Act of December 2, 1980, created vast acreages of National Wildlife Refuges and National Parks and park preserves within the Planning Area. Due to these large selections by the Natives and the State of Alaska plus large withdrawals for federal parks and refuges indicate that BLM will manage only a few isolated tracts within the Planning Area.

Most land BLM will be managing is remote from settled areas, with Native villages generally located just outside (although there are a few inside the boundaries).

CONCERNS/PROBLEMS

In all likelihood pressure will increase for mineral exploration and development on the remaining public lands (as well as on State lands) because so many areas of Alaska have been put

into withdrawal status, National parks, monuments, or refuges where mining cannot occur. As exploration and development increase, BLM will not only need to provide for orderly access to public lands (ANCSA 17(b)(1) notwithstanding) but will also need to provide for access across public lands. Also, a potential increase in other resource uses, such as recreation and forestry, could support the access needs.

Since much of the Planning Area and Alaska land in general has been withdrawn in some way, there will be an ever-increasing pressure to open the remaining public lands to entry in the Planning Area. The demand can be expected to include everything from agricultural entry to emergency shelters, trapping cabins/shelter to recreational cabins. However, the public may direct some of this demand to nearby State lands.

Recreation cabin and trapping cabin/shelter demand is evidenced by the number of unauthorized occupancies occurring in the McGrath Resource Area. Presently, about four known unauthorized cabins are located on remaining public lands administered by BLM. Two of these are in the Anvik River block, one is in the Minchumina block and one in the Lime Village block. Lest this figure be misleading, a number of unauthorized structures are located on what was previously Federal

land that has been Native-selected or State-selected, with BLM retaining interim management until the land has been interim conveyed to the Natives or tentatively approved to the State. Generally, most of the unauthorized occupancies on Federal lands, Native-selected, and State-selected lands are located north and northwest of the Lime Village block and southeast of the Minchumina block.

Since public lands border many of the Native village and regional selections there will be continued pressure to utilize these adjacent public lands for subsistence activities. This will be true in all six of the public land blocks.

Several small pieces of "split interest" or "in-lieu" lands (lands having BLM surface management and Native regional corporation subsurface management and ownership) could cause land management concerns. These areas have been discussed previously (see heading Alaska Native Corporations). Overall, they are relatively small pieces of land aggregating only 85,000 acres and are located in the Goodnews, NYAC, Anvik River, and Sleetmute blocks.

BLM's communication needs will increase as the agency intensifies management of remaining public lands in the Planning Area. As mentioned, two BLM radio sites exist on public

land -- one on Mt. Hamilton in the NYAC block and the other on Mt. Sischu in the Minchumina block. BLM also has two sites on state-selected lands. One is located about 25 miles northwest of McGrath on Cloudy Mountain and the other is located about 45 miles west of McGrath in the Beaver Mountains. In addition, BLM has one site that is not currently used about 25 miles north of Chuathbaluk Village in the Russian Mountains.

These sites basically provide communication in the southern and eastern portion of the Planning Area but do not provide for the western and northwestern portion. Public demands, if any, for communication sites are also unknown at this time.

A careful analysis will be required to insure adequate communications and sites for BLM as well as providing adequate communication sites for the public, if demand warrants.

<u>OVERLAYS, LANDS</u>

10-1, BLM, Other Federal, and State-selected Lands
10-2, Native Selections and Mineral Lieu

L A N D S O P P O R T U N I T I E S

INTRODUCTION

Land status is currently extremely tenuous. Much of the land in the Planning Area has been selected by the State and by Natives, primarily for its economic potential. The land opportunities identified on the remaining BLM lands are few. Interim management responsibilities on Native and State selections will continue, but will diminish as the land transfer process matures.

ACCESS - ALL BLOCKS

As pressure increases for mineral exploration and development (energy and nonenergy) within the Planning Area, a systematic transportation network will be needed to move the resources from their point of origin to other areas in the State or nation for processing or consumption. In October 1974, BLM

prepared a preliminary analysis on the location of transportation and utility corridors for the entire state titled "Multimodal Transportation and Utility Corridors Systems in Alaska." The Joint Federal-State Land Use Planning Commission also completed a study addressing future transportation needs.

Therefore, an opportunity exists to retain those general areas described in the studies, to serve as future transportation and utility corridors. This general corridor system could also provide for future development of Alaska's potential for timber, agriculture, fish and wildlife, and recreational resources in the area.

Assumption: Corridor locations should be considered as interim locations subject to change based on views of the public and public agencies, and resource development.

EMERGENCY SHELTERS - ALL BLOCKS

There will be an ever-increasing demand for subsistence use of public lands by rural or bush residents, especially for trapping, hunting, and fishing. This demand will be accompanied by a need for emergency shelters in the winter while pursuing these activities.

An opportunity exists to make public lands available for emergency shelters throughout most of the Planning Area to meet this need. This demand is anticipated in all blocks except the Goodnews and NYAC blocks.

LAND ENTRY

There are opportunities throughout this planning area for entry under homesite, headquarter site, and trade and manufacturing site laws. There are lands throughout the area suitable for activities related to these types of entry. Since much of the Planning Area and Alaska in general is withdrawn in some form or another, there will be an ever-increasing pressure to open to entry the remaining public lands in the Planning Area. An area of 140,000 acres within which about 21,000 acres have good suitability for cropland, offers an opportunity to meet this need. This area is located between the South Fork of the Kuskokwim River and the Big River and shown on overlay 14-1 by soil unit IQ15 (soil association symbol IQ15 is taken from the Exploratory Soil Survey of Alaska).

EXCHANGE/TRANSFER - GOODNEWS BLOCK

The Goodnews block is a relatively small block of public land totaling about 312,000 acres. Except for a small amount of village selected land adjoining it, this block is surrounded on three sides by a huge amount of national wildlife refuge land administered by the U.S.D.I., Fish and Wildlife Service. This block of BLM-administered land may be more suitable for inclusion in the national wildlife refuge for overall management continuity of the area.

Therefore, an opportunity exists to make an exchange with the Fish and Wildlife Service or to make a direct transfer to the Fish and Wildlife Service. This transfer could also be used for partial fulfillment of section 22(e) of the Alaska Native Claims Settlement Act.

SPLIT INTEREST OR "IN LIEU" SUBSURFACE

GOODNEWS, NYAC, ANVIK RIVER AND SLEETMUTE BLOCKS

Approximately 85,000 acres of "in lieu" subsurface land occurs in small tracts in four planning blocks in the Planning Area. This is land in which BLM has surface ownership and management, and the Calista Regional Corporation has the subsurface ownership.

There is an opportunity, therefore, to prepare a joint management plan for these areas that are located within the Goodnews, NYAC, Anvik River, and Sleetmute blocks.

COMMUNICATION SITES - ALL BLOCKS

There are several existing communication sites on peaks on public land within the Planning Area. Those sites are located on Mt. Hamilton in the NYAC block and Sischu Mountain in the Minchumina block. Mt. Hamilton has a dedicated right-of-way for a communication site; however, Sischu Mountain does not. Several other BLM communication sites located on State and Native-selected lands are also located within the Planning Area as mentioned in URA Step III.

Therefore, an opportunty exists to dedicate those presently used mountain tops as communication sites. New areas, as they are identified, could also be reserved for sites where needed.

CHAPTER 11

MINERALS

MINERALS OPPORTUNITIES

There are opportunities to provide for continued exploration and inventory of all mineral resources. Leasable and locatable mineral surveys will be area-wide while salable mineral surveys will continue to be site specific and project oriented.

There are opportunities to open areas presently closed to mineral entry. The rising prices of precious or strategic minerals have enhanced the feasibility of development in remote areas.

Gold and platinum are the major known minerals and are mined at several locations in the area. There are areas of very high and high potential deposits of copper, lead, zinc, molybdenum, chormium, iron, titanium, stibnite, tungsten, and antimony.

There are opportunities for oil and gas leasing throughout the area. The State of Alaska has lease sales scheduled for several petroleum basins and an OCS sale is scheduled for Norton Sound. BLM lands are generally peripheral to these lands. Lease offers could be held in conjunction with State of Alaska and OCS offers.

There are opportunities to lease or to issue permits for local use of coal. The transportation expense from the lower 48 enhances the potential for local fossil fuels to be used for heating and electrical generation.

There are opportunities to lease or permit geothermal resources at several locations within the area. Present demand is low, but local use could be permitted in conjunction with local development.

PALEONTOLOGY

From Step III it is apparent that limited data has been collected about the fossils occuring on public lands. It is difficult to propose management objectives on the basis of sparse data. However, in accordance with Bureau of Land Management guidance contained in Washington Office Instruction

Memorandum No. 80-58 about the paleontology program in general, Washington Office Instruction Memorandum No. 79-267 dealing with paleontolgical inventory, and Washington Office Instruction Memorandum No. 78-405 dealing with management of paleontology resources, a logical sequence of management objectives for this program is proposed.

It is important to recognize the unique opportunities afforded paleontological resource managers in Alaska.

It is the only state which can potentially provide frozen Pleistocene beasts in whole or partly intact condition; it provides a tremendous potential for the discovery and excavation of early-man sites in Alaska (it is probable these sites are associated with megafossils or frozen carcasses). It is a fine, large environment for further research in floral and faunal assembleges of the Paleozoic and Mesozoic.

INVENTORY

This should be the first step in development of a paleontology program. The easiest means to accomplish this would be to contract the inventory to a qualified group to inventory fossil locations and deposits from literature surveys and

field studies on a quadrangle basis. This inventory should cover invertebrate, vertebrate, and paleobotanical fossils. It should address numerous environments, including caves, beaches, gravel bars, and mountains. The inventory should describe known collecting sites and define, where possible, their utility for commercial, amateur, and scientific purposes.

An evaluation of the fossils' scientific value to the locality, to the nation, and to the world should be included. Collections should be classified by (1) those areas needing immediate, detailed follow-up study, (2) areas where fossilization is evident but has no apparent scientific value and (3) areas where there is little likelihood of finding fossils.

The Bureau needs this data before it can establish collection localities or set aside sites such as mammoth burials or other megafossils as public recreational sites.

PROTECTION

Once a viable inventory is completed, the Bureau should initiate measures to protect any valuable fossils localities from natural or human destruction. These measures might include

fencing, excavation or other measures appropriate for the area. Not all sites would need protection.

Dispersal of information to the public is an important part of a protection program. Public information and handouts should be developed to discuss the paleontology program.

RECREATION

Collection areas should be identified and publicized. There appears to be considerable potential in terms of the type of fossils: pelecypods, gastropods, ammonites, trilolbites. Sufficient data is not available about accessibility of the sites for quantity and quality of the fossils in each area.

Megafossils which are identified could be set aside in a museum if the original location is remote or endangered.

RESEARCH

BLM (public) lands should remain open to study and research by qualified scientific groups with adequate credentials similar to the Antiquities Permit System. This would improve BLM's public service, increase knowledge about paleontologic resources on the public lands, and aid the scientific community.

M I N E R A L S

INTRODUCTION

The purpose of this step of the URA is to assess the mineral resource base of the Southwest Planning Area. The information presented was compiled from published material and the personal knowledge of BLM employees. This analysis is a broad, preliminary assessment of the mineral resources. The report is primarily concerned with minerals known to exist on lands which may be managed by the Bureau of Land Management after the State of Alaska selections, Alaska Native Claims Settlement Act selections, and Alaska Lands Bills withdrawals are completed. The adequacy of any assessment of mineral resource potential to satisfy land use planning, regional mineral exploration and other requirements is determined in large measure by the level and completeness of the available geologic information. The Lower Yukon/Kuskokwim district is relatively unknown geologically, and consequently this study will need updating as information becomes available.

Information about the geology and mineral deposits of central Alaska has been developed over a period of more than 75 years, but prior to 1959 it was mainly of a reconnaissance nature and with few exceptions was very strongly controlled by the occurrence and distribution of placer gold. Accordingly, the information level differed drastically from region to region and in many cases has proven to be inadequate as a basis for obtaining much more than the crudest perspective of overall mineral resource potential, especially in regions removed from gold-producing districts (Eberlein, et al, 1977). Furthermore, even the most comprehensive of the earlier surveys did not develop certain kinds of geologic data necessary to evaluate the likelihood that some of the more recently recognized deposit types (e.g., volcanogenic sulfide deposits, stratabound and stratiform base metal deposits, island arc porphyry copper deposits, composite porphyritic biotite granite intrusives having a potential for tin-tungsten deposits) may occur in a given area. Notable exceptions were commodity-oriented investigations for tin, tungsten and quicksilver in selected areas by the U.S. Geological Survey and U.S. Bureau of Mines during World War II under the Strategic Minerals Program and reconnaissance examinations for radioactive deposits by the Geological Survey on behalf of the Division of Raw Materials, U.S. Atomic Energy Commission, during the middle and late 1940's and early 1950's.

Although great disparities still exist among different parts of central Alaska, considerable progress has been made since 1959 toward improving the level of geologic information. Mainly as a result of the Geological Survey's 1:250,000 scale regional geologic mapping program, slightly more than 50 percent of the region is now covered by published, modern, ground-based geologic mapping at that scale (Eberlein, et al, 1977). However, only about 3.3 percent of central Alaska is covered by geologic maps at a scale of 1:63,360 or larger, the minimum considered acceptable to satisfy most regional mineral exploration requirements in the western conterminous United States.

Considerable progress also has been made in recent years toward improving the quality and extent of geophysical and geochemical data for central Alaska. Contoured and/or profile aeromagnetic coverage, suitable for regional extrapolations at scales between 1:500,000 and 1:63,360, is now available for approximately 71 percent of the region, and reconnaissance soil, stream-sediment and bedrock geochemical data, ranging from spotty to fairly extensive, now exist for almost 40 percent of the region.

In July 1974, the Geological Survey initiated a multidisciplinary Alaskan Mineral Resource Assessment Program (AMRAP) directed toward evaluating the endowment of terraines having high economic mineral potential on a 1:250,000 scale quadrangle format. Unfortunately for this analysis, the results of AMRAP investigations to date are available for all or parts of only three of the thirteen 1:250,000 Alaska Topographic Series quadrangles that cover the Southwest Planning Area. However, from these early results it is evident that such studies are generating the kinds of data that are essential to modern regional resource analyses. As a result, future assessments can be expected to have a considerably improved geologic and mineral resource information base that will enable them to be more definitive, precise, and conclusive.

Perhaps the most serious hindrance to the development of an understanding of the bedrock geology of central Alaska, especially as it bears on mineral resource evaluation, has been, and will continue to be, imposed by the region's natural environment. Large areas are covered by tranported material and by vegetation that obscure bedrock. With few notable local exceptions, central Alaska physiographically is characterized by unglaciated uplands and lowlands whose evolution has been controlled mainly by periglacial erosional processes

operating under a subarctic permafrost climate. The uplands have been sculptured largely by creep and solifluction, and their lower slopes are commonly mantled by windborne silt. Unglaciated lowlands have been formed mainly by depositional processes that blanket bedrock with materials brought in from highlands and tend to erase irregularities in the lowland surface. Underlying permafrost prevents downward percolation of groundwater, and summer melting of ice at the top of permafrost keeps the extensive vegetation cover relatively saturated. Thus, large areas of unglaciated lowlands are marshy flats almost totally lacking in bedrock exposures. It is estimated that 40 percent of this area is blanketed by a Quaternary surficial cover of alluvial, glaciofluvial, morainal, mucky, swampy, lacustrine, floodplain, and windblown deposits, and undeformed subaerial volcanic rocks (1.4 percent). Accordingly, most bedrock geologic investigations in these extensive areas of surficial cover are and doubtless will continue to be, much less conclusive than desired for definitive mineral resource evaluation purposes, even on a regional scale (Eberlein, 1977).

LOCATABLES

The principal locatable minerals of the Southwest Planning Area are platinum and gold; the region has had a history of placer mining of both since the early 1900's. This activity

has recently increased substantially as a result of the increased price of gold and valuable minerals. With few exceptions, it has been limited to small scale operations of minor economic importance. Since the rise in the value of gold, 1972-73, numerous claims have been staked on land both open and closed to mineral entry.

Economics and limitations imposed by the climate, inaccessibility, high labor costs, and vegetative cover hampered most serious development of hardrock minerals in the past (Eberlein, 1977).

As mentioned previously, the U.S.G.S. is undertaking an intensive effort to evaluate the mineral resources of the various quadrangles of Alaska. As discussed in U.S.G.S. Circular 823-H, a preliminary assessment of the mineral resource potential of the Talkeetna quadrangle has been completed and is available to the public. This study includes a series of maps with accompanying text based on field data and satellite imagery. The Medfra and Goodnews Bay quadrangles have fieldwork underway, and it is anticipated that the reports and maps will soon be available to the public.

An excellent source of reference material which can be considered a foundation for mineral resource assessments of central Alaska is a series of open file reports prepared by various authors of the U.S.G.S. on metalliferous and nonmetalliferous minerals, coal and geothermal resources. They are listed in the reference section of this report.

LEASABLES

There are five onshore and two offshore oil and gas basins within the Southwest Planning Area (overlay 11-1). Two onshore basins, the Bethel Basin and the Yukon Delta Petroleum Province, and one offshore basin, the Bering Sea Tertiary Province, are not presently expected to impact BLM administered lands. One of the remaining basins is the Minchumina Basin which is rated high potential. There are approximately 1,013,760 acres (44 townships) in the northern part of the Lime Village planning block that fall within this basin. The State of Aalska plans a lease sale in 1984. The route to the Trans/Alaska Pipeline System via Fairbanks is more than 220 miles.

The other remaining basin is the Holitna Basin and it is rated low potential. It includes about 115,200 acres (5 townships)

of BLM-administered lands in the southern part of the Lime Village planning block. The State of Alaska plans a lease sale in 1985.

The Yukon-Koyukuk Cretaceous Province is rated low potential. It includes 898,560 acres (39 townships) of BLM-administered lands in the Nulato Hills portion of the Anvik River planning block. There are no lease sales scheduled for this basin.

An OCS sale (1982) and a State offshore sale (1983) are scheduled in the Norton Basin. Onshore facilities related to offshore development could impact NLM-administered lands. With further evaluation of this field, some explorator or development wells may be located onshore. BLM administers about 20 miles of shoreline from Tolstoi Point south to the Tolukowuk Bluffs.

Four thermal springs are known to exist within the area. Unlike thermal springs elsewhere in the world that tend to be related to geologically recent volcanic activity, these springs are spatially associated with granitic plutons of late Mesozoic and early Cenozoic age, especially with their contact zones. Springs are classified as thermal if their temperature is at least 15° C.

Coal appears in eight locations throughout the resource area with varying rank. There are three locations along the Yukon River where production occurred around the turn of the century. The Cheeneetnuk River has an occurrence of bituminous rank coal in an 8 foot (1.8m) bed in rocks of Tertiary age. Unalakleet coal deposits were used for local heating.

There are no known deposits of sodium, potassium oil shale, or phosphate within the Planning Area.

SALABLE MINERALS

The area possesses huge tonnages of sand and gravel; however, production has been used only for road and airfield construction and a small amount for village and domestic use. Most of the pits used by the State Highway Department are free-use permits or rights-of-way material sites and their dollar value is difficult to assess. However, the Yukon-Kuskokwim Delta is lacking in good sources near most of the villages. For this reason, material has been barged in from as far away as Seattle at a cost of $\$6.00/yd^3$ at the dock in Bethel. This value has set the trends very high for the local sources and made good material sites very valuable to both the State and local landowners. These deposits are sufficient for any likely use.

URA MINERAL CLASSIFICATIONS

The minerals analysis for the URA is based on present knowledge concerning the mineral resources, mineral interests, and mineral potential of three types of mineralized areas. The three types of areas are based on the Interior Department's definitions of mineral terms, which are:

> Identified - Economic Reserves: That portion of the identified resource from which a usable mineral and/or energy commodity can be economically and legally extracted at the time of determination.
>
> Identified - Subeconomic Resources: Known valuable deposits not now minable economically.
>
> Undiscovered Resources: Unspecified bodies of mineral-bearing material surmised to exist on the basis of broad geologic knowledge and theory. Two subtypes, hypothetical and speculative, may be considered.
>
> Hypothetical Resources: Undiscovered materials that may reasonably be expected to exist in a known mining district under known geologic conditions.
>
> Speculative Resources: Undiscovered materials that may occur either in known types of deposits in a favorable geologic setting where no discoveries have been made, or in as yet unknown types of deposits that remain to be identified.

MINERALIZED AREAS

The Southwest Planning Area contains at least one example of each of the three types of mineralized areas. Much of the resource area lies within areas geologically favorable for minerals.

The areas delineated on the Step 3 mineral potential overlay were determined by all or most of the parameters listed below:

1. Locatable Minerals (Parameters generally used to determined classification).

   a. High Potential: Known, significant mineral occurrences, as shown by:

      - Favorable known geology
      - Existence of mining claims
      - Favorable air magnetometer results
      - ERTS interpretation
      - Favorable results of geochemical analysis
      - High level of current or recent exploration activity
      - Confidential industry data

   b. Good Potential - Indicated favorable geology as shown by:

      - Geologic inference of areas with high potential
      - Mapped occurrences
      - Placer activity in area
      - Favorable geochemical results
      - Favorable air magnetometer results
      - Moderate amount of exploration activity

   c. Possible Potential - Areas meeting most of the criteria for Good Potential but with less definable borders

   d. Unassessed - Indicated favorable geology

   e. Potential - Geological inference of possible mineralization, shown by:

      - Confidential data received from industry
      - Regional trends of geology

2. Oil and Gas Classification - Based on classifications assigned in Minerals, Energy, and Geology, LUPC 1973.

a. High Potential: - Sufficient section for formation of oil and gas, about 15,000 feet or more

- Adequate source rock
- Adequate reservoir rock
- Structures known to contain oil and gas

b. Medium Potential: - Section of approximately 10,000 feet

- Less than adequate source rock
- Less than adequate reservoir rock
- Inferred structure

c. Low Potential - Relatively thin section

- No known source or reservoir rock
- Structure not known

3. Miscellaneous and Industrial Minerals

a. Sand and Gravel - Existence of significant quantities

b. Geothermal - U.S.G.S. classification "Areas Valuable Prospectively" (or areas having good potential for commercial use)

c. Limestone, Clay, Marble - Not delineated at this time

Broad regional mineralized areas are projected throughout the Planning Area. Numerous claims are scattered through the mineralized areas, scattered in a broad arc from Ruby, to the Aniak district, to the Platinum - Goodnews area.

All of the mineralized areas addressed in the URA have approximately the same problems. Access is the key problem. There must be economic reasons to justify the great expense of

building either a road or railroad into an area. Therefore, to develop access, a mineral deposit with a large enough tonnage or grade to defray the costs of access must first be identified.

The problems of harsh climate, lack of good access, lack of energy sources, lack of an immediate labor force (or housing and facilities to maintain a labor force), and lack of mills and smelters require a mineral deposit to be very high grade of large tonnage to be economic. Several Alaskan deposits, which are currently being seriously considered by companies are world-class deposits.

It should be emphasized that knowledge of Alaskan lode and placer deposits is far from complete and that the information sources upon which this report is based range all the way from vague notations in the old literature to the results of well documented modern studies. Despite efforts to make this analysis complete, certain occurrences have been omitted, because they are altogether unsubstantiated and it is inevitable that records for some deposits prospected and abandonded, especially before the turn of the century have become lost. Production data are incomplete and are essentially unavailable after 1961.

In the following paragraphs the mineral potential of the Planning Area is discussed for those quadrangles where BLM administers land. Overlay 2-2 shows the location of the various U.S.G.S. quadrangle sheets for the Southwest Planning Area.

UNALAKLEET

Approximately 50 percent of this quad has been selected by state or Native groups or has been withdrawn under Section 204(c) of FLPMA. The majority of the proposed resource area is currently open to mining and mineral leasing or to metalliferous minerals.

The geologic setting is favorable for the potentialy occurrence of uranium. There are no known productive deposits, and relevent resource data is almost totally lacking. This area runs through a belt that contains swarms of porphyritic rhyolitic to dacite sills and other small plutons and non-marine intrusives. There are locally developed pyritiferous zones which are extensively oxidized. Altered zones of silica and sericite are present. This area may contain undiscovered porhyyry copper deposits.

The following features contribute to an overall geologic setting considered suitable for the occurrence of deposits indicated as speculative, widely distributed marine mafic volcanic rocks (lower Cretaceous) in part propytitically altered and intruded both by granitic plutons and high level rhyolitic bodies with their extrusive counterparts, major trending faults to the northeast and several mafic and at least one known ultamafic instrusive body.

Speculative types of deposits include copper, lead, zinc, molybdenum, gold, deposits (both vein and porphry) associated with granitic and rhyolictic igneous rocks, as well as platinum, chormium, iron, and titnium in magmatic deposits.

The region has not been throughly prospected for base metals. The rock type present (small felsic intrusive and extrusive rocks) and their structural setting, together with extensive altered areas and associated geochemical anomalies, contribute to a geologic setting which is considered permissive for the occurrence of porphyry copper deposits and uranium deposits associated with granitic and rhyolitic rocks.

Leasables

The area lies within the low potential Yukon-Koyukuk Cretaceous province; however, a very high potential oil and gas province exists off-shore in the Norton Sound basin.

There are several occurrences of coal along the Yukon river with reported production of bituminous rock at Bullfrog Island, Eagle Island and Fox Point Island areas. Just south of Unalakleet a lignite deposit of reported production is reported. There is also an occurrence of lignite at the confluence of Old Woman River and Unalakleet Rivers.

There are no known geothermal resources, but the geological setting appears favorable.

Salables

Again huge tonnages of sand and gravel exist along the Yukon River with no apparent market.

OPHIR

This entire quadrangle has been state selected or withdrawn by Section 204(c) of FLPMA; 204(c) withdrawals make up approximately 60 percent of the quadrangle. These withdrawals created the Innoko National Wildlife Refuge. Doyon Corporation has selected one township, while the State of Alaska has selected the eastern half of the quadrangle. Therefore, the economic mineral potential of this quadrangle will not be discussed.

MEDFRA

Approximately 85 percent of the quadrangle has been state selected. The twelve townships in the northeastern part of the quadrangle have low mineral potential but will be briefly discussed.

Locatables

All recorded mining history is located south of the resource area boundary along Nixon Fork hills where disseminated placer gold prevails. Along the Sulukna River drainage and Our Creek, placer gold may be present although no record exists.

U.S.G.S. Open File Report OF-78-1-D (Eberlein, 1977), describes this area as low mineral potential, probably explaing why the state didn't include the area in possible selections.

Leasable

There is an extremely low potential for leaseable minerals in this section of the quadrangle. A low potential sedimentation basin does exist south of the URA area according to the LUPC report.

Salable

There is a low potential for salable minerals in this section of the quadrangle.

HOLY CROSS

Approximately the eastern half of the quadrangle has been state selected and the western quarter withdrawn under 204(e) of FLPMA. Most of the resource area is closed to mineral leasing and mining but will be discussed briefly.

According to U.S.G.S. Open File Report 78-1-D (Eberlein, 1977), this area is not very heavily mineralized. The basic rock structures within this quadrangle vary from alluvial, estuarine, beach, dune sand, loess, delta, and reworked silt deposit of Holocene and Pleistocene age to marine sedimentary rock of Mesozoic and Paleozoic age of siltstone, chert, and mafic volcanic rock of Jurassic age. There are also volcanic rocks mainly on the surface of Tertiary and Cretaceous age consisting of primarily Andesite and trachyte flows.

Locatables

There are some small isolated areas that have mineral potential within the resource area, with four low mining claim activities in the Stuyahok, Tom Gray, Little Lockwood Creek, and Anvik area for gold, mercury, stibnite, and platinum.

Leasables

The resource area lies within a low-potential oil and gas basin which should be investigated.

Salables

Huge tonnages exist along the Yukon River floodplain between the Yukon and Innoko rivers. Some of this material may be of value because of the barge traffic that the Yukon supports. No other salables are known to exist within this area.

IDITAROD

Approximately 50 percent of this quadrangle has been selected by the State and approximately has been withdrawn under FLPMA 204c. The remaining southern half approximately will comprise the URA area and will be discussed.

The Iditarod Nixon Fault biscects the quadrangle. Most of the quadrangle consists of stratified sedimentary rock, Cretaceous in age, of volcanic greywacke and mudstone; and of sandstone with some coal bearing rocks in the upper part of Albin and Cenomanian age. The other major formation is metasedimentary rock of Lower Paleozoic age consisting of schist, quartzite, slate, greenstone and carbonate rocks of the Holitna group. The area is heavily mineralized and the principal deposits and groups of deposits are localized along the major deepseated fault zones.

Local controls related to structurally and chemically suitable sites that offered sufficient permeability for the passage of ore-forming solutions and adequate porosity for the deposition of cinnabar and stibnite. Most productive deposits are in or adjacent to faulted or altered mafic dikes and sills. The ultimate source of gold in the most productive stream and bench placers are believed to be irregular quartz veins in granitic plutons. Especially rich placers formed where present streams transect older bench gravels.

Locatables

The Iditarod-Flat area is a principle producer of placer gold with a total production of about 41,400 kg. The area is heavily mineralized with various deposits of gold, silver, mercury, stibnite, zinc, copper, tungsten, and antimony which are located mainly in quartz veins associated with lower Tertiary granitic intrusions. There are major deposits of mercury and stibnite formed in veins and open-spaced filling hydrothermal.

Leasables

There are no known sedimentary basins within the Planning Area. There is one reported occurrence of coal being produced along the Iditarod River north of Flat. The coal is of anthracite-subbituminous rock with a 1 meter thick bed and some reported production which is located along a Cretaceous shear zone. There are also reported warm springs near Flat that issue from schist of possible Cretaceous age near a small intrusive of mafic igneous rocks.

Salables

There are huge tonnages of sand and gravel located along the major river drainages but with no source of use because of a lack of development. There are no other leasables with the resource area.

McGRATH

Approximately 50 percent of this quadrangle has been state selected. There is some mining activity but all on state selected land.

The general geology discussed here describes the western half of the quadrangle. The Farewell Faults nearly bisects the quadrangle, while Pleistocene deposits of alluvial, glacial, dune sand, silt, and reworked sand and silt deposits prevail.

There are some areas of lower Paleozoic rock, metasedimentary rocks consisting of schist, quartzite, slate, and carbonate rocks of the Holitna group. The other board area of rock is Cretaceous in age and which includes an unnamed sequence of volcanic greywacke and mudstone and sandstone with some coal bearing rocks in the upper part of album and Cenomonion age.

Locatables

This area has no recordation of any mining activity nor is its geology conducive to mineral production.

Leasables

The northern portion is part of a low-potential Holitna basin and should be investigated farther. No other leasables are known to exist in the area.

Salables

Huge tonnages of sand and gravel exist on all major and minor river drainages but with no available market.

RUSSIAN MISSION

Approximately 80 percent of the quadrangle has been withdrawn under Section 204(c) of FLPMA for inclusion in the Yukon Delta National Wildlife Refuge or has been selected by the Kuskokwim Native Corporation or the Calista Regional Corporation. Again, what land remains assumes a checkerboard shape in appearance. The remaining land does have potential for mineral resources and will be discussed briefly.

Locatables

The area has a history of placer mining for gold since the early 1900's. Some hydrothermal vein deposits of gold, copper, lead, tungsten, and stibnite(M) exist.

Leasables

Portions of this quadrangle lie in the low potential Bethel basin. There are also two occurrences of warm springs in the quadrangle. No other leaseables are known to occur.

Salables

Huge tonnages of sand and gravel exists within this quadrangle but again with limited use because there is no available market or transportation system.

SLEETMUTE

Approximately 75 percent of this quadrangle has been selected either by the State of Alaska or the Kuskokwim Native Corporation or Calista Regional Corporation. An extremely piece meal arrangement of remaining townships exists, so only the upper western quarter of this quadrangle will be discussed.

The primary rock structures over this area are Cretaceous in age and include an unnamed sequence of volcanic greywacke and mudstone, sandstone with some coal bearing rocks in the upper part of Albian, Cenomanian age in the Yukon/Koyukuk province

and interbedded greywacke and shale in the Kuskokwim Mountains. Along Crooked Creek drainages and in various outcrops in the Kuskokwim Mountains some tertiary volcanic rocks of basalt and andesite exist as well as isolated outcrops of tertiary hypabyssal rocks (igneous rocks of deep magmatic origin that solidified as minor intrusions before reaching the surface) of rhyolite and dacite with some flows and tuff beds. Principal deposits and groups of deposits are localized along major deepseated, through going fault zones. Local controls related to structurally and chemically suitable sites that offered sufficient permeability for the passage of ore-forming solutions and adequate porosity for the deposition of cinnebar and stibnite. Most productive deposits are in or adjacent to faulted and altered mafic dikes and sills.

Ultimate sources of gold in many of the most productive present stream and bench placers ar believed to be irregular quartz veins in granitic plutons and in associated hornfels zones. Especially rich placers were locally formed where some present streams transect older bench gravels. Some gold was also reconcentrated from glacial and/or glaciofluval deposits.

Locatables

The major types of deposits known in this area are mercury and antimony, located in vein and open spaced filling produced by low temperatures, hydrothermal action, and placer gold. Gold, silver, zinc, copper, lead, tungsten and tin are speculative because of their association with quartz veins of lower tertiary granitic intrusives. Total production of mercury over the past 75 years is about 1,300 tons, mainly from the Red Devil Mine. A small amount of by product antimony also has been produced.

Placer deposits are widely distributed throughout the region and have accounted for almost 13 percent, or about 70,000 Kg, of Alaska's total placer gold production plus by product silver through 1960. Principle producers include Iditarod-Flat area and Innoko area. This region can be considered favorable for the occurrence of more lode (mercury) deposits. Also, additional deposits of porphyry gold deposits associated with quartz monzonite stocks probably contains a significant resource of low grade gold.

Leasables

Part of the Holitna basin lies within eastern quarter of this quadrangle; this basin is considered low in potential for any oil and gas development. The basin actually lies outside the area of influence of this URA.

There are no known deposits of coal, sodium potassium, oil shale or phosphate within this quadrangle.

Salable

The area possesses huge tonnages of sand and gravel, however, production has been used only for local roads, airfields and domestic construciton.

Again until an adequate transportation system is developed this resource will be limited to use in local areas.

LIME HILLS

Approximately 75 percent of this quadrangle has been state selected or withdrawn under Section 204(c) of FLPMA for in-

clusion in the Lake Clark National Monument. The western quarter of the quadrangle does have some mineral potential and will be discussed.

The Farewell fault runs along the Cheeneetnuk River in a north-to- southeast trend. Alluvial, glacial, dune sand, silt and reworked sand and silt deposits of Pleistocene age predominate along the Tatlawiksuk, Swift and Stony River drainages. Between the Cheeneetnuk and the Gagaryah Rivers, lower Pleistocene rocks, metasedimentary (rocks of sedimentary origin undergoing metamorphism) consisting of schist, quartzite, slate, greenstone and carbonate rocks of the Holitna group are present. These carbonate rocks include some limestone and dolomitic limestone. The Holitna basin also lies within the area.

Leasables

The Holitna Basin, which has a low potential for oil and gas, does lie along the western edge of the area and may warrant some future inventigations.

There has been one occurrence of coal reported by Barnes (1967) along the Cheeneetnuk River. This basin is an extension of the basin which flanks the McKinley Park. Some coal deposits have been located to the northeast, and it is likely that extensions of this coal could be found. Further investigations should continue. There are no known deposits of sodium, potassium, oil shale, or phosphate within the resource area.

Locatables

This area has low potential for locatable minerals according to U.S.G.S. Open File Report, 77-168D, and 78-1-D. A mercury mine does exist at the hadwaters of the Cheeneetnuk River. The possibility of placer gold is present.

Salables

Large volumes of sand and gravel are located along the drainages of the Swift and Stony Rivers.

Limestone may be present, but is not currently located or mined.

BETHEL

Approximately the eastern half of this quadrangle has been withdrawn under Section 204(c) of FLPMA for inclusion in the Yukon Delta National Wildlife Refuge along with some Native selections. The northern portion of the URA area is open to metalliferous minerals while the southern portion is closed to mining and mineral leasing.

Gold and platinum are the major types of known deposits, while speculative types of minerals mercury and chromium exists.

The geologic controls are modern stream and bench placers of Salmon River and its western tributaries that drain the Red Mountain dunite intrusive deposits. This is considered the ultimate source of platinum metals.

Other deposits of gold in the area contribute their existence to bench and placer setting. The ultimate source of gold is probably Tertiary granitic intrusive rocks and reconcentration from previous glacial settings.

No other leasable minerals are known to exist within the quadrangle.

Salables

Huge tonnages of sand and gravel exist along the major river drainages and beaches but have no apparent market.

GOODNEWS BAY

The total platinum production from Goodnews Bay district is estimated to be well over 20,000 Kg. The msot productive ground involved two paystreaks in Salmon River Valley. Platinum has been reported present in the sediments of Goodnews Bay but no results of industry sampling programs are available. No workable lodes containing platinum have been found. Although Red Mountain dunite is not considered a favorable site for the discovery of any large low grade workable ores of platinum metals, some high grade concentrations may exist. Total identified resources in beaches, bays, and lodes has been estimated at 210,000 Kg's. The platinum metals potential of the off-shore area es essentially unknown but could be sizable.

Beach placers locally contain low grade chromite resources and restricted occurrences of gold and platinum.

Leasables

The area is located in the low-potential sedimentary Bethel Basin.

There are no known coal or geothermal deposits in the area.

PALEONTOLOGY

The paleontology program is a relatively new part of the Bureau of Land Management planning system. Frequently over the last few years, responsibility for this program has shifted erratically between the minerals, watershed, and cultural resource activities. It is presently in the minerals program.

This continual migration, coupled with the devotion of most resource specialists to other projects, the lack of fully a trained paleontologist, and severe limitations in funding have resulted in essentially no program in paleontology. This is particularly true in Alaska where the land conveyance program has the greatest management and financial support.

This situation is not unique to the Bureau, at least with respect to the area covered by the southwest planning effort. Limited work has been done by others in this region. There is a definite lack of technical literature specifically addressing this region. Most geological reports about this region deal primarily with metalliferous minerals and mention fossils only as an aside or in connection with stratigraphic dating.

Lack of data and failure to initiate a comprehensive inventory, however, is no reason to suppose no significant paleontological values exist in the region. On the contrary a significant site near Paimiut revealed a mastodon skeleton.

In an effort to call attention to the paleontology resource on public lands in Alaska, the major geologic eras and periods will be discussed in broad terms. Recorded fossil sites in each of these units will be referenced by geographic area and shown on an overlay 11-3.

The basis for using geologic units as the core of this analysis is to make discussion of fossils easier in terms of chronological sequence and to facilitate discussion of possible occurrences that have not been reported yet.

The eastern and northern portions of the Southwest Planning Area are comprised of broad southwest trending rocks of lower Paleozoic and Cretaceous age (see table 11-1). The western peninsula between Norton Sound and Kuskokwim Bay is dominantly made up of Quaternary deposits with a southwest trending finger of Cretaceous rocks and scattered Tertiary volcanics on the south side of Norton Sound. In the extreme southern portion of the Planning Area, just north of Bristol Bay, Cretaceous and Jurassic material and older material ranging in age from early Paleozoic to Jurassic is found. (Beikman, Helen M., 1978).

PRECAMBRIAN

Three quarters of the history of the earth is represented in rocks of the Cryptozoic. Fossils are seldom present in recognizable form, because most of these rocks have been deformed and have suffered one or more phases of metamorphism, or volcanic intrusion.

Precambrian rocks in the Southwest Planning Area occur 15 miles south of the Kwethluk river on the Bethel quadrangle; and in a long belt between Goodnews River and Kuskokwim Bay. They are comprised primarily of schist and granite.

Table 11-1. Recorded Paleontologic Evidence from the Paleozoic

Period	Geologic Unit	Fossil	Number	Location	Source of Information
Ordivician	Tatina Group	Undiff.	-	Alaska Range	Fernald, 1960
Silurian	Holitna Group	Stromatopora	2681	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Stromatopora	2683	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Favosites	2683	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Cyathaphylloid Coral	2683	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Leperditia	2684	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Stramotopora	2685	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Favosites	2685	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Favosites	2686	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Sponge	2687	North Holitna River	Cady, 1955
Silurian	Holitna Group	Favosites	2687	North Holitna River	Cady, 1955
Silurian	Holitna Group	Cyathophylloid Coral	2687	North Holitna River	Cady, 1955
Silurian	Holitna Group	Atripa	2687	North Holitna River	Cady, 1955
Silurian	Holitna Group	Spirifer	2687	North Holitna River	Cady, 1955
Silurian	Holitna Group	Favosites	2688	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Menotrypa	2688	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Spirifer	2688	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Athyris	2688	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Productells	2688	Kulukbuk Hills	Cady, 1955
Silurian	Holitna Group	Proetus	2688	Kulukbuk Hills	Cady, 1955
Devonian	Takotna Series	Crushed crinoid fragments	-	10 miles below junction of Kuskokwim with East Fork	Mertie, et al, 1924
Devonian	Takotna Series	Corals	-	Above junction Kuskokwim and Takotna River	Mertie, et al, 1924
Devonian	Takotna Series	Favosites	-	Above junction Kuskokwim and Takotna River	Mertie, et al, 1924
Devonian	Takotna Series	Alveolites	-	Above junction Kuskokwim and Takotna River	Mertie, et al, 1924
Devonian	Takotna Series	Striatopora	-	Above junction Kuskokwim and Takotna River	Mertie, et al, 1924

Table II-1. (continued)

Period	Geologic Unit	Fossil	Number	Location	Source of Information
Devonian	Takotna Series	Stromatopora	-	Above junction Kuskokwim and Takotna River	Mertie, et al, 1924
Devonian	Takotna Series	Creiphyllum	-	Above junction Kuskokwim and Takotna River	Mertie, et al, 1924
Devonian	Takotna Series	Cladopora	-		Mertie, et al, 1924
Devonian	Takotna Series	Melocrinus ?	-	Long Creek	Mertie, et al, 1924
Devonian	Takotna Series	Orthothetes	-	Divide between Stony and Hoholitna River	Smith, 1917
Devonian	Takotna Series	Productella	-		Smith, 1917
Devonian	Takotna Series	?	50 AHR 356A	Nuklukaluk River	Hoare, 1961
Carboniferous	Gemuk Group	?	51 ACd 134	?	Hoare, 1961
Carboniferous	Gemuk Group	?	53 AHR 1234	Uagag Cr.	Hoare, 1961
Permian	Gemuk Group	?	8007	Lake chaukuk-Shadow Bay Tuli	Hoare, 1959
Permian	Gemuk Group	?	8008	3 miles N or Nagahat Lake	Hoare, 1961
Permian	Gemuk Group	?	8010	Bear Creek, N of Goodnews Bay	Hoare, 1961
Permian	Gemuk Group	?	50 AHR 378A	NNW Goodnews Lake	Hoare, 1961
Permian	Gemuk Group	?	50 AHR 392	N. Nukluk Creek	Hoare, 1961
Permian	Gemuk Group	?	50 AHR 394C	N. Nukluk Creek	Hoare, 1961
Permian	Gemuk Group	?	51 ACd 1846	20 miles West Togiak Lake	Hoare, 1961
Permian	Gemuk Group	?	51 ACd 206	13 miles NW Goodnews Lake	Hoare, 1961
Permian	Gemuk Group	?	53 AHR 1236	Uagag Creek	Hoare, 1961
Probably Permian	Gemuk Group	?	53 AHR 1118	Segtutlis Mountain	Hoare, 1961
Paleozoic	Gemuk Group	?	52 AHR 324A	2 mi west of Goodnews Lk.	Hoare, 1961
Paleozoic	Gemuk Group	?	53 AHR 1055	6 mi east Chinekigtilk Mt.	Hoare, 1961
Paleozoic	Gemuk Group	?	53 AHR 1088A	Goodnews R., 30 mi NE Goodnews Bay	Hoare, 1961
Paleozoic	Gemuk Group	?	53 AHR 1088B	Goodnews R., 30 mi NE Goodnews Bay	Hoare, 1961
Late Paleozoic	Gemuk Group	?	53 AHR 1276	13 miles east Pangakepuk Lake	Hoare, 1961

The literature search revealed no known fossils from Precambrian rocks. If they are found, it is probable they will be deformed and crushed and may provide little useful information.

PALEOZOIC

The base of the rocks known as Paleozoic is the point where fossils become abundant.

Roughly 20 percent of the rocks in Southwest Alaska, as mapped by Beikman (1978), have been determined to be Paleozoic (570,000,000 years to 225,000,000 years ago). The Paleozoic includes rocks in the Cambrian, Ordovician, Silurian, Devonian, Mississippian, Pennsylvanian and Permian periods.

Typical fossils from these periods would include Cambrian trilobites, brachiopods and mollusks and annelid worms. During the Ordovician period, echinoderms, coral, bryozoa trachiopods pelecypods, gastropods, and cephalapods were prevalent. Grapalites and stromatolites were also present.

In Southwest Alaska lower Paleozoic rocks occur in Kayuk Mountains and in a broad southerly trending band west of the Alaska range. An undifferentiated sequence or variying Paleozoic age also occurs in the vicinity of Goodnews Bay and near Flat Top Mountain on the east side of the Kuskokwim Mountains.

During the Silvian Period blastoids, crinoids, corals, brachiopods eurypleuds and trilolites were in existence. The Devonian period is characterized by similar life types which are more advanced. Lungfish inhabited Devonian seas. Primitive land plants were also present. In the Carboniferous (Mississippian and Pennsylvanian Periods) these invertebrates continued their development. Spore bearing trees were common in swamps. Ferns and rushes were also present. Early insects including spiders and cockroaches, also inhabited the earth during this period. Eosaurauus copei, one of the earliest reptiles, dates from Pennsylvanian time. Extreme specialization of life occured in the Permian. True conifers were prevalent, as were 20 orders of insects. Reptiles increased markedly during the Permian.

Relatively few fossils have been found representing the Paleozoic in Southwest Alaska. This is partly because most geologic studies have concentrated on the mineral and economic

aspects of rocks. It is also the result of the area's remote location and its geographic and surface characteristics, which make extensive mapping difficult.

Paleozoic fossils that have been reported in this planning unit are shown in table 11-1.

It is apparent that most of these fossils are stromatoporoids, corals, spirifers and other brachiopods, with at least one arthropod and one trilobite. The data for the Gemuk group does not include the name of the fossil; this information was not included in the original source (USGS Miscellaneous Geologic Investigation Map I-339, Geology of the Goodnews Bay Quadrangle).

MESOZOIC

Approximately half of the Southwest Planning Area is comprised of rocks from the Mesozoic, Triassic, Jurassic, and Cretaceous Periods (225,000,000 years ago) (Dunbar, Carl O. and Wanse, Karl, 1969).

Mesozoic rocks cover a broad area east of Kuskokwim Bay, and north of Bristol Bay. A large sequence of Mesozoic age rocks, also occurs on Norton Sound's south shore and extends to the vicinity of St. Marys (Beikman, 1978).

Newly evolving, generally more efficient organisms characterized the Mesozoic. The Hurassic referred to as the age of reptiles. Angiosperms (seed-bearing plants) emerged during the Triassic. Reptiles like phytosaurs, dinosaurs and other large reptiles gained bipida stance and could run quickly by the end of Triassic time. The earliest mammals developed in Triassic time. The Jurassic is characterized by more than 1,000 types of insects, cycadeoid (trees) and reptiles. Archeoptery, the first feathered reptile, precursor of birds, appeared in the Jurassic. Four types of mammals are known to have existed by Jurassic time, based on teeth differences.

In the early Cretaceous, deciduous plants become widespread. Dinosaurs continued to be dominant. Mammals continued to evolve and at least one primate is known from Cretaceous time.

The fossil record for the Mesozoic is not significantly better than that for the Paleozoic. The same reasons are likely most historical emphasis has been on mineral wealth, and access to the rocks has been largely limited to river courses.

Recorded paleontologic evidence from the Mesozoic in Alaska's Southwest Planning Area are those fossils shown on table 11-2.

The majority of recorded Mesozoic fossils are pelecypods of Inoceramus genus. It is interesting to note that several plants were also found in addition to wood and bark fragments and dicotylednous leaves.

The remaining third of the land under study is overlain with either Quaternary detritus or Tertiary volcanic material (Cenozoic Era, 65,000,000 years to the present).

CENOZOIC

Man, other mammals, and modern plants are characteristic of the Cenozoic era. The youthful, alluvial character of these deposits has restricted fossil finds. Recorded fossils of the Cenozoic in the Southwest Planning Area are:

Period	Geologic Unit	Fossils	Number*	Locality	Source of Information
Eocene	?	Aspidium Meyeri	7007	Folger Creek	Mertie, 1924
Eocene		Gingko adiantoldes	7007	Folger Creek	Mertie, 1924
Eocene		Populus arctica	7007	Folger Creek	Mertie, 1924
Eocene		Poppulue Zaddachii	7007	Folger Creek	Mertie, 1924
Pleistocene	Quarternary	Phiomia	----	Paimiut	BLM file

Table 11-2. Recorded Paleontologic Evidence from Mesozoic Era

Period	Geologic Unit	Fossil	Number*	Location	Source of Information
Triassic	Gemuk	?	23168	Nukluk Cr	Hoare, 1961
Triassic	"	?	23307	Eek Mountains	Hoare, 1961
Triassic	"	Montis	18927	Cinnabar Creek	Cady, 1955
Triassic	"	Halobia	19409	Cinnabar Creek	Cady, 1955
Triassic	"	Myophoria	19409	Cinnabar Creek	Cady, 1955
Triassic	"	Mysidioptera	19409	Cinnabar Creek	Cady, 1955
Triassic	"	?	50 AHR 590	Kanuktik Lake	Hoare, 1961
Cretaceous	Holiknuk Series	Inoceramus	-	Yukwonilnik River	Maddran, 1910
Cretaceous	Holiknuk Series	Dicotyledonous leafs	-	Chagavenapuk	Maddran, 1910
Cretaceous	Kolmakoff Series	Inoceramus	-	Kolmakof	Maddran, 1910
Cretaceous	?	Unio	7822	Taylor Creek	Mertie, 1924
Cretaceous	?	Inoceramus	9219	N. Mulchatna River	Smith, 1917
Cretaceous	?	Pleurophori due,	9364	Head of Susulatna River	Mertie, 1924
Cretaceous	?	Pelecypod ?	9365	Folger Creek	Mertie, 1924
Cretaceous	?	Turi tella	9366	Folger Creek	Mertie, 1924
Cretaceous	?	Inoceramus	9367	Camelback Mountain	Mertie, 1924
Cretaceous ?	?	Octrea	9776	Andreafski River	Harrington, 1918
Cretaceous	?	Aralia Wellingtoniana	9916	Pilot Station	Hoare, 1971
Cretaceous	?	Credneria grewiopsoids	9916	Pilot Station	Hoare, 1971
Cretaceous	?	Unionid	M1173	Pilot Station	Hoare, 1971
Cretaceous	Gemuk	?	53 AHR 1284	12 miles east Pungakepuklk	Hoare, 1971
Cretaceous	Gemuk	Aucella crassiocollis	19730	Holokuk River	Cady, 1955
Cretaceous	Gemuk	Inoceramus	19731	Holokuk River	Cady, 1955
Cretaceous	Gemuk	?	21473	Lake Creek	Hoare, 1959
Cretaceous	Gemuk	?	21474	Lake Creek	Hoare, 1959
Cretaceous	Gemuk	?	21475	Lake Creek	Hoare, 1959
Cretaceous	Gemuk	?	23166	Eek Mountains	Hoare, 1961
Cretaceous	Gemuk	?	23167	Middle Fork of Eek River	Hoare, 1959
Cretaceous	Gemuk	?	23169	Tuntunduas	Hoare, 1961
Cretaceous	Gemuk	"	23171	Mt. Oratia	Hoare, 1961

Table 11-2. (continued)

Period	Geologic Unit	Fossil	Number*	Location	Source of Information
Cretaceous	Kuskokwim Group	Inoceramus	11	Oskawalik	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus	13	Kolmakof	Cady, 1955
Cretaceous	?	Inoceramus	7823	Ophir Creek	Mertie, 1924
Cretaceous	Kuskokwim Group	Inoceramus dunveganensis	9087	Kolmakof	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus	9088	Kolmakof	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus altus	9222	Sleetmute	Cady, 1955
Cretaceous	Kuskokwim Group	Inceramus	9223	Sleetmute	Cady, 1955
Cretaceous	Kuskokwim Group	Inceramus reachensis	9225	Sleetmute	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus reachensis	9226	Georgetown Tr.	Cady, 1955
Cretaceous	Kuskokwim Group	Ostrea	9226	Georgetown Tr.	Cady, 1955
Cretaceous	Kuskokwim Group	Dicotyledonous fragments	9227	Georgetown Tr.	Cady, 1955
Cretaceous	Kuskokwim Group	Ostrea	9228	Georgetown Tr.	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus	9228	Georgetown Tr.	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus	31 AD 75, 75b	Nushgak Hills	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus	31 AD 75a	Nushagak Hills	Cady, 1955
Cretaceous	Kuskokwim Group	grass or sedge	41 ACa 123	Sleetmute	Cady, 1955
Cretaceous	Kuskokwim Group	Prunus ? seeds	41 ACa 124	Sleetmute	Cady, 1955
Cretaceous	Kuskokwim Group	Serpula	18646	Sleetmute	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus dunveganesis	18646	Sleetmute	Cady, 1955
Cretaceous	Kuskokwim Group	Pachudiscid ammonite	18646	Sleetmute	Cady, 1955
Cretaceous	Kuskokwim Group	Ostrea	18866	George River Mouth	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus dunveganensis	18866	George River Mouth	Cady, 1955
Cretaceous	Kuskokwim Group	Ammonite fragments	18866	George River Mouth	Cady, 1955
Cretaceous	Kuskokwim Group	Lepardid	18866	George River Mouth	Cady, 1955
Cretaceous	Kuskokwim Group	Cladophlebis septentrionalis	42 ACa 43	George River Mouth	Cady, 1955
Cretaceous	Kuskokwim Group	Bracheapod ?	18926	Nogamat	Cady, 1955
Cretaceous	Kuskokwim Group	Wood or bark fragments	44 ACa 23	Nogamat	Cady, 1955
Cretaceous	Kuskokwim Group	Scaphitis (imprints) ?	19386	Holukuk River	Cady, 1955
Cretaceous	Kuskokwim Group	Inceramus	19387	Holukuk River	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus athabaskensis	19389	Napaimiut	Cady, 1955
Cretaceous	Kuskokwim Group	Ostrea	19389	Napaimiut	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus	19389	Napaimiut	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus dunveganensis	19390	Kolmakof	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus athabaskensis	19390	Kilmakof	Cady, 1955
Cretaceous	Kuskokwim Group	Wood and bark fragments	44 AW 90	Kokmakof	Cady, 1955

Table 11-2. (continued)

Period	Geologic Unit	Fossil	Number*	Location	Source of Information
Cretaceous	Kuskokwim Group	Inoceramus	19391	Russian Mission	Cady, 1955
Cretaceous	Kuskokwim Group	Dicotyledonous leaf fragments	44 AW 95-104	Russian Mission	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus athabaskensis	19392	Russian Mission	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus	19393	Kolmakof	Cady, 1955
Cretaceous	Kuskokwim Group	Wood and/or bark fragments	44 AW 110	Russian Mission	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus	19394	Nogamat	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus	19395b	Nogamat	Cady, 1955
Cretaceous	Kuskokwim Group	?	19396	Nogamat	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus	19728	Kiokluk Mountains	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus	19729	Holokuk River	Cady, 1955
Cretaceous	Kuskokwim Group	Wood and/or bark fragments	45 ACa 79	Napamiut	Cady, 1955
Cretaceous	Kuskokwim Group	Ostrea	19732	Napamiut	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus dunveganensis	19732	Napamiut	Cady, 1955
Cretaceous	Kuskokwim Group	Saphites condont	19732	Napamiut	Cady, 1955
Cretaceous	Kuskokwim Group	Crustacean trails	19733	Return Creek	Cady, 1955
Cretaceous	Kuskokwim Group	Fish scales, undet.	19734	Napamiut	Cady, 1955
Cretaceous	Kuskokwim Group	Inoceramus altus	19735	Napamiut	Cady, 1955
Cretaceous	Kuskokwim Group	Ammonite fragments	19735	Napamiut	Cady, 1955
Cretaceous	Kuskokwim Group	Fish bone and scales	19735	Napamiut	Cady, 1955
Cretaceous	Kuskokwim Group	?	20715	61,000' N 159° 45' W	Hoare, 1959
Cretaceous	Kuskokwim Group	?	20716	Tuluksak River	Hoare, 1959
Cretaceous	Kuskokwim Group	?	20717	Cripple Creek	Hoare, 1959
Cretaceous	Kuskokwim Group	?	20718	Salmon Creek	Hoare, 1959
Cretaceous	Kuskokwim Group	?	21029	Tuluksak River	Hoare, 1959
Cretaceous	Kuskokwim Group	?	21030	Tuluksak River	Hoare, 1959
Cretaceous	Kuskokwim Group	?	21481	Tuluksak River	Hoare, 1959
Cretaceous	Kuskokwim Group	?	50 AHR 708	?	Hoare, 1959
Cretaceous	Kuskokwim Group	?	53 AHR 1303	Ualik Lake	Hoare, 1961
Cretaceous	Kuskokwim Group	?	53 AHR 1301	Kuluka River	Hoare, 1961

*Numbers in this column refer to the U.S.G.S. collection number, or field number as listed in professional publications. This number appears on the accompanying overlay to show approximate fossil location.

OVERLAYS, MINERALS

11-1, Leaseable Minerals: Potential Petroleum Basins, Known Coal Deposits, Potential Geothermal Locations

11-2, Metallic Minerals Occurrence

11-3, Paleontological Sites

MINERAL LAND STATUS

Generally, all withdrawals are subject to valid existing rights at the time of the withdrawals. This includes all forms of mineral entry including sand and gravel, oil and gas. In many cases, as the title to the land changes, the management of the surface and subsurface change to that agency. The authority to transfer title to the mineral estate is maintained by the BLM. In many cases this authority can be considered only custodial because we do not complete the reports or field investigation, but, instead, make a technical review of the reports made by others.

The Federal government has retained the mineral rights of some lands located within the Yukon Delta Wildlife Range. In-lieu selections near NYAC and Platinum have provided BLM with the surface management of land, where the mineral estate may belong to Calista Corporation.

The following lists the BLM responsibilities for the mineral land status classifications shown on overlay 11-4:

1. Open to metaliferous minerals - all mining or mineral locations are permissible.

2. Closed to leasing and mining - the land is withdrawn from entry by BLM regulations or by public land order. Mineral entry may be allowed on certain withdrawn lands as described below.

3. FLPMA and ANILCA withdrawals for National Wildlife Refuges - BLM has approval authority at the State Office level for mineral leasing on the National Wildlife Refuges.

4. State of Alaska Patented and Tentatively Approved Lands - BLM has responsibility for those lands where minerals have requested that their claims remain federal claims. This request is made before the final TA. The entire section, rather than just the claim boundary is excluded from state selection. BLM has surface management responsibility and is responsible for mineral patent examinations.

5. Native Patented or Interim Conveyance (or DIC'd) lands - the Natives retain both the surface and mineral estate, but BLM is required to do mineral patent examinations.

6. Alaska National Interest Lands Act (ANILCA) withdrawals for National Parks - although the National Park Service will have complete management and will do the field

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examinations, the BLM at State Office level must approve the mineral patent examinations and the areas open to metaliferous minerals.

CHAPTER 12

FOREST PRODUCTS

F O R E S T P R O D U C T S

INTRODUCTION

Forests cover approximately 8 million acres of the 12 million acres of BLM lands in the Southwest Planning Area. The remaining 4 million acres are covered by non-forest vegetation communities - tundra, brush, and muskeg bogs. The major forest communities are lowland spruce-hardwood, upland spruce-hardwood and bottomland spruce-poplar. These, combined with non-forest communities, are presented in table 12-1 in acreages per major block of BLM land. More than half of the forested lands occur in blocks numbers 3 through 6 (overlay 10-1), with most of the land covered by lowland spruce-hardwood followed by upland spruce-hardwood and bottomland spruce-poplar communities (see vegetation overlay 4-1).

Table 12-1. Major Forest Types (Acres X 1,000) on BLM Lands Within the Southwest Planning Area in Alaska

MAJOR BLOCKS OF BLM LAND

Forest Types	B-1	%	%	B-2	%	%	B-3	%	%	B-4	%	%	B-5	%	%	B-6	%	%	Total
Lowland Spruce-Hardwood				23	5.4	.7	658	15.9	20.8	1,178	31.8	37.2	589	32.1	28.1	416	44.9	13.2	3,164
Upland Spruce-Hardwood							2,270	54.9	54.7	974	26.4	23.5	583	21.0	14.0	322	34.8	7.8	4,149
Poplar Spruce-Hardwood							41	1.0	12.9	63	1.7	20.0	187	6.8	59.8	23	2.5	7.3	316
Brush or Barren Land	312	100	0.7	406	94.6	8.7	1,166	28.2	25.1	1,485	40.1	32.0	1,112	40.1	23.9	165	17.8	3.6	4,646
Total	312	100	2.5	429	100	3.5	4,132	100	33.7	3,700	100	30.2	2,773	100	22.6	926	100	7.5	12,272

1/ Bureau of Land Management Land consist of six major blocks within the Southwest Planning Area and are intermixed with State, Native and other public lands.

2/ % = The percentage of that block which is in that vegetation type.

3/ % = The percentage of that vegetation type occurring in this block.

FOREST COMMUNITIES

LOWLAND SPRUCE-HARDWOOD

Black spruce is the dominate species in this community and is intermixed with tamarack, paper birch, quaking aspen, and balsam poplar. This community occurs in intermontane basins and lowlands and occupies shallow peat bogs, outwash plains, alluvial fans and north slopes (Vierick and Little, 1972). This community has little commercial value because black spruce is slow-growing on cold acidic soils (Eyre, 1968) and seldom exceeds eight inches in diameter or 50 feet in height.

UPLAND SPRUCE-HARDWOOD

White and black spruce intermixed with scattered paper birch and quaking aspen characterize this community. White spruce is found with birch and aspen on moderate south-facing slopes, while black spruce grows on northern exposures and poorly drained flat areas. White spruce heights range from 30 to 70 feet with diameters up to 16 inches. Aspen and birch range in height from 20 to 60 feet with diameters from three to 12 inches. Black spruce is similar in size to those found in the

lowland spruce hardwoods. The commercial value of this community is variable depending on stand characteristics, access, and demand.

BOTTOMLAND SPRUCE-POPLAR

Tall stands of white spruce and balsam poplar with understories of high and low shrubs comprise this community. These relatively dense stands of white spruce and poplar occur on broad level floodplains, low river terraces, and deeply thawed south slopes. White spruce and balsam poplar range from 30 to 100 feet in height and 15 to 24 inches in diameter with the largest trees occurring on more favorable sites. Balsam poplar and birch usually replace white spruce at maturity. This community has the highest commercial value due to its high productivity and accessible location along the major rivers, which are the only access and transportion routes for timber operations.

TIMBER PRODUCTION

Estimating total timber volumes and annual production in all forest communities on BLM lands would be difficult since intensive inventories have not been done on BLM lands. Intensive inventories have been conducted in the Kuskokwim River

valley and adjacent uplands as part of a state-wide reconnaissance inventory conducted from 1957 to 1962 (Hutchinson, 1967). The Kuskokwim inventory, however, includes primarily Native selected lands with little if any BLM land included in the survey. State-wide inventories, although not specific to BLM lands, did encompass BLM land, therefore, volume and production estimates applying to the interior state wide and Kuskokwim surveys can be applied, to a degree, on BLM lands. State wide forest survey data indicate that the commercial forests of interior Alaska have an average raw timber volume of 1,500 board feet per acre with saw timber acreages averaging 3,270 board feet per acre (Hutchinson, 1967). (Commercial forest land is defined as areas producing 20 cubic feet or more annually.) On the more productive sites such as the Kuskokwim River valley, volume averages around 4,400 board feet per acre with averages of 1,200 feet and 6,700 feet for hardwood and softwood types respectively (Hegg, and Sieverding, 1979).

Most BLM land is covered by lowland and upland spruce hardwood communities which comprise 34 and 26 percent of these lands (table 12-2). The lowland spruce hardwood community is dominated by black spruce, with timber volumes ranging from 0 to 799 cubic feet per acre, and with an average of 300 cubic feet per acre. This is considered to be inoperable noncommercial

forest (Hegg and Sieverding, 1979). (Inoperable noncommercial forest land is defined as areas supportin a gross volume of less than 800 cubic feet per acre.) The upland type is more variable, with more commercial species of adequate size such as white spruce and birch.

Extensive commercial white spruce stands occur in the upland along the Kuskokwim and Lower Yukon Rivers (Hegg and Sieverding, 1979). The extent and production of these commercial stands occurring on BLM lands is not well defined, but production would probably be considerably less than the 4,400 board feet per acre average estimated for the Kuskokwim River bottoms, since upland sites are usually less productive. Intensive inventory of forest resources on BLM lands will be required before any accurate estimate of total timber volumes and production can be made.

FOREST INSECT AND DISEASE CONDITIONS

Insect and disease damage in the Southwest Planning Area is minimal. Insect damage by spruce beetles (*Densroctomis rufipennis*) has been noted on 2,300 acres near Devil's Elbow on the Kuskokwim River. Scattered light infestations of eastern larch beetles (*Dendroctonus simplex*) were found near Anvik on the Yukon River and could spread in the next few

years (U.S. Department of Agriculture Forest Service, 1979). According to present land status, neither of these occurrences are on BLM lands and are not expected to have any significant effect on timber resources.

FOREST USES

TIMBER PRODUCTS

Historically forests in the resource area were used for shelter and fuel. Early settlers and miners seeking gold used wood products for heat and logs for cabins and mine timbers. Fuel wood was used for boilers on river steamers traveling the major tributaries (Hegg and Sieverding, 1979). Today the forests are used essentially for the same products except for boiler fuels. Firewood is still used for heating, although demand is declining due to increasing use of fuel oil for heating. Other primary uses include house logs, poles for drying racks and fish wheels, and unfinished lumber for various local forms of construction (Hegg and Sieverding, 1979).

Within the Southwest Planning Area there are approximately a dozen sawmills in operation whose primary products are three-sided home logs and lumber. These mills have an estimated daily capacity of 5,000 board feet with an annual capacity of

one million board feet (U.S. Department of Agriculture Forest Service, 1978). Timber sources of these sawmills have come from BLM lands or lands under interim management by BLM. Bureau of Land Management files to date show timber sales of approximately 1,300,000 board feet from the Kuskokwim drainage. A recent study indicates the total annual local demand along the middle Yukon and upper Kuskokwim Rivers to be about 2,000,000 board feet (Koweluk, 1970). It is doubtful that BLM lands remaining after settlement of land selections and conveyances could satisfy this demand.

The major market for these wood products is local difficult access, low demand, and high transporation costs are the major impediments to an expanding forest product industry. In 1963, an Alaskan corporation applied for purchase of 715 million board feet in the Kuskokwim Valley to be harvested over a 20 year period. The application was turned down because it was felt the area could not sustain a cut of this magnitude. Timber sales of this size probably would not occur on BLM lands due to limited access and low productive potential of these forest lands.

SUBSISTENCE

Forest products are an integral part of a subsistence livelihood in the planning area. Raw materials for heat, shelter and various forms of local construction (i.e., fish wheel, drying racks, etc.) are the major subsistence uses derived from forest products. The amount and extent of use of these products is not well known. McGrath Resource Area records from 1974 through 1978 show permits were issued for approximately 169 cords of wood, 1,700 house logs and 350,000 board feet of lumber. Most of the house logs and all the lumber were cut and processed by local commercial sawmills. It is doubtful that the permits issued for firewood cutting reflect the actual amounts being used throughout the resource area even when considering the increasing use of fuel oil as a source of heat.

Most wood products used for subsistence have come from state and Native selected lands near population centers along the major tributaries. These areas are more accessible and provide more high quality timber than most BLM lands. These lands are or have been under interim management by the BLM. As management of these lands is shifted to state and Native organizations, less subsistence use on BLM managed lands is

expected to occur. If the population along the major tributaries in the region increases substantially, subsistence use of public lands could increase in the distant future.

OVERLAYS, FOREST PRODUCTS

See Vegetation Overlay 4-1

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FOREST PRODUCTS

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F O R E S T P R O D U C T S
O P P O R T U N I T I E S

Management opportunities for sustained yields of forest products are not well defined due to lack of inventory data. Approximately 500,000 acres have been identified as having good suitability for timber production (Soil Suitabilities, overlay 14-1). However, many of these areas are marginal for commercial forest operations.

The areas of highest potential as indicated by the Kuskokwim and Yukon River inventories lie in the floodplains of major rivers in each major block of BLM land. In these inventories, the exact amounts of BLM land covered within the boundaries of the inventory area and the location, quantity and quality of timber occurring on these lands were not delineated. Until these lands are adequately inventoried, no area-wide, realistic management plan can be developed. Therefore, the major opportunity for the future is a comprehensive inventory, conducted at a level that would assure a data base adequate to develop the timber resource to its potential.

Low present demand and uncertain future demands for forest products and transportation problems, linked to the remoteness of the area, also have a definite effect on management emphasis and opportunities. Present demand is confined to the local area in the vicinity of population centers. This demand is satisfied through timber harvests on Native, State, and Federal lands (BLM files). Timber is being cut on BLM lands but in small quantities compared to what potential harvests could be if demand increases from outside sources. If demand were to increase substantially, more intensive management of timber resources would be advisable to maintain sustained yields of forest products. How much of this timber would come from BLM lands will depend on land ownership distribution, access and timber quality. Generally, if commercial timber operations increase, the highest quality timber which is accessible and near major rivers will receive harvest priority (most of these type timber resources occur on Native or State lands). Timber resources falling into this category that are on BLM land can only be identified through inventory. Until inventories are conducted, all harvest operations will have to be conducted on a case-by-case basis without a complete understanding of their potential effects on future management of the entire timber resource on BLM lands.

CHAPTER 13

RANGE

R A N G E

INTRODUCTION

Cold winters, snow-covered ground, and the relatively high potential for predation make year-round livestock grazing generally impractical in the planning area.

Because of the short season (about 3 or 4 months) when grazing could occur, the high transportation costs to market, the lack of base ranches, and the abundance of predators, summer grazing has limited feasibility.

Soil suitability for both cattle/sheep and reindeer grazing is presented on overlay 14-1, "Soil Suitability." This information is presented as the approximate percentage of soils mapped that are rated as "good" for potential support of grazing.

The vegetation types offering grazing potential for livestock are upland spruce-hardwood, high brush, moist tundra, wet tundra, and alpine tundra (vegetation overlay 4-1). Using a stand condition/productivity matrix, the U.S. Forest Service Resource Planning Team has figured an average for forage production for the different vegetation types at different levels of productivity and stand condition on a state wide basis. These averages are shown in tables 13-1 through 13-8. Joan Foote of the Institute of Northern Forestry, Fairbanks, Alaska, has made estimates of annual production usable by the animal type most likely to dominate each resource unit. These values are shown in parentheses on each chart. No corresponding nutritive value for this forage has been determined. The University of Alaska experiment station at Palmer currently has such studies in progress.

LAND USE

LIVESTOCK

There has not been any grazing of domestic livestock within the area, and no applications for grazing permits have been received. It is probable though that homesteaders have some livestock on their own land. In the current literature there

Table 13-1. Statewide Average Forage Production.
Bottomland Spruce-Poplar Forest.

C \ P	HIGH	MOD. HIGH	MOD. LOW	LOW
NON-STOCK	X	X	(2,000 lb/ac)	(1,000 lb/ac)
SEED SAPLING	X	X	(180 lb/ac ⟶)	
POLE	X	X	(←50 ⟷ 140 lb/ac)	
SAW TIMBER	X	X	50-85 cfa (←50-75 lb/ac→)	50 cfa
TOTAL % AREA	0	0	2	98

C = Condition of site
P = Productivity
c.f.a. = Cubic feet per acre
( ) = Indicates amount of forage usable by native animals
X = Figure not estimated

Table 13-2. Statewide Average Forage Production.
Upland Spruce-Hardwood Forest.

C \ P	HIGH	MOD. HIGH	MOD. LOW	LOW
NON-STOCK	X	X	X	(<1,200 lb/ac)
SEED SAPLING	X	X	X	(50-180 lb/ac)
POLE	X	X	X	(180 lb/ac)
SAW TIMBER	X	X	X	<50 cfa (<100 lb/ac)
TOTAL % AREA	0	0	0	100

C = Condition of site
P = Productivity
c.f.a. = Cubic feet per acre
( ) = Indicates amount of forage usable by native animals
X = Figure not estimated

Table 13-3. Statewide Average Forage Production.
Lowland Spruce-Hardwood Forest
(Open Low Growing Spruce Forest).

C \ P	HIGH	MOD. HIGH	MOD. LOW	LOW
NON-STOCK	X	X	X	(<750 lb/ac)
SEED SAPLING	X	X	X	(50-150 lb/ac)
POLE	X	X	X	(50-125 lb/ac)
SAW TIMBER	X	X	X	< 20 cfa (<100 lb/ac)
TOTAL % AREA	0	0	0	100

C = Condition of site
P = Productivity
c.f.a. = Cubic feet per acre
( ) = Indicates amount of forage usable by native animals
X = Figure not estimated

Table 13-4. Statewide Average Forage Production.
High Brush (Shrub Thickets).

C \ P	HIGH	MOD. HIGH	MOD. LOW	LOW
GOOD	2,500 lb/ac (1,000 lb/ac)	1,920 lb/ac (1,150 lb/ac)	1,335 lb/ac (750 lb/ac)	750 lb/ac (375 lb/ac)
FAIR	2,000 lb/ac (700 lb/ac)	1,480 lb/ac (740 lb/ac)	965 lb/ac (390 lb/ac)	450 lb/ac (300 lb/ac)
POOR	1,500 lb/ac (300 lb/ac)	1,050 lb/ac (420 lb/ac)	600 lb/ac (180 lb/ac)	150 lb/ac (45 lb/ac)
VERY POOR	X	X	X	X
TOTAL % AREA	(Figures not available)			

C = Condition of site
P = Productivity
( ) = Indicates amount of forage usable by native animals
X = Figure not estimated

Table 13-5. Statewide Average Forage Production.
Moist Tundra (Except Aleutians).

C \ P	HIGH	MOD. HIGH	MOD. LOW	LOW
GOOD	2,000 lb/ac (1,400 lb/ac)	1,500 lb/ac (1,120 lb/ac)	1,000 lb/ac (700 lb/ac)	500 lb/ac (350 lb/ac)
FAIR	1,200 lb/ac (720 lb/ac)	1,050 lb/ac (630 lb/ac)	700 lb/ac (420 lb/ac)	350 lb/ac (210 lb/ac)
POOR	800 lb/ac (400 lb/ac)	600 lb/ac (300 lb/ac)	400 lb/ac (200 lb/ac)	200 lb/ac (100 lb/ac)
VERY POOR	200 lb/ac X	150 lb/ac (60 lb/ac)	100 lb/ac X	50 lb/ac X
TOTAL % AREA	(Figures not available)			

C = Condition of site
P = Productivity
( ) = Indicates amount of forage usable by native animals
X = Figure not estimated

Table 13-6. Statewide Average Forage Production.
Wet Tundra.

C \ P	HIGH	MOD. HIGH	MOD. LOW	LOW
GOOD	1,200 lb/ac (960 lb/ac)	970 lb/ac (775 lb/ac)	735 lb/ac (550 lb/ac)	500 lb/ac (400 lb/ac)
FAIR	X	X	600 lb/ac (420 lb/ac)	X
POOR	X	X	X	X
VERY POOR	X	X	X	X
TOTAL % AREA	25	25	25	25

C = Condition of site
P = Productivity
( ) = Indicates amount of forage usable by native animals
X = Figure not estimated

Table 13-7. Statewide Average Forage Production.
Alpine Tundra (Except Aleutians)

C \ P	HIGH	MOD. HIGH	MOD. LOW	LOW
GOOD	1,000 lb/ac (700 lb/ac)	750 lb/ac (450 lb/ac)	100-300 (150 lb/ac)	0-50 lb/ac (0-25 lb/ac)
FAIR	500 lb/ac (300 lb/ac)	250 lb/ac (125 lb/ac)	0 lb/ac (0 lb/ac)	X
POOR	X	X	X	X
VERY POOR	X	X	X	X
TOTAL % AREA	(Figures not available)			30

C = Condition of site
P = Productivity
( ) = Indicates amount of forage usable by native animals
X = Figure not estimated

Table 13-8. Statewide Average Forage Production.
Muskeg-Bog (Low Brush, Muskeg-Bog).

C \ P	HIGH	MOD. HIGH	MOD. LOW	LOW
GOOD	800 lb/ac (160 lb/ac)	550 lb/ac (110 lb/ac)	300 lb/ac (60 lb/ac)	50 lb/ac (10 lb/ac)
FAIR	X	X	X	X
POOR	X	X	X	X
VERY POOR	X	X	X	X
TOTAL % AREA	(Figures not available)			

C = Condition of site
P = Productivity
( ) = Indicates amount of forage usable by native animals
X = Figure not estimated

is a shortage of information about the use and potential use of subarctic ranges for domestic livestock grazing.

REINDEER

In the past, reindeer have occupied coastal regions from the Arctic Coastal Plain to the Alaska Peninsula, with a few scattered herds in the interior. In 1926, the herds ranged throughout what we now call the Goodnews, Nyak, and Nulato Hills blocks. By 1966, the range in the planning area was confined to the Unalakleet and coastal area near St. Michael in the Nulato Hills block.

In 1962, Reindeer Grazing Permit F-030400 (R-7008) was issued to Stebbins Community Association Herd of Stebbins, Alaska. Their permit expired January 1, 1972, and was for 5,000 head or less on 736,000 acres. This area falls just west of the Nulato Hills block about the village of Stebbins. In 1978, interest was again expressed by the Stebbins Community Association for grazing lands west of the planning block. Their application was returned because of tenuous land status.

Reindeer grazing has not occurred on these planning blocks for at least 15 years and no applications have been recently filed.

OVERLAYS, RANGE
Soils 14-1
Vegetation 4-1

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RANGE OPPORTUNITIES

INTRODUCTION

Due to the lack of existing quantifiable range resource information, the range opportunities presented are speculative.

DOMESTIC LIVESTOCK

Because of the remoteness from markets, the harsh climatic conditions and the abundance of predators, opportunities for livestock grazing are based solely on soil types.

UNALAKLEET BLOCK

No soil units with greater than 20 percent good suitability for cattle and sheep grazing lands are identified for the Unalakleet planning block. Small tracts of suitable lands for these uses may be located in this planning block specially

along drainages and on terraces. If public demand warrants the identification of such lands may be accomplished through inventory and proper utilization of the soil resource insured by the development of specific land use plans.

NYAC BLOCK

No soil units with greater than 20 percent good suitability for cattle and sheep grazing lands are identified in the NYAC block. Small tracts of suitable lands may be found within this block along drainage ways. An opportunity exists if public demand warrants to identify location of suitable grazing lands.

ANVIK BLOCK

No soil units are identified which have greater than 20 percent good suitability for cattle and sheep grazing lands. Small areas of suitable soils may be found. Within this unit expecially along drainages.

An opportunity exists where public demand warrants to identify location and condition of suitable soils for grazing.

SLEETMUTE BLOCK

No soil unit had been identified as having greater than 20 percent potential for cattle or sheep grazing. Small tracks may be located within this block along drainages. An opportunity exists to identify suitable soils and the carrying capacity for livestock where a demand is identified.

LIME HILLS BLOCK

Approximately 23,000 acres of potential cattle and sheep grazing lands are located near Why Lake, Lone Lake, Can Creek, Little Underhill Creek and Trout Lake in the southern half of the upper Kuskokwim sub-unit. The suitable lands in the Why Lake, Lone Lake, Can Creek and Little Underhill Creek areas occur on hilly moraines and comprise from 20 to 40 percent of the 140,000 acre IQ17 soil mapping unit. The suitable lands in the Trout Lake area are located on high alpine slopes and comprise up to 40 percent of the 23,000 acre IU3 soil mapping unit.

An opportunity exists to identify the location, condition, and carrying capacity of the suitable lands and make those lands available for grazing.

REINDEER

Reindeer range is generally considered the same as caribou range. We can, therefore, suggest potential reindeer range by delineating current and historic caribou range. Virtually all Bureau administered lands within the planning area lie within past or current caribou range. Research should be initiated to determine the carrying capacity for reindeer on the Bureau administered blocks. Additionally, the impact of a reindeer grazing industry on resident caribou herds should be evaluated.

UNALAKLEET BLOCK

Approximately 837,000 acres are identified as having good suitability within the Unalakleet planning block for reindeer grazing. These lands are located on most landforms except those covered by dense timber within the one million acre IU2, IU3, IQ2, IO11, and IQ16 soil mapping units.

An opportunity exists to identify areas of grazing potential for domestic herds.

ANVIK BLOCK

Approximately 850,000 acres are identified as having good suitability for reindeer grazing in the Anvik block. These lands are located on most landforms within the 1.75 million acre IU2, IQ13, IU3, IQ6, IQ10, and IQ13 soil units.

An opportunity exits to identify and inventory suitable lands and access grazing potential where public demands warrant.

SLEETMUTE BLOCK

Roughly 16 million acres of the Sleetmute block has good suitability for reindeer grazing. Most landforms except those covered by dense timber have good potential. The 1.6 million acres are located with the 2.5 million acre IQ2, IQ6, IQ8, and IQ19 soil units.

An opportunity exists to identify and inventory suitable grazing lands where public demand warrants.

LIME VILLAGE BLOCK

A large percentage of lands within this block have good capability for reindeer grazing. Those areas identified as having the greatest potential are located on a wide range of land

forms with soil units IQ2, IQ15, with 85 percent good suitability; IQ6, IQ14, and IQ26 with 75 percent good suitability; and IU3, IQ13, IQ19, and IQ17 with 50 percent good suitability. In total approximately 900,000 acres in the 1.7 million acre planning block has good suitability for reindeer grazing.

An opporutnity to identify and inventory suitable lands, access carrying capacity and range condition exists.

MINCHUMINA BLOCK

Roughly 480,000 acres have been identified as having good suitability for reindeer grazing lands within the Minchumina planning block. These lands are located on most landforms except those covered in dense timber in the 770,000 acre IQ2, IQ6, IQ13, IQ18, IU3, and IL6 soil mapping units.

An opportunity exists to access the grazing potential of these lands.

CHAPTER 14

SOILS AND WATERSHED

SOILS AND WATERSHED

SOILS

INTRODUCTION

Soil in its natural setting is an expression of the physical environment on which it is developed. The physical character of a soil, its ability to support varied uses, and its sensitivity to detrimental impacts are controlled by the history of its development, and the interaction between the soil and its environment. Since soils are an expression of their physical environment, a study of the soil will aid in evaluating the capabilities and limitations of specific land areas. The soil overlay developed for URA III and IV displays the results of an evaluation of soil capabilities for the planning area. This analysis was based on the Exploratory Soil Survey of Alaska, USDA-SCS, 1979, a document which updates the information used in URA Step II.

Interpretations developed by the Soil Conservation Service have been used to identify those soil units within the planning area having good potential for commercial grazing of cattle and sheep and reindeer, for cropland production, and for forestry.

SCS's evaluations are based largely on soil properties and related factors but do not necessarily identify areas where socioeconomic conditions warrant an increase in management emphasis. The interpretations were designed to be used for broad land use planning in estimating the effects of a specific land use on soil and the environment in general.

The exploratory soil survey from which the evaluations were drawn is not a detailed survey, and therefore does not precisely define the location of specific soils or a soil's range of properties and characteristics. Because the survey identifies areas where "associations" of soils are located, it is not possible to identify the ground location of individual soil "types" except through further survey work. The term "association" is used to describe the grouping of specific soil types likely to be found in a geographic area. In a soil association the major soils of a geographic region such as the foothills of the Alaska Range are identified as well as those soils located along active flood plains, valleys, and along

ridge crests. Evaluations for specific land uses are based on each soil type within an association but a single value has been assigned to the soil association as a whole.

METHOD OF DEVELOPING EVALUATIONS

To develop this single value each mapping association individual soil component's suitability rating was examined.

The percentage of a mapping unit's components with good suitability controlled the classification it received on the URA III overlay. Mapping units with 20 to 50 percent good suitability and those with greater than 50 percent good suitability are grouped for each specific land use and the location of the unit is displayed on the overlay. For our purposes those soil components identified as having "fair" suitability also contributed by allocating one half of their percentage to the "good" category.

By the use of this weighted mean approach it was possible to display on a single overlay the relative potential of a mapping unit for common crops, cattle and sheep grazing, reindeer grazing, and commercial forestry (see overlay 14-1).

It is important to recognize the limitations of this effort. The overlay does not identify the specific locations of those soils with good, fair, poor or unsuitable capabilities. Its intention is only to "flag" those geographic area which may present management opportunities for specific land uses. The overlay does not identify small areas of good potential unless more than 20 percent of the soil association has good value. Thus, small tracts which may have good potential and favorable socioeconomic conditions are not recognized, while large tracts with less favorable socioeconomic conditions may be.

Finally, not all specialists would agree with the ratings that SCS has applied but within the context of the exploratory nature of the survey and the regional perspective of this planning effort the overlay does have value in "flagging" geographic regions for a more detailed future evaluation.

OVERLAYS, SOILS
14-1 Soils Suitability

S O I L S O P P O R T U N I T I E S

INTRODUCTION

SUITABILITY FOR COMMON CROPS

The potential suitability for farming of each identified soil, or map unit component, is estimated for the principal crops grown in Alaska -- barley, oats, grasses for hay and silage, and potatoes. Although only these crops were used, it is assumed that the ratings are also valid for vegetables and other crops suited to Alaskan soils. Soils were rated as good, fair, poor, or unsuited. The criteria for good and fair ratings follow:

Good:

Soil or climatic limitations, if any, are easily overcome, and all of the common Alaskan crops can be grown under ordinary management practices. On soils of this group:

1. Loamy texture extends to a depth of at least 18 inches (45 cm).

2. Crop growth is not impeded by excessive soil moisture during the growing season.

3. Damage by flooding occurs no more frequently than one year in ten.

4. Slopes are predominantly less than seven percent.

5. Periods of soil moisture deficiency are rare, or irrigation is economically feasible.

6. Damage to crops as a result of early frost can be expected no more frequently than two years in ten.

7. The hazard of wind erosion is estimated to be slight.

Fair:

Soil or climate limitations need to be recognized but can be overcome. Common crops can be grown, but careful management and special practices may be required. On soils of this group:

1. Loamy texture extends to a depth of at least 10 inches (25 cm).

2. Periods of excessive soil moisture, which can impede crop growth during the growing season, do not exceed a total of two weeks.

3. Damage by flooding occurs no more frequently than two years in ten.

4. Slopes are predominantly less than 12 percent.

5. Periods of soil moisture deficiency are infrequent.

6. Damage to crops as a result of early frost can be expected no more frequently than three years in ten.

7. There is no more than a moderate hazard of wind erosion.

SUITABILITY FOR RANGE FOR CATTLE AND SHEEP

Ratings of soils for rangeland are based on characteristics of both soils and the natural vegetation. In many areas, grazing land could be created by clearing the natural forest, but this is not considered in the ratings. Soils covered by tundra vegetation or forests with little or no grass in the understory are considered unsuitable. Soils which support only a sparse or slow-growing grassy vegetation or which are in areas with very short growing seasons have only limited usefulness for grazing. The most important adverse soil characteristics are poor drainage and wet conditions during much or all of the grazing season. A few sandy soils have slow growth rates because of droughtiness. The soils were rated good and fair on the following basis:

Good:

The natural vegetation is predominantly grasses and palatable forbs. Cattle or sheep can graze most of the year.

Fair:

The natural vegetation includes grasses and palatable forbs, but either it provides grazing for only relatively short periods or the vegetation is dominated by unpalatable species.

Soils that support palatable species but that are excessively wet during part of the growing season are included in this rating.

SUITABILITY FOR RANGE FOR REINDEER

Reindeer subsist on a wide variety of plants, including sedges, grasses, forbs, mushrooms, and low tundra shrubs, especially willows. In winter they have the ability to survive on lichens and plants that are preserved under the snow in green condition. They are primarily tundra (including alpine tundra) animals, but in winter they commonly migrate to the forested or shrub-covered regions adjacent to the tundra. Because plants in tundra or tundra-fringe areas are slow-growing, reindeer herds require large grazing areas. It is likely that between 200 and 300 acres (80 to 120 hectares) must be available per animal for sustained use over long periods.

Very large sections of Southwest Alaska are suitable for reindeer grazing. The prinicipal limiting factors are a low proportion of suitable plants, as in forests dominated by coniferous trees and some sparsely vegetated alpine tundras, and very slow growth rates on droughty excessively steep

soils. All soils are evaluated in terms of suitability for reindeer range, but these ratings should not be construed as a recommendation that commercial reindeer herds replace caribou.

Soils are rated for reindeer range on the following basis:

Good:

The natural vegetation includes a high proportion of plants suitable for either summer or winter grazing by reindeer.

Fair:

The natural vegetation includes plants suitable for use by reindeer, but the total availability of such plants is significantly less than that of typical arctic tundra.

COMMERCIAL FORESTRY

The principal soil factors that diversely affect the growth of commercial tree species are excessive wetness and droughtiness. Noncommercial black spruce forests occupy many poorly drained mineral soils and some organic soils in the interior and the Cook Inlet-Susitna lowland, but large areas of these soils have only low-growing vegetation. Growth rates are

reduced by persistent droughtiness on only a few sandy soils on dunes in interior Alaska, but occasional prolonged dry spells affect growth on all soils in the interior.

The following ratings of soil suitability for commercial forestry are based on soil features that affect potential yields and harvesting with modern equipment:

Good:

Soil or climatic limitations do not restrict the growth of suitable commercial species or the use of modern harvesting equipment.

Fair:

Soil or climatic limitations moderately reduce the growth rate of suitable commercial species or require unusual harvesting operations.

W A T E R S H E D

INTRODUCTION

Hard data on streams in the area are sparse, and virtually non-existant for the Unalakleet drainage. Table 14-1 lists the records that are available through the U.S.G.S. for the Lower Yukon and Kuskokwim basins. Estimated average runoff (table 14-2) and sediment loads (table 14-3) for Alaska streams is presented for comparison. Recommended quality criteria for public water supplies are given in table 14-4, and state quality criteria for various water resource activities are given in table 14-5.

UNALAKLEET BASIN

Use of water resources in the area is limited almost entirely to nonconsumptive recreation and navigation and domestic consumptive. There is a small agricultural demand for a herd

Table 14-1 - Index of streamflow and water-quality records - Yukon Basin, Alaska --

a - approximately; C - Crest-stage; D - Daily; G - Gage heights and/or streamflow data; L - Low flow; S - Seasonal or fragmentary

Station identification	Name	Location		Drainage area (square miles)	Streamflow		Water-Quality			
		Latitude	Longitude		Continuous record	Partial record	Chemical	Water temperature	Sediment	Biological
623930160112000	Yukon River at Anvik	62°39'30"	160°11'20"				1915-16 D			
15565235	Ophir Creek near Takotna	63°08'42"	156°31'15"	6.19	1975-		1976			
15565300	Innoko River at Shageluk	62°40'50"	159°33'45"				1956			
15565447	Yukon River at Pilot Station	61°56'04"	162°52'50"	a321000	1975-		1954 D; 55-56; 75-	1976-	1975-	1975-
15565450	Andreafsky River at St. Marys	62°03'05"	163°10'00"				1954			
620505163434500	Yukon River at Mountain Village	62°05'05"	163°43'45"				1954 D; 55-56; 58-59			
624330164122000	Yukon River at New Kwiguk	62°43'30"	164°12'20"				1970			
624120164361500	Yukon River at Alakanuk	62°41'20"	164°36'15"				1972			

TABLE 14-2

AVERAGE ANNUAL STREAM RUNOFF
IN cfs per square mile OF ALASKA BY AREA

REGION	AREA OR SUBREGION	Surface Water runoff in cfs per sq. mi. Maximum	Mean	Minimum
Arctic	West Arctic	25-50	.5-1	0
	Colville	25-50	.5-2	0
	East Arctic	25-50	.5-2	0
Northwest	Kotzebue Sound	20-25	.5-1	0-.1
	Norton Sound	10-25	.5-2	0-.1
Yukon	Lower Yukon	8-10	.5-1	.1-.3
	Central Yukon	8-10	.5-1	.1-.3
	Koyukuk	10-25	.5-1	0-.1
	Upper Yukon-North	10-50	.5-1	0-.1
	Tanana	10-50	.5-4	.1-.3
	Upper Yukon-Canada	10-25	.5-4	.1-.3
Southwest	Kuskokwim Bay	10-25	1-2	.3-1
	Bristol Bay	10-50	2-4	.5-1
	Aleutian	25-50	2-4	1-2
Southcentral	Cook Inlet	10-50	1-8	.3-1
	Gulf of Alaska	25-100	1-12	.2-1
	Kodiak-Shelikof	50-100	4-8	1-2
Southeast		50-100	4-30	.3-10

TABLE 14-3

ESTIMATED SUSPENDED SEDIMENT LOADS AND YIELDS AT

SELECTED POINTS ON ALASKAN RIVERS

STATION NAME	Drainage Area	Glaciers % of area	Yrs. of Record	Millions of tons per yr.	Tons per sq. mi.
Chamberlin Creek	1.46	64%	1	.0015	1,000
Chena R. nr. Fairbanks	1,980	0%	8	.406	200
Chilkat R. nr. Klukwan	760	?	1	9.3	12,000
Colville R.	19,300	?	1	6.4	300
Copper R. nr. Chitina	20,600	13%	3	72.2	3,500
Eagle R. nr. Eagle R.	192	12-14%	2	.585	3,000
Knik R. nr. Palmer	1,180	54%	5	7.84	6,600
Kobuk R. at Ambler	6,570	0%	3	.4	60
Koyukuk R. at Hughes	18,700	0%	5	1.0	50
Kuskokwim R. at Crooked Creek	31,000	1%	4	9.0	300
Kuzitrin R. nr. Nome	1,720	0%	4	.07	40
Matanuska R. nr. Palmer	2,070	13%	8	7.01	3,400
Nenana R. nr. Healy	1,910	4%	15	3.29	1,700
Ogoturok Cr. nr. Pt. Hope	35	0%	1	.002	60
Speel R. nr. Juneau	226	26%	1	1.08	4,800
Susitna R. nr. Gold Creek	6,160	5%	1	10.6	1,700
Tanana R. nr. Tanacross	8,550	1%	11	9.39	1,100
Yukon R. at Eagle	113,500	3%	5	30.7	270
Yukon R. at Ruby	259,000	1%	3	70	300

Table 14-4.--*Recommended quality criteria for public water supplies (after Environmental Protection Agency, 1972)*

Chemical constituent	Maximum concentration in mg/l
Chloride	250
Iron (dissolved)	.3
Manganese	.05
Nitrate	10
Sulfate	250

Table 14-5. Water quality criteria for waters of the State of Alaska (from Alaska Administrative Code, title 18, Environmental Conservation, chapter 70, section 02)

Water uses \ Water quality parameters	(1) Total coliform organisms	(2) Dissolved oxygen, mg/l or percent saturation	(3) pH	(4) Turbidity, measured in Jackson Turbidity Units (JTU)	(5) Temperature, as measured in degrees Fahrenheit (°F)	(6) Dissolved inorganic substances
A. Water supply, drinking, culinary and food processing without the need for treatment other than simple disinfection and simple removal of naturally present impurities.	Mean of 5 or more samples in any month may not exceed 50 per 100 ml, except ground water shall contain zero per 100 ml.	Greater than 75 percent saturation or 5 mg/l.	Between 6.5 and 8.5	Less than 5 JTU	Below 60°F	Total dissolved solids from all sources may not exceed 500 mg/l.
B. Water supply, drinking, culinary and food processing with the need for treatment equal to coagulation, sedimentation, filtration, disinfection and any other treatment processes necessary to remove naturally present impurities.	Mean of 5 or more samples in any month may not exceed 1000 per 100 ml, and not more than 20 percent of samples during one month may exceed 2400 per 100 ml, except ground water shall contain zero per 100 ml.	Greater than 60 percent saturation or 5 mg/l.	Between 6.5 and 8.5	Less than 5 JTU above natural conditions.	Below 60°F	Numerical value is inapplicable.
C. Water contact recreation	Same as B-1	Greater than 5 mg/l.	Between 6.5 and 8.5	Below 25 JTU except when natural conditions exceed this figure; effluents may not increase the turbidity.	Numerical value is inapplicable.	Numerical value is inapplicable.
D. Growth and propagation of fish and other aquatic life, including waterfowl and furbearers.	Same as B-1 to protect associated recreational values.	Greater than 6 mg/l in salt water and greater than 7 mg/l in fresh water.	Between 7.5 and 8.5 for salt water. Between 6.5 and 8.5 for fresh water.	Less than 25 JTU when attributable to solids which result from other than natural origin.	May not exceed natural temperature by more than 2°F for salt water. May not exceed natural temperature by more than 4°F for fresh water. No change shall be permitted for temperature over 60°F. Maximum rate of change permitted is 0.5°F per hour.	Within ranges to avoid chronic toxicity or significant ecological change.
E. Shellfish growth and propagation, including natural and commerical growing areas.	Not to exceed limits specified in "National Shellfish Sanitation Program Manual of Operations." 1/	Greater than 6 mg/l in larval stage. Greater than 5 mg/l in the adult stage.	Between 7.5 and 8.5	Same as D-4.	Less than 68°F	Within ranges to avoid chronic toxicity or significant ecological change.
F. Agricultural water supply, including irrigation, stock watering, and truck farming.	Mean of 5 or more samples may not exceed 1000 per 100 ml with 20 percent of samples not to exceed 2400 per 100 ml for livestock watering, for irrigation of crops for human consumption, and for general farm use, except ground water shall contain zero per 100 ml.	Greater than 3 mg/l.	Between 6.5 and 8.5	Numerical values are inapplicable.	Between 60°F and 70°F for optimum growth to prevent physiological shock to plants.	Conductivity less than 750 micromhos at 25°C. Sodium adsorption ratio less than 2.5, sodium percentage less than 60 percent, residual carbonate less than 1.26 mg/l, and boron less than 0.3 mg/l.
G. Industrial water supply (other than food processing).	Same as B-1 whenever worker contact is present.	Greater than 5 mg/l for surface water.	Between 6.5 and 8.5	No imposed turbidity that may interfere with established levels of water supply treatment.	Less than 70°F.	No amounts above natural condition which may cause undue corrosion scaling, or process problems.

1/ Houser, 1965.

2/ U.S.Public Health Service, 1962.

Table 14-5 continued

(7)	(8)	(9)	(10)	(11)	(12)
Residues including oils, floating solids, sludge deposits and other wastes	Settleable solids, suspended solids, (includes sediment and dredge spoil and fill)	Toxic or other deleterious substances, pesticides and related organic and inorganic materials	Color, as measured in color units	Radioactivity	Aesthetic considerations
Same as B-7	Below normally detectable amounts.	Carbon chloroform extracts less than 0.1 mg/l and other chemical constituents may not exceed "Public Health Service Drinking Water Standards." 2/	True color less than 15 color units.	The concentrations of radioactivity shall not: a) Exceed 1/30th of the MPC's values given for continuous occupational exposure in the National Bureau of Standards Handbook No. 69. b) Exceed the concentrations specified in the 1962 U.S. Public Health Service Drinking Water Standards 2/ for waters used for domestic supplies. c) Have a demonstrable detrimental effect on aquatic life. d) The concentration of radioactive materials in these waters shall be less than those required to meet the Radiation Protection Guides for maximum exposure of critical human organs recommended by the former Federal Radiation Council in the case of foodstuffs harvested from these waters for human consumption. Because any human exposure to ionizing radiation is undesirable, the concentration of radioactivity in these waters shall be maintained at the lowest practicable level.	May not be impaired by the presence of materials or their effects which are offensive to the sight, smell, taste or touch.
Residues may not make the receiving water unfit or unsafe for the uses of this classification; nor cause a film or sheen upon, or discoloration of, the surface of the water or adjoining shoreline; nor cause a sludge or emulsion to be deposited beneath or upon the surface of the water, within the water column, or the bottom or upon adjoining shorelines.	No imposed loads that will interfere with established levels of water supply treatment.	Chemical constituents shall conform to "Public Health Service Drinking Water Standards."	Same as A-10		Same as A-12
Same as B-7	No visible concentrations of sediment.	Below concentrations found to be of public health significance.	Secchi disc visible at minimum depth of 1 meter.		Same as A-12
Same as B-7 plus the following: Residues shall be less than those levels which cause tainting of fish or other organisms and less than acute or chronic problem levels as determined by bioassay.	No deposition which adversely affects fish and other aquatic life reproduction and habitat.	Concentrations shall be less than those levels which cause tainting of fish, less than acute or chronic problem levels as revealed by bioassay or other appropriate methods and below concentrations affecting the ecological balance.	Same as C-10		Same as A-12
Same as D-7	No deposition which adversely affects growth and propagation of shellfish.	Same as D-9	Same as C-10		Same as A-12
Same as B-7	For sprinkler irrigation, water free of particles of 0.074 mm or coarser. For irrigation or water spreading, not to exceed 200 mg/l for an extended period of time.	Less than that shown to be deleterious to livestock or plants or their subsequent consumption by humans.	Inapplicable		Same as A-12
Same as B-7	No imposed loads that will interfere with established levels of treatment.	Chemical constituents may not exceed concentrations found to be of public health significance.	Same as C-10		Same as A-12

of musk oxen at the village of Unalakleet. Domestic water use is estimated at 35,000 gal/day by the two villages in the subregion. Unalakleet, population 550, is provided water via a public distribution system from a gallery placed under a lagoon north of the community. St. Michael, population 207, is provided water from a central tank supplied from a lake about three miles from the village.

STREAM FLOW AND RUNOFF

Basin characteristics, climate, presence of permafrost, and topographic relief in the subregion result in highly variable seasonal runoff -- flashy streams responding rapidly to storm events or snow melt but with low annual runoff rates. Based on flow records for streams on the Seward Peninsula annual runoff is estimated at about 1 cfs per square mile. Mean annual peak runoff approximates 10 cfs per square mile. Mean annual low monthly runoff is between 0.1 and 0.2 cfs per square mile. Based on these figures, Unalakleet flows compute as follows:

Mean annual peak flow - 16,000 cfs
Mean annual low flow - 160 to 320 cfs
Average annual flow - 1,600 cfs

WATER QUALITY

Surface Water

Water quality records for the basin are unavailable, and no stations have been established in the area. However, based on analysis of groundwater and records of other streams within the physiographic unit a general statement can be made.

Surface water quality in the basin is acceptable for most uses. Total dissolved solids are less than 200 gm/l., and are mostly calcium bicarbonate. Coastal waters tend to be higher in sodium chloride and magnesium of the bicarbonate type. Streams which drain mineralized areas may be higher than normal in sulfate, turbidity, color, sediments, and BOD, and can be expected to reach their highest levels during spring runoff. Normal sediment concentrations range between 10 and 100 mg/l. This is the lowest rate of sediment discharge known in the state. The low sediment yield is probably due to a number of factors, among them relatively low topographic relief, low annual runoff, lack of glaciers or surface disturbance in the subregion. The annual range of surface water temperatures in the area is believed to be from 32° F to 39° F while that of lakes range from 32° F to 60° F.

Groundwater

As with surface water, little data is available for groundwater quality in the subregion. Records for the public water supply at Unalakleet, a gallery beneath a lagoon north of the village, indicated groundwater of the calcium bicarbonate type with the presence of sodium chloride. All public health service standards are met or exceeded with the exception of turbidity, which is nearly twice the established limit (table 14-6). Water from wells in the St. Michael area is reported to contain sufficient amount of sodium chloride to make it unsuitable for domestic use. The temperature of groundwater in the subregion apparently ranges between 32° F and 39° F with an average near 35° F. Chemical analysis of groundwater in the Norton Sound area is presented in table 14-6.

Flood Hazard

Basin characteristics and low annual precipitation minimize the danger of floods caused by stream bank overflow in the subregion. As all settlements are located on the coastal strip, the greatest hazard is derived from wind or earthquake generated waves. Ice damming of the upper drainages may present a future hazard if construction were to occur there.

Table 14-6 .--*Chemical analyses of ground water in the Norton Sound subarea.*

[concentrations in milligrams per litre (mg/l) or micrograms per litre (µg/l)]

Location	Date	Well depth (ft)	Temperature (°C)	mg/l	µg/l		mg/l												Specific conductance (µmhos/cm at 25°C)	pH units
				Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (as N)	Dissolved solids	Total hardness		
WELLS																				
Shishmaref	04-18-69	--	--	1.8	6,300(a)	400(a)	12	6.2	20	1.6	50	0	0.4	38	0.0	0.68	115	55	200	6.6
Wales	--	33	--	7.2	120(a)	--	14	5.8	22	.2	59	0	9.1	37	.6	.07	125	59	240	7.3
Teller	04----72	--	--	3.7	--	20(a)	181	200	1,310	61	274	0	175	2,660	.3	2.3	4,740	1,270	9,100	7.6
Nome	11-26-71	--	--	14	180(b)	140(b)	74	108	1,240	61	522	0	381	1,875	.8	4.5	4,030	628	6,720	8.1
Elim	03-10-75	--	20.0	8.4	10(c)	20(c)	84	39	250	11	268	--	60	450	.1	1.4	1,040	370	1,980	--
Golovin	08-03-68	46	--	8.0	--	--	570	1,090	8,300	280	510	0	1,780	15,400	.5	.09	27,000	5,900	41,900	7.3
Koyuk	01-28-64	75	--	8.6	50(a)	0(a)	166	116	800	34	357	--	135	1,550	.0	2.2	3,000	890	5,280	8.0
Unalakleet	08-22-68	--	25.0	9.2	720(a)	--	28	5.1	5.2	.2	98	0	2.5	14	.2	.05	113	91	195	7.6
St. Michael	06-17-71	--	--	42	530(b)	110(b)	63	98	1,120	31	1,400	0	8.4	1,320	1.4	.36	3,370	560	5,660	7.3
Savoonga	01-31-70	179	--	42	8,600(a)	410(a)	205	1,100	8,400	360	284	0	2,030	15,400	.6	.02	27,700	5,030	38,800	6.7
SPRINGS																				
Moonlight	03-10-69	--	2.0	4.3	20(b)	--	46	2.6	2.7	1.5	153	--	6.6	3.2	.1	.00	142	126	251	7.9
Elim	06-12-73	--	--	9.5	30(c)	0(c)	57	12	6.0	.6	--	--	11	13	.0	.00	--	192	378	--
Pilgrim	--	--	55	100	--	--	530	1.4	1,450	61	30	--	24	3,346	4.7	--	--	--	--	6.8
Serpentine	--	--	60	100	--	--	47	.5	730	40	64	--	29	1,480	6.4	--	--	--	--	7.9

a Undifferentiated
b Total
c Dissolved

LOWER YUKON SUB-BASIN

WATER USE

No industrial or mining acitvities are going on in the subregion. Water resource use is limited to nonconsumptive navigation and recreation and domestic consumptive. There is a small agricultural demand by a herd of about 800 reindeer located near Stebbins. The population of the subregion is about 4,800. The major villages and populations are as follows: Hooper Bay (556), Emmoka (502), Alakanuk (495), Mountain Village (491), Chevak (447), and Stebbins (231). Based on the population in the subarea and the type of water facilities available the domestic water use is estimated at 145,000 gal/day. Agricultural demand is estimated at 380,000 gallons in summer and 200,000 gallons in the winter.

STREAM FLOW AND RUNOFF

Stream flow has only been recorded for the subregion since 1975 and at one location - Pilot Station on the Yukon River. However, low flow of the streams can be expected to occur during the late winter, and runoff is estimated at between 0.2 and 0.3 cfs per square mile. Ice jam flooding is common

during spring break up along the lower reaches of the river. In 1975 an area of approximately 1,000 square miles was flooded above Holy Cross. Other peak lows occur during the summer as a result of heavy precipitation. The mean annual peak runoff is estimated at 10 cfs per square miles or less. Mean annual runnoff is estimated at 1 cfs per square mile. Based on the period of record flows for the Lower Yukon at Pilot Station are as follows:

Mean annual peak flow - 610,000 cfs
Mean annual low flow - 41,000 cfs
Average annual flow - 202,500 cfs

The hydrograph based on the period of record at Pilot Station indicates a unimodal periodicity for discharge, the peak flwo occurring during spring thaw and breakup, gradually decreasing due to the mitigation of summer rainfall and glacial melt (figure 14-1). Low flow occurs during late winter (April - 42,000 cfs).

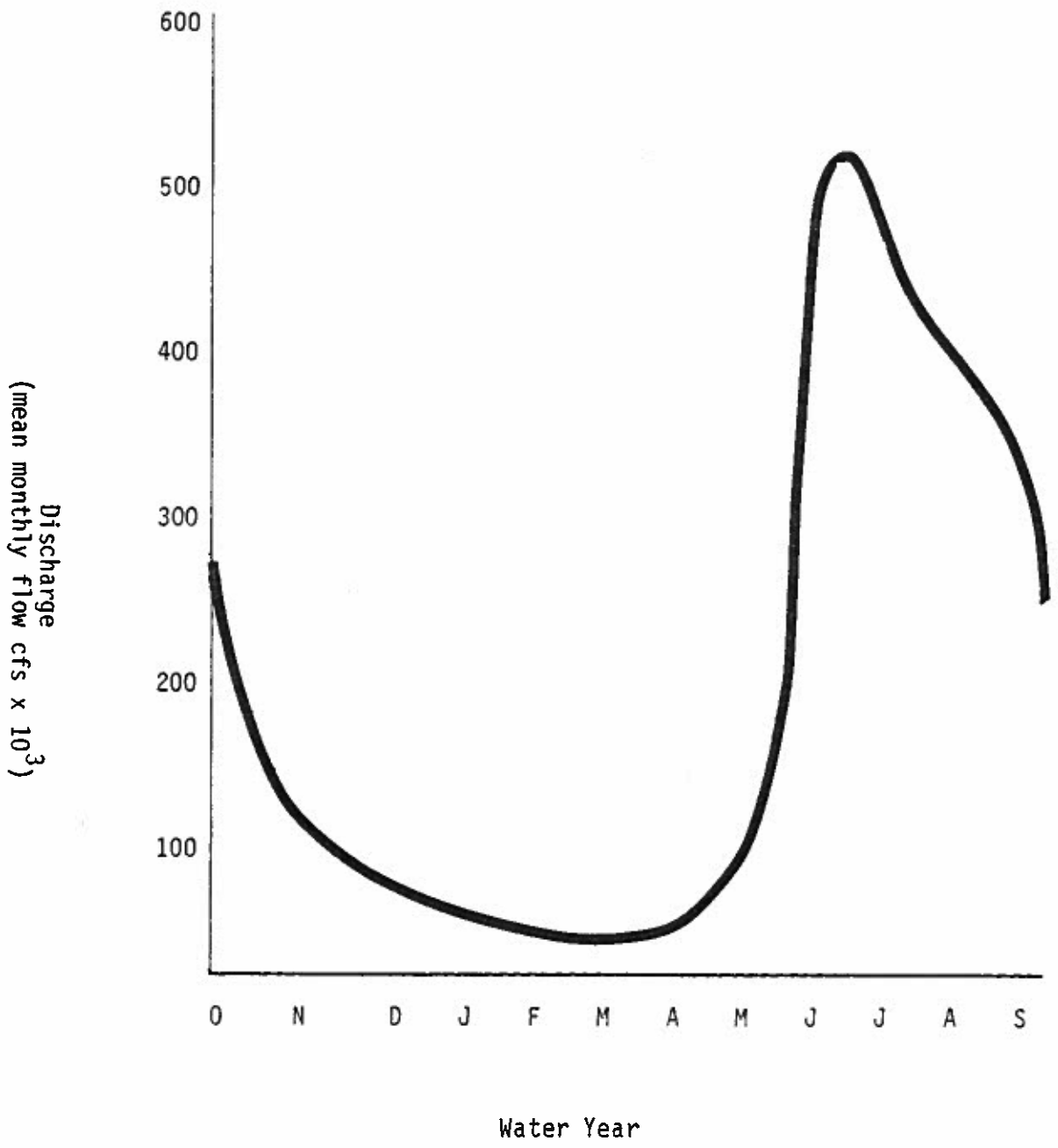
WATER QUALITY

Surface Water

Water quality data for the subregion is limited. Seven sites in the subregion have been sampled at random: the Yukon River at Anvik, Mountain Village, New Kwiguk, and Alakanuk; the

Figure 14-1. Hydrograph

Yukon River at Pilot Station



Andreafsky River at St. Mary's; the Innoko River at Shageluk; and Ophir Creek near Takotna.

In addition, a water quality station has been established at Pilot Station on the Yukon River. Period of record is from 1975 to the present. These data are available from the U.S. Geological Survey. The annual range of dissolved solids concentration apparently ranges between 40 and 140 mg/l., and are of the calcium bicarbonate type. Chemical quality is acceptable for domestic purposes, exceeding Environmental Protection Agency recommendations in iron content only. Table 14-7 lists water quality analysis for the Yukon River at Pilot Station.

Coastal waters tend to be higher in sodium chloride and magnesium of the bicarbonate type than inland water sources.

Sediment concentrations generally range between 10 and 100 mg/l. The annual temperature range for lakes is from 32° F to 60° F, for larger streams it is 32° F to 40° F.

Groundwater

Concentrations of dissolved solids in the groundwater range from about 70 mg/l to about 21,000 mg/l (table 14-8). Inland

Table 14-7 .--*Water quality of the Yukon River at Pilot Station, Lower Yukon subarea.*

[concentrations in milligrams per litre (mg/l) or micrograms per litre (µg/l)]

Date and discharge (ft^3/s)	mg/l	µg/l		mg/l												Specific conductance (µmhos/cm at 25°C)	pHunits
	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (as N)	Dissolved solids	Total hardness		
15565447 Yukon River at Pilot Station																	
04-02-75 43,000	--	1,500(a)	150(a)	49	11	--	--	182	0	--	1.1	--	0.16	--	170	319	7.3
06-20-75 623,000	4.7	11,000(a)	280(a)	23	4.3	1.9	1.1	78	0	12	1.0	0.1	.11	88	75	150	7.9
07-10-75 466,000	7.2	--	--	23	4.5	1.8	1.0	78	0	15	.9	.1	.08	92	76	165	7.6
08-14-75 365,000	6.6	11,000(a)	310(a)	27	6.2	2.5	1.5	93	0	21	1.0	.1	.06	112	93	194	8.0
09-24-75 419,000	7.3	--	--	26	6.1	2.3	1.0	87	0	16	1.1	.1	.24	103	90	184	8.0

a Total

Table 14-8 .--*Chemical analyses of ground water in the Lower Yukon subarea.*

[concentrations in milligrams per litre (mg/l) or micrograms per litre (µg/l)]

Location	Date	Well depth (ft)	Temperature (°C)	mg/l	µg/l		mg/l												Specific conductance (µmhos/cm at 25°C)	pH units
				Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (as N)	Dissolved solids	Total hardness		
WELLS																				
Stebbins	03-06-75	--	3.0	24	420(a)	60(a)	10	29	660	31	520	--	15	810	0	0.03	1,850	140	3,420	8.1
Kotlik	04-28-63	--	--	23	20(b)	0(b)	222	597	6,970	409	1,430	--	218	12,000	0.8	0.61	21,200	3,000	32,600	8.2
Emmonak	09-24-71	80	--	35	2,500(c)	140(c)	32	38	165	24	542	0	1.0	115	.4	4.5	698	236	1,140	7.1
Alakanuk	07-20-72	88	--	26	7,400(c)	300(c)	117	26	1,520	54	1,120	0	7.3	1,675	2.4	.16	4,027	400	6,500	7.5
Sheldon Point	04-02-75	--	1.0	26	30(a)	150(a)	110	360	3,800	160	1,800	--	30	6200	.6	.02	11,600	1,800	19,500	--
Hooper Bay	04-02-75	--	4.5	27	410(a)	10(a)	14	5.9	310	16	595	--	8.5	190	1.7	1.0	888	59	1,440	--
Chevak	04-02-75	--	0.5	40	1,600(a)	440(a)	22	3.9	15	2.6	100	--	3.6	94	.0	.08	149	71	189	--
Mountain Village	05-06-71	60	--	17	200(b)	10(b)	40	5.4	7.4	.9	160	--	.0	15	.3	.00	152	122	253	8.0
Pitkas Point	02-16-72	86	--	14	1,700(c)	2,900(c)	73	14	8.9	1.7	306	0	6.5	8	.1	.07	273	240	451	8.0
Pilot Station	10-28-71	200	--	10	80(c)	10(c)	41	9.2	4.5	.7	164	0	.2	5.5	.3	2.9	165	141	287	7.6
St. Mary's	04-08-66	78	1.0	17	880(b)	40(b)	5.2	50	4.2	1.5	277	0	1.0	4.2	.3	.05	220	219	426	7.4
Fortuna	09-07-68	--	3.5	21	90(b)	50(b)	19	2.7	3.8	1.0	73	0	5.2	2.6	.2	.72	95	58	137	6.6
Russian Mission	04-22-71	--	--	20	50(c)	10(c)	37	9.6	3.8	.9	141	0	2.6	1.5	.0	4.7	165	131	264	8.0
Holy Cross	01-26-72	73	--	18	330(c)	20(c)	20	5.9	3.8	.5	81	0	6.9	2.0	.1	1.8	106	74	167	7.0
Shageluk	02-01-75	--	2.0	30	1,600(a)	820(a)	55	16	6.1	.6	265	--	2.5	1.6	.2	.01	246	200	413	7.3
Anvik	11-22-68	77	--	27	8,300(b)	650(b)	56	16	5.0	2.3	270	0	.0	2.1	.1	.11	250	205	400	7.1
Grayling	02-01-75	--	--	23	20(a)	0(a)	8.6	2.0	4.2	1.0	35	--	1.8	4.2	.1	1.9	71	30	85	6.9

a Dissolved
b Undifferentiated
c Total

wells yield a calcium bicarbonate type of water, whereas coastal wells yield a magnesium bicarbonate or sodium chloride type. With the exception of areas where sodium chloride content is high, groundwater is of acceptable chemical quality for most uses. As with surface water, iron content exceeds the maximum recommendation of the Environmental Protection Agency.

The temperature of groundwater ranges from about 33° F to about 40° F.

Flood Hazard

Floods caused by ice jams during breakup are common events in the subregion. Heavy rainfall during summer storms is a second source of floods. Though having little impact at present, this will be of greater concern as the population grows and development occurs.

KUSKOKWIM BASIN

WATER USE

Domestic use and water required for small mining operations are the major demands for water resources in the subregion in

addition to nonconsumptive uses for transportation and recreation. The population of the area is about 10,000. The main communities are at Bethel (3,231), Akolmiut (464), Akiachak (392), Toksook Bay (304), and McGrath (334). Based on the population and the type of water distribution facilities available, domestic water consumption is estimated to be about 136,000 gal/day. Water requirements for the mining operations are unknown.

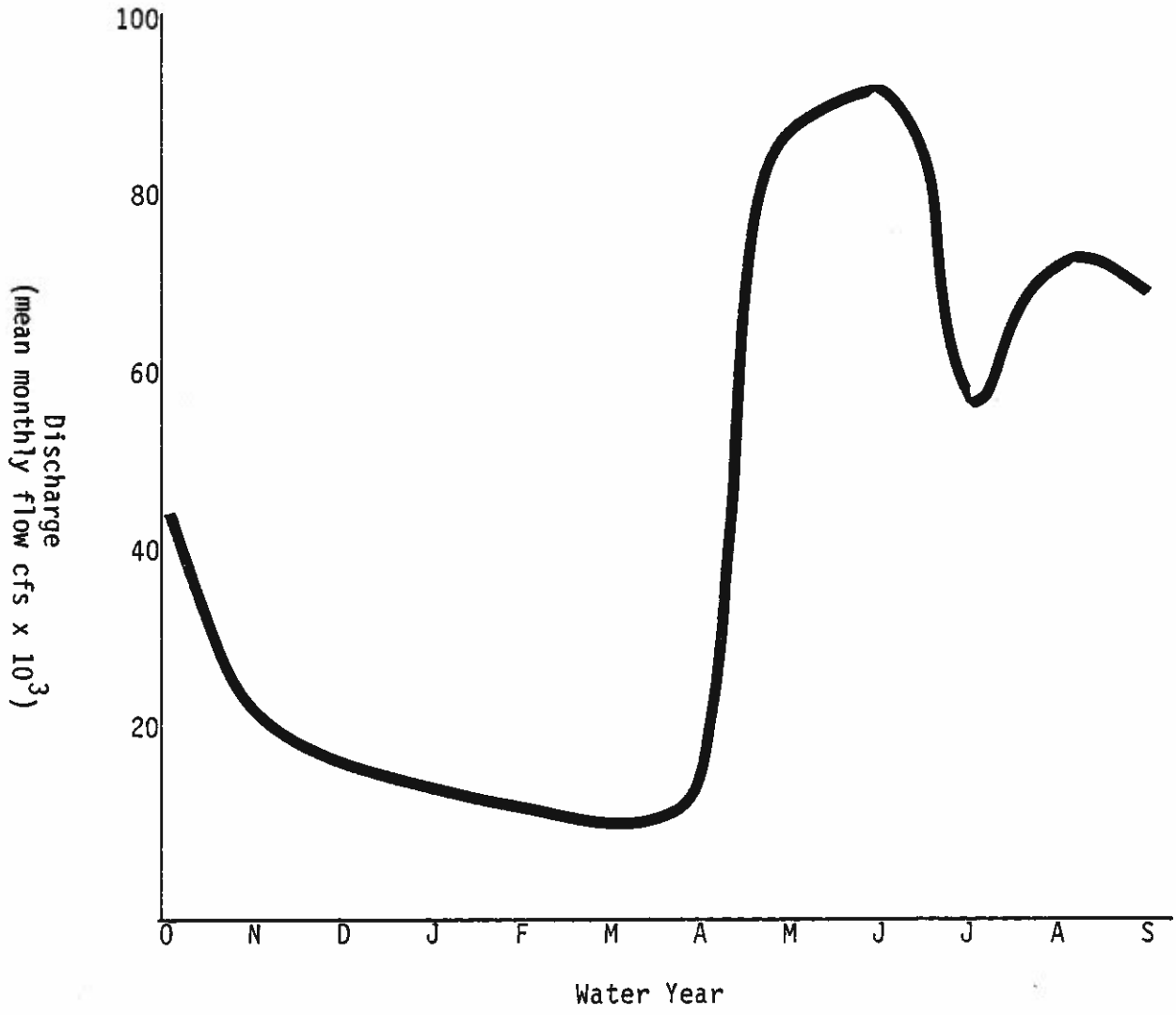
STREAM FLOW AND RUNOFF

Although not extensive, stream flow records for the Kuskokwim River are better than for any other stream in the region. Gauging stations have been maintained at McGrath from 1963 through 1973 and at Crooked Creek and from 1951 through the present. A station was recently established on the Kisaralik River above Upper Falls (June, 1980). Data are available from the U.S. Geological Survey.

The hydrograph based on these records indicates a bimodal periodicity, with peak flows occurring during spring thaw and the midsummer (figure 14-2). The latter can be attributed to the effect of summer insolations on the glacier fed tributaries of the northeastern area of the subregion, and in-

Figure 14-2. Hydrograph

Kuskokwim River at Crooked Creek



tensive summer rainfall. Mean annual peak runoff for the subregion is estimated at about 10 cfs per square mile for the lowlands, 25 cfs per square mile in the uplands, to in excess of 50 cfs per square mile in some of the high basins in the Alaska Range.

The period of low flow occurs during late winter. Figure 14-3 gives the flood magnitude frequency curve for the Kuskokwim at the gauging stations.

The period of low flow occurs during late winter and ranges from about 0.2 cfs per square mile to 0.5 cfs per square mile throughout the subregion, and averages about 0.3 cfs per square mile. The mean annual runoff likewise varies through the subregion, being about 1 cfs per square in the western lowlands, 2 cfs per square mile in the foothills of the Alaska Range and 4 cfs per square mile in the higher basins. The average is probably about 1 cfs per square. Based on period of record, flows for the Kuskokwim River at Crooked Creek are as follows:

Mean peak annual flow - 190,200 cfs
Mean low annual flow (est) 19,600 cfs
Average annual flow (est) 42,410 cfs

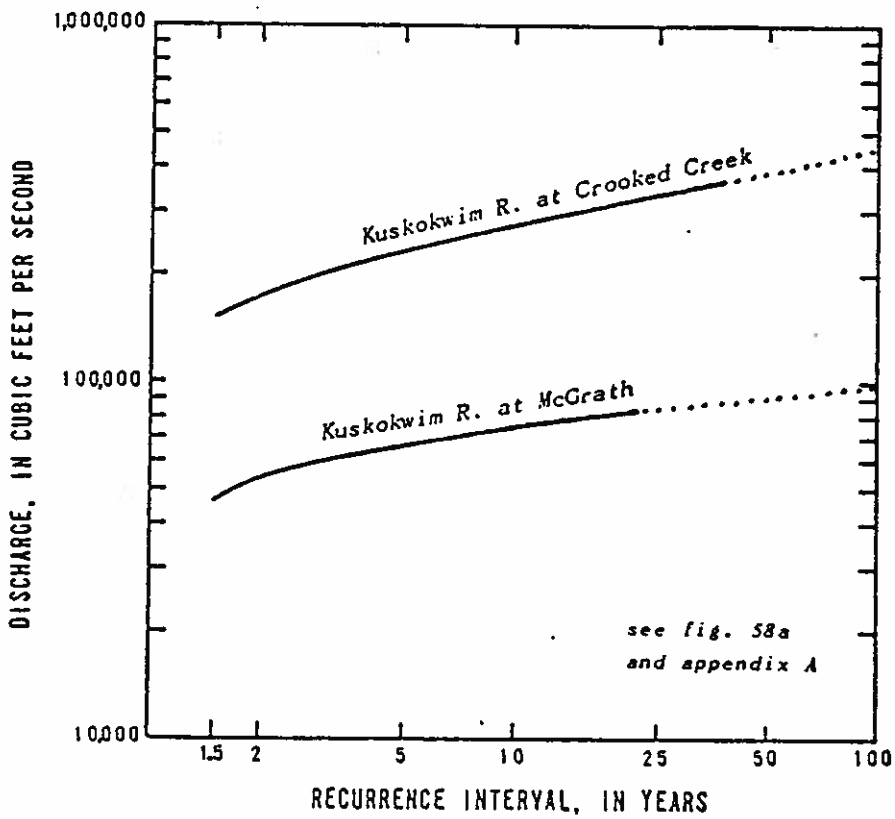


Figure 14-3 -- Flood magnitude-frequency relation at selected sites on the Kuskokwim River

Greatest discharge for the period of record is 392,000 cfs on June 5, 1964, and the minimum discharge is about 6,100 cfs during March, 1966.

WATER QUALITY

Surface Water

As for other areas of the region, water quality data for the Kuskokwim basin is limited. Nine sites have been sampled on a random basis in the subregion: Kuskokwim River at Medfra, McGrath, Crooked Creek and Bethel; Big River at McGrath, Takotna River near McGrath; Stony River near the village of Stony River; Holitna River near Sleetmute; and Aniak River near Aniak. A synopsis of that data is presented for the Kuskokwim River at McGrath and Crooked Creek in table 14-9.

In general, dissolved solids concentrations of surface water (table 14-9) in the subregion are less than 200 mg/l., mostly calcium bicarbonate. All of the streams have water of acceptable quality for nearly all uses.

On the basis of little sampling three areas can be outlined where estimated normal summer concentrations of suspended sediment for the subregion. The eastern section near the

Table 14-9 .--*Water quality of the Kuskokwim River in the Kuskokwim Bay subarea.*

[concentrations in milligrams per litre (mg/l) or micrograms per litre (µg/l)]

Date and discharge (ft^3/s)	mg/l	µg/l		mg/l												Specific conductance (µmhos/cm at 25°C)	pH units
	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (as N)	Dissolved solids	Total hardness		
15303600 Kuskokwim River at McGrath																	
08-22-50 --	7.6	80(a)	--	34	9.4	--	--	122	0	34	1.0	0.2	0.02	153	124	264	7.3
03-22-72 3,950	12	30(b)	20(b)	48	13	2.6	1.1	180	0	30	.3	.3	.00	196	174	328	7.8
15304000 Kuskokwim River at Crooked Creek																	
03-11-69 8,630	11	50(a)	--	40	8.3	2.7	1.7	145	0	18	.0	.4	.18	154	134	251	7.9
05-25-70 86,000	5.7	290(a)	0(a)	13	3.1	1.3	.7	44	0	8.3	1.1	.1	.16	58	45	98	7.8

a Undifferentiated
b Dissolved

Alaska Range has the highest concentrations (figure 14-6) (greater than 2,000 mg/l) in streams draining the glaciers and higher slopes. The central and southern sections of the area are believed to contribute concentrations of greater than 100 mg/l., with concentrations of about 50 to 100 mg/l., being found in the extreme western part. The Kuskokwim River at Crooked Creek yields an average annual rate of 300 tons per square mile, or about 9 million tons per year.

Surface water temperature range is from 32° F to about 44° F for the streams.

Groundwater

The chemical quality of ground water in the subregion is varied. Water at Kwithluk shows magnesium bicarbonate, Nightmute has calcium magnesium bicarbonate type water, and Eek, sodium bicarbonate type. Toward the interior, water is of the calcium bicarbonate type.

Some groundwaters in the subregion are high in nitrates. Iron is noted in water from wells in some coastal communities and from wells near some streams. The temperature of groundwater

in the subregion ranges from 32° F to 40° F. Table 14-10 lists chemical analyses of groundwater from various locations in the subregion.

Flood Hazard

The subregion is subject to floods due to ice jams during break up, particularly in the Kuskokwim River lowlands and near the mouths of the major tributaries. Intensive rainfall during summer rainstorms is a second source of flooding.

High flows during the summer months are abetted by the effect of insolation on the glaciers of the Alaska Range, which influence the eastern tributaries. Channel icings in the uplands can cause winter or early spring flooding even when flows are low.

Table 14-10-*Chemical analyses of ground water in the Kuskokwim Bay subarea.*

[concentrations in milligrams per litre (mg/l) or micrograms per litre (µg/l)]

Location	Date	Well depth (ft)	Temperature (°C)	mg/l	µg/l		mg/l												Specific conductance (µmhos/cm at 25°C)	pH units
				Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (as N)	Dissolved solids	Total hardness		
WELLS																				
Akiachak	09-25-71	--	--	28	30,000(a)	2,300(a)	49	9.5	4.3	1.4	204	0	1.0	30	0.1	0.07	199	161	329	6.4
Akiak	02-03-75	--	--	13	6,900(b)	690(b)	80	10	13	3.2	245	--	17	7.8	.1	1.5	279	240	419	6.6
Bethel	01-30-75	--	0.0	35	2,700(b)	110(b)	27	7.2	4.4	2.5	131	--	3.1	2.3	.1	.05	150	97	214	7.4
Chefornak	02-04-71	--	3.0	30	--	--	13	23	186	23	365	0	.0	175	.6	.68	634	127	1,070	7.7
Crooked Creek	09-20-69	--	--	6.3	20(c)	10(c)	50	11	7.5	.8	182	0	31	2.8	.1	1.8	207	170	348	7.7
Eek	02-03-71	--	--	10	--	--	48	31	550	8.8	306	0	6.0	838	.4	2.1	1,650	247	2,970	7.3
Goodnews Bay	06-19-62	--	--	2.7	70(c)	100(c)	22	8.8	5.2	.8	112	--	.0	6.0	.1	.02	101	90	187	6.8
Lower Kalskag	02-03-75	--	1.0	22	510(b)	2,200(b)	32	6.0	2.5	1.9	135	--	3.0	2.3	.1	.04	139	100	223	6.8
Kipnuk	02-26-72	171	--	21	11,000(a)	250(a)	546	40	3,660	100	1,520	0	63	5,880	2.0	.05	11,100	1,530	18,100	8.0
Kongiganak	10-12-68	258	1.5	34	--	--	110	100	800	60	636	0	13	1,325	.3	.18	2,733	686	5,284	7.2
McGrath	------59	22	--	15	20(c)	20(c)	104	72	1.8	3.8	666	--	32	3.0	.2	.14	560	556	947	7.1
Mekoryuk	06----71	45	--	28	30(a)	700(a)	70	88	184	7.2	238	0	58	460	.2	12	1,060	536	1,910	7.7
Napakiak	01-30-75	123	1.0	30	2,900(b)	340(b)	62	11	27	3.7	282	--	16	9.9	.1	.05	302	200	492	7.3
Newtok	09-09-72	--	--	35	1,200(a)	50(a)	5.5	14	350	23	794	0	12	140	.9	2.5	998	71	1,630	7.5
Nightmute	08-29-66	56	1.0	25	10(c)	--	19	10	7.7	.6	115	0	1.0	7.8	.1	.05	128	90	209	6.7
Nikolai	03-16-70	76	1.0	21	2,700(c)	--	50	5.0	2.9	1.3	182	0	.0	1.1	.0	.00	174	142	279	7.6

Table 14-10 .--*Chemical analyses of ground water in the Kuskokwim Bay subarea, continued.*

[concentrations in milligrams per litre (mg/l) or micrograms per litre (µg/l)]

Location	Date	Well depth (ft)	Temperature (°C)	mg/l	µg/l		mg/l												Specific conductance (µmhos/cm at 25°C)	pH units
				Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Carbonate (CO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (as N)	Dissolved solids	Total hardness		
Quinhagak	05----62	--	--	39	1,600(c)	450(c)	31	26	193	14	150	0	37	339	0.2	0.27	756	186	1,363	7.0
Red Devil	------70	18	--	4.3	50(c)	0(c)	14	8.4	1.5	.2	73	0	8.9	.2	.1	.45	76	69	138	7.1
Sleetmute	02-26-70	25	--	14	120(c)	0(c)	13	2.8	2.5	.9	45	0	2.8	3.2	.1	2.2	71	44	109	6.5
Toksook Bay	07-11-73	--	--	8.8	--	--	36	7.7	11	.02	155	0	7.4	11	.2	.04	159	120	284	7.3
Tuluksak	10-28-70	--	--	9.7	5,600(a)	3,000(a)	32	6.3	3.9	1.4	135	0	2.3	6.2	.1	.07	129	106	215	7.3

a Total
b Dissolved
c Undifferentiated

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WATERSHED

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WATERSHED OPPORTUNITIES

INTRODUCTION

Due to lack of base-line data regarding water resources, little can be said of specific opportunities in the region. The greatest need at present is to establish an inventory program on those lands which will be managed by BLM to provide such data. Snow load information is necessary to determine runoff, flood potential, areas of critical wildlife winter habitat, and other such information necessary for resource management. Water availibility and quality information is necessary for any resource development activity and currently is available for only two of the major streams in the region -- the Yukon and Kisaralik rivers. Similarly ground-water data is available only for a few villages in the region. Virtually nothing is known about the resource on lands which will be under BLM management.

Although areas succeptable to flooding have been mapped on the broad scale (Dorris, 1973) this information was interpreted from topographic maps and is unreliable. Again, except for the two major rivers, information on stream morphology is non-existent.

The Bureau is directed to maintain and improve stream channel stability, but no program of this nature exists, nor is there currently a demand in this area. However, as resource development proceeds in the region, channel stability may become a critical issue. A perfect opportunity for impact and mitigation studies is ongoing at NYAC, on the Tuluksak River and Bear Creek, in the Kilbuck Mountains. A pilot program should be carried on there.

The State of Alaska is currently working on a hydrolgic unit classification program, but a final product is several years off.

Instream flow reservations for terrestrial and aquatic needs, as well as future Bureau programs, should be applied for in the very near future to insure that the federal government is allocated its fair share of the resource.

The Alaska Power Administration and Army Corps of Engineers have conducted inventories of potential dam sites in the region, for hydropower, water storage, and flow regulation. Those that would possibly impact Bureau managed lands are listed in table 14-11 by sub-region.

Areas with identified agricultural potential should be assessed for water quality and quantity (surface and ground) prior to classification to assure suitability and availability.

Table 14-11. Potential Water Resource Sites

Sub-region	Stream	Location	Purpose
Unalakleet	Unalakleet River	Ten miles upstream of Unalakleet	S
	Old Woman River	Eight miles above mouth	S
	Golsovia River	Eight miles above mouth	S
Lower Yukon	Yukon River	Lost Creek (Russian Mission)	S, R, P_L
	Atchuelinguk River	Five miles downstream of Jackson Creek	S
Kuskokwim	Kuskokwim River	Napaimiut	S
	Crooked Creek	Crooked Creek	S, R, P_L
	George River	Ten miles upstream of mouth	S
	Unnamed stream	Southwest of Chawckat Mountain (Goodnews)	P_S

S - Water storage
R - Streamflow regulation
P - Hydropower
L - large (> 2,500 kw)
S - small

CHAPTER 15

WILDLIFE HABITAT

W I L D L I F E H A B I T A T

INTRODUCTION

The Planning Area encompasses all or part of five Game Management Units (GMU) as identified by the Alaska Department of Fish and Game. The Game Management Units are:

GMU 18 (Yukon-Kuskokwim Delta)
GMU 19 (McGrath)
GMU 20 (Fairbanks-Central Tanana)
GMU 21 (Middle Yukon)
GMU 22 (Nome)

These are shown on overlay 15-2. The six BLM planning blocks in the area are in part of all the GMU's except GMU 20.

Goodnews planning block is in the southern portion of GMU 18. Nyac planning block is split between the eastern portion of GMU 18 and the western portion of GMU 19. The Anvik River

planning block lies within the northeastern corner of GMU 18, the southeastern part of GMU 22, and the western edge of GMU 21. The Sleetmute planning block is in the southern part of GMU 21 and the western part of GMU 19. The Lime Village block is in the center of GMU 19 and the northeastern corner of GMU 19 and the eastern part of GMU 21.

Discussions of wildlife are arranged around wildlife classes. These are waterfowl, sea birds, raptors, small game, furbearers and big game.

The planning unit encompasses two basic physiographic provinces: Western Tundra and Interior. The western tundra province includes the coastal and Yukon-Kuskokwim delta regions, which are barely above sea level, as well as more inland regions that are characterized by flat relief, thaw lakes formed by surface melting, sloughing and erosion of permafrost ground. The plant communities of this region are dominantly moist and wet tundra interspersed with considerable amounts of open water.

The Interior physiographic province includes the broad floodplains of the Yukon and Kuskokwim Rivers as well as major tributaries such as the Innoko and Holitna-Hoholitna Rivers.

These floodplains are characterized by oxbows, sloughs and lakes which support floating vegetative mats composed of buckbean, five finger and sedges, a plant association important to nesting waterfowl.

WATERFOWL

The Yukon-Kuskowkwim delta provides nesting habitat for most of the geese found in the Pacific flyway, including 50 percent of all black brant, 80 to 90 percent of all cackling and emperor geese, and essentially all of the white-fronted geese. In addition, it is a major producer of the whistling swan. With the exception of the Norton Sound area, nearly all of the public land in this province is administered by the US Fish and Wildlife Service as Yukon Delta National Wildlife Refuge and will not be addressed in this plan.

The Interior physiographic province includes several BLM-administered blocks of land which are also important producers of waterfowl. This region makes a significant contribution to the six million ducks and 250,000 geese produced annually in interior Alaska. In addition, it is also an important nesting area for the whistling swan.

Wildlife overlay 15-3 (waterfowl, peregrine falcon and sea birds) identifies known areas of waterfowl nesting and molting concentrations and major migration routes.

GAME MANAGEMENT UNIT 19, 21, INTERIOR PORTIONS OF 22

The average duck breeding density in this unit is 67.0 ducks per square mile. Common nesting species include lesser scaup, pintails, widgeons, mallards, green-winged teal, bufflehead, American goldeneye, and shovelers. Of these, the mallard is one of the more abundant and is commonly found nesting along lakes, sloughs, beaver ponds, rivers and headwater streams. Mallards tend to be one of the last waterfowl species to leave the interior in the fall, remaining on open waters until early November. Some individuals may even winter on warm spring-fed streams. Major migration routes are along the large rivers such as the Kuskokwim and Yukon. Since waterfowl are found throughout the planning unit, a brief discussion of the more common species is given rather than attempting a presentation of all species. Because of the large area covered by the plan, individual species habitat requirements are given rather than the location of specific mountain ranges and drainages. The vegetation overlay, 4-1, must be rised in conjunction with this narrative to determine location of the habitat.

The green-winged teal is a very common breeder in these units. This species commonly nests in the boreal forests under stumps or large trees in brushy areas during May and early June. Teal generally migrate from the interior by October, moving along major rivers to the coast.

The widgeon is a common summer duck in the interior. It generally arrives by mid or late May and is frequently found nesting in wooded, brushy marshes.

Widgeons are early fall migrants, leaving breeding areas by late August. They also migrate along the major rivers to the coast.

Shovelers are common on marshes and savannah-like associations of shrubs, grasses and sedges. They arrive on nesting areas in May, and nest in open grassy areas near shrubs or logs. Fall migration along the major rivers begins in late August and early September.

The American (common) goldeneye is a common breeder in the boreal forests of the major floodplains, nesting in natural tree cavities.

This species is one of the earliest to arrive in the spring, usually being abundant by early May. They are also one of the latest to leave, often still abundant in October.

The lesser scaup arrives in the spring as soon as the larger lakes have open water. This species often nests near water using sedge and horsetail for cover. Fall migration takes place in September along the major river drainages.

The bufflehead frequents wooded ponds, lakes, and backwaters in the interior. Early migrants appear in early May and nesting commences in June in tree cavities. Fall migration is generally well underway by September.

The pintail is locally common in these units, nesting in a wide variety of habitats, but typically found using areas with grass, sedge, mixed grass and brush, and drift logs.

GAME MANAGEMENT UNIT 22

The coastal portion of this unit is part of the western tundra province discussed previously. Many of the waterfowl species discussed above plus additional species common in the Yukon

Delta National Wildlife Refuge occur on coastal BLM-administered land in ths unit. These include the common scoter, spectacled eider, and old squaw.

The spectacled eider is a common nester in coastal habitats. It generally arrives in mid-May and nests among tussocks of dry beach rye, sedge, or dry grass on small islands or near ponds. Migration south along the coast back to wintering areas in the Aleutians, Kodiak Island and the Alaska Peninsula occurs during August and September.

The common scoter arrives during June and nests in grassy or sedge-covered lake banks near water. Fall migration along the coast to southeastern Alaska, Kodiak Island, the Alaska Peninsula, and Aleutians begins in September and October.

The old squaw occasionally nests in late June along the coast in close association with lacustrine waters in stands of sedges or grass. Fall migration along the coast to the Aleutians, Kodiak Island, southeastern Alaska and the coasts of British Columbia and the Pacific northwest is well underway by early September.

SEA BIRDS

Several sea bird nesting colonies are located in the Planning Area along the coast of Norton Sound and are identifed on wildlife overlay 15-3. Double-crested, red-faced and pelagic cormorants nest in the cliffs at Tolukowuk Bluffs, Shorty Cove, Black Point, Black Cove Island and Tolstoi. The Black oystercatcher and glaucous Gull nest on the flat ground and boulder rubble at Black Cove Island, Black Point, and Tolstoi. Red-legged kittiwakes, Arctic terns and Aleutian terns are known to maintain a nesting colony on Black Cove Island; and the horned and tufted puffins nest at Tolstoi and on Black Cove Island.

RAPTORS

Eighteen species of hawks, falcons, owls, and eagles are known to occur in the planning unit. Detailed species density and distribution information are lacking because of the secretive behavior and low densities of most species. Since raptors are found throughout the subject area, the URA describes typical habitats for some of the more important or abundant species, rather than attempting to identify areas of concentration

without sufficient data. Several surveys have been conducted by BLM biologists during 1979-1980, and the results of these will be presented where appropriate.

GOLDEN EAGLE

Golden eagles usually nest on rocky ledges or cliffs, and occasionally in trees. Nesting generally occurs between early May and mid June. Foraging occurs over a wide territory, with small mammals such as hares and marmots and birds such as ptarmigan being major diet items.

BALD EAGLE

Bald eagles are occasionally found along major water bodies in the planning unit. This species is migratory, arriving at nesting territories in the early spring. Birds typically return to the same nesting territories year after year and often use the same nest. Nests are usually located in large trees. Major food items may include fish and a few small mammals and birds; however, a large portion of the diet is obtained by scavenging and beach combing.

OSPREY

The osprey is migratory and widely distributed along water bodies throughout the Planning Area. Nesting concentrations are known to occur along the Holitna and Hoholitna drainages. Nests are typically constructed in trees or on cliffs near water, and the diet is composed primarily of fish.

Goshawks are year-round residents of the forested floodplains of the subject area. These birds are generally secretive and difficult to observe due to their habit of frequenting dense, heavily timbered areas. Major food items are birds and small mammals.

MARSH HAWK

The marsh hawk, a very common raptor in western Alaska, frequents wet and moist tundra habitats. This species is typically a ground nester and feeds primarily on small mammals and birds.

ROUGH-LEGGED HAWK

The rough-legged hawk is a migratory species which nests primarily on cliffs in early April. Nesting concentrations of this species have been documented along the Kuskokwim River

between Georgetown and Aniak (Mindell and Dodson, 1980, Draft Report). This species is primarily a rodent eater and, as a result, population densities respond quickly to prey base changes.

RED-TAILED HAWK

The red-tailed hawk is the most abundant raptor species nesting in the Kuskokwim drainage. However, only one nesting pair, on the North River of the Unalakleet River drainage, was seen by BLM biologists during surveys of eight rivers west of the Yukon during 1979 and 1980. Tracts of mature timber on river floodplains appear to be important nest sites for this species.

Of 35 nests observed during 1979-1980, BLM biologists found 71 percent in white spruce trees, 22 percent in balsam poplar and 6 percent in paper birch. This migratory species feeds primarily on small mammals and an occasional bird.

SMALL GAME

Small game animals including the snowshoe hare, tundra hare, willow ptarmigan, rock ptarmigan, sharp-tailed grouse, ruffed grouse and spruce grouse are found throughout the planning unit where suitable habitat occurs.

SNOWSHOE HARE (*Lepus americanus*)

The snowshoe hare is the most common of the two hares. Habitat requirements are flexible; however, typically the snowshoe hare inhabits areas supporting streamside willows, dwarf birches, and brush thickets. It feeds on succulent grasses, buds, twigs and leaves during the summer, and twigs, needles of spruce and the bark and buds of hardwood species during the winter. This nocturnal species experiences population cycles. During years of high abundance they can cause extensive damage by girdling willows and other browse species. During years of low numbers, predator species that rely on the hare such as raptors, lynxes, foxes, and coyotes suffer from a food shortage.

TUNDRA HARE (*Lepus othus*)

The tundra hare is more restricted in its distribution in the Planning Area. The range of this species is limited primarily to open moist and wet tundra areas. Typically, wooded areas and bottomlands are avoided.

WILLOW PTARMIGAN

The willow ptarmigan is found along stream courses and in riparian shrub communities. Tall shrubs also appear to be an important part of this species' habitat. Willow leaves are the primary summer food source of the willow ptarmigan, while buds, twigs, and catkins are major food items. Between April and July the ptarmigan establishes and defends breeding territories typically close to timberline.

ROCK PTARMIGAN

The rock ptarmigan generally inhabits higher elevations which are usually drier and rockier than the areas used by willow ptarmigan. The rock ptarmigan breeds in the scattered shrubs and herbaceous vegetation of the mountainous tundra. Fall, winter and spring diets are composed of the buds and catkins of dwarf birch. Green herbaceous vegetation, insects, berries and seeds make up most of the summer diet.

RUFFED GROUSE

Ruffed grouse inhabit the forested portions of major river drainages in the planning unit. Preferred habitat includes deciduous woodlands interspersed with spruce on relatively

dry, well-drained, south-facing slopes. Nesting generally commences in April and continues until late September in shrubby, moist areas near the woodland fringe.

SHARP-TAILED GROUSE

The sharp-tailed grouse is a "fire-dependent" species which is commonly found in burned-over areas or scrubby woodlands with open to sparse canopy. Breeding begins in April or May. At this time open grassy areas are required by the males to perform their courtship display. Important fall and winter foods include berries, seeds, insects, buds, and catkins.

SPRUCE GROUSE

Spruce grouse occur in the forested portions of the subject area. They inhabit mature white spruce-birch woodlands and black spruce bogs. Breeding activity generally begins in April or May. Summer and fall diets include cranberries, blueberries, crowberries, various seeds and the flowers and leaves of herbaceous plants. The winter diet is almost exclusively spruce needles.

FURBEARERS

The grouping of these species, which are diverse in habitat requirements and behavior, is based on their economic importance as providers of furs for domestic and market use. Included in the group are the river otter, least and short-tailed weasel, beaver, muskrat, hoary marmot, arctic ground squirrel, red squirrel, northern flying squirrel, mink marten, lynx, red fox, arctic fox, coyote and wolf. All of these are known to occur in the Planning Area although their numbers and distribution vary locally according to availability of preferred habitat and food. A brief synopsis of the habitat requirements and diets of the more important furbearer species is provided below.

COYOTE (*canis latans*)

The coyote, which appeared in Alaska around 1915, is found in all habitat types but is most common on the floodplains of the larger river drainages. The ability of the coyote to expand its range in Alaska is in part attributed to its ability to use any available food source. The coyote's diet includes a variety of small mammals, berries, herbaceous matter, invertebrates and carrion. Most coyote pelts are sold commercially, but a few are retained for domestic use.

ARCTIC FOX (*Alopex lagopus*)

The natural distribution of this species is limited to the tundra areas and along the marine coast. The Arctic fox prefers to den in elevated, well-drained soils. It feeds on a variety of small mammals, birds, eggs and carrion with local population densities fluctuating dramatically depending on the availability and abundance of these items. This species is one of the most important producers of furs for both the commercial market and domestic use.

RED FOX (*Vulpes vulpes*)

The best red fox habitat appears to be in the drainages of interior Alaska and the coastal areas along the south of Norton Sound. Dens are typically excavated on the sides of well-drained hills. The red fox is omnivorous, feeding on a wide variety of small mammals, birds, eggs, invertebrates, plant material and carrion. Most of the pelts taken are sold commercially but some are kept for domestic use.

LYNX (*Lynx canadensis*)

This species is generally found in the dense undercover of climax forests typical of the floodplains of major river

systems. Major prey items are the hare and ptarmigan. The major trapping effort for this species is around villages and road and trail systems. Most pelts are sold; however, some are retained for domestic use.

MARTEN (*Martes americana*)

With the exception of the Yukon-Kuskokwim delta, the marten is found throughout the Planning Area. This species' distribution is very dependent on climax spruce forest distribution. Major food items include microtine rodents, squirrels, and berries. Most marten trapped are sold commercially, with a few being kept for domestic use.

MINK

Mink are usually associated with riparian habitats. Their diet includes small mammals, birds, fish, and invertebrates. The Yukon-Kuskokwim delta is an important mink pelt producing area. Skins from this area have consistently brought high prices.

SHORT-TAILED WEASEL (*Mustela erminea*)

The short-tailed weasel or ermine prefers forested or brushy areas in broken terrain. Primary prey include microtine rodents, shrews, mice, birds, eggs, young hares, pikas, insects and fish. This weasel is not a major furbearer ;however, some pelts are sold or retained for domestic use.

LEAST WEASEL (*Mustela nivalis*)

Least weasels are found throughout a variety of habitats including forests and tundra. Major food sources are mice, voles, birds, and invertebrates. Pelts are sometimes sold.

RIVER OTTER (*Lutra canadensis*)

Land otters are found throughout the planning unit with highest densities occuring in the Yukon-Kuskokwim delta. As the name implies, this species' distribution is associated with rivers, streams, and lakes. Food items include crustaceans, insects, fish, frogs, birds, small mammals, and vegetable matter. Most otter hides are sold commercially, but some are used domestically.

BEAVER (Castro canadensis)

The distribution and abundance of this species is dependent upon habitat availability and degree of exploration. Preferred habitat includes a dependable water supply and willow, aspen, cottonwood or birch vegetation. Major dietary items are leaves and bark of deciduous trees and shrubs as well as roots and stems of aquatic vegetation, sedges. Beavers are trapped mainly for commercial use, but in some areas are also used for human and dog food.

MUSKRAT (Ondatra zibethicus)

This species is found throughout the planning unit with dense populations occuring in the Yukon-Kuskokwim delta. The muskrat distribution is dependent upon wetland distribution. Food items are a variety of sedges, aquatic plants, invertebrates and fish. Most muskrats are taken for commercial sale of fur, but some are used domestically.

HOARY MARMOT (Marmota caligata)

Hoary marmots are found in mountainous terrain where they prefer the precipitous sides of canyons and valleys where large boulders provide sufficient protection. They consume

tender stems and leaves of grasses and forbs. There is little commercial use of marmot fur.

ARCTIC GROUND SQUIRREL (*Spermophilus parryii*)

The Arctic ground squirrels inhabit well-drained tundra from sea level to uplands where loose soils provide easy burrowing and low vegetation allows easy viewing of surrounding terrain. They are most abundant in mountainous terrain. Ground squirrels feed on seeds roots and bulbs, plant stems and leaves, mushrooms, insects, carrion and bird eggs. The ground squirrel is used for both furs and food.

RED SQUIRREL (*Tamiascuirus hudsonicus*)

The red squirrel is abundant along rivers with heavy spruce stands since this species is highly dependent upon spruce seeds as a food source. The red squirrel is taken for food, fur, and trap bait.

NORTHERN FLYING SQUIRREL (*Glaucomys sabrinus*)

The flying squirrel is rae in the Planning Area. It is typically found in the mature forest stands along drainages.

Flying squirrels eat a variety of seeds, fruits, and other vegetable material.

WOLF (*Canis lupus*)

The wolf exists in nearly all types of climates and terrains in the Planning Area. It is common from the Yukon-Kuskokwim delta to the foothills of the Alaska Range. Prey items include all ungulates, many smaller mammals, birds and fish. The wolf is an important fur producer, and there is a high demand for their pelts. Harvest of this species is controlled and closely monitored by ADF&G.

WOLVERINE (*Gulo gulo*)

The wolverine is distributed throughout the Planning Area. Specific habitat requirements are unknown but ample food sources apparently are a key requirement. Almost any item from fruit to the largest ungulate constitutes food. Wolverine fur is prized for parka trim, and tourists purchase skins mounted as rugs.

BISON (*Bison bison*)

Bison were introduced into Alaska during the late 1920's. They are predominantly grazing animals, preferring a diet of grasses, herbs and sedges over shrubs. They typically exhibit periodic movements to seek different pasturages as well as to reach more traditional calving and rutting areas. In Alaska bison summer ranges are often created by fire, silt deposition and changes in stream channels. Winter ranges are usually poorly drained areas such as bogs, stream banks and margins of sloughs and ponds.

There is a herd of bison in Game Management Unit 19 along the south fork of the Kuskokwm River near Farewell (wildlife overlay 15-4, Bear, Moose, and Bison). This herd is reported to be increasing in numbers.

MOOSE (*Alces alces*)

The moose is one of Alaska's most important wildlife species. Not only do rural Alaskas depend upon this species for subsistence, but sport hunting of the moose adds millions of dollars annually to the state's economy. The moose is a particularly successful species capable of utilzing nearly all habitats in

the planning unit. Large groups often concentrate at or near timberline during the fall rut and then move to several plains communities along floodplains or climax willow associations at higher elevations during the winter. These areas provide browse during the most critical season of the year. Local seasonal concentrations occur in the planning unit and are identified on wildlife overlay 15-1, Caribou Range.

GAME MANAGEMENT UNIT 18

Winter concentrations of moose are known to occur along the Yukon and upper Tuluksak Rivers as well as the Kuskokwim River upstream from the confluence with the Tuluksak River.

GAME MANAGEMENT UNIT 19

Winter concentrations of moose are known to occur along the Kuskokwim between Lower Kalskag and Napaimiut as well as between Red Devil and the headwaters of major northeastern tributaries such as the North Fork, East Fork, Nixon Fork and South Fork of the Kuskokwim and Big River. Winter concentrations also occur along major tributaries to the Kuskokwim such as the Takotna River, Swift River, upper Hoholitna and Holitna Rivers and the Aniak River. Winter concentrations in the

higher elevation climax willow associations occur along the western foothills of the Alaska Range and the Kuskokwim Mountains. In addition to these winter concentrations, summer and/or fall concentrations of moose are known to occur along the mainstream of the Kuskokwim River from downstream of McGrath to its headwaters, along the foothills of the Alaska Range, upper South Fork of the Kuskokwim River, the flat pothole country between the Lower Pitka Fork and the Katlitna River, headwaters of the Swift River, and the upper Holitna and Hoholitna Rivers.

GAME MANAGEMENT UNIT 20

The pothole and lake country east of Lake Minchumina is known to support year-round concentrations of moose.

GAME MANAGEMENT UNIT 21

Winter concentrations of moose have been identified along the entire length of the Yukon River and the Innoko River and its major tributaries such as the Iditarod River, Mud River, Dishna River and the North Fork of the Innoko River. Fall concentrations occur between the headwaters of the Innoko

River and Tolstoi Creek, and to the south of Holy Cross and east of the Yukon River. Spring and summer concentrations are also known to occur south of Holy Cross.

GAME MANAGEMENT UNIT 22

Drainages of the Unalakleet River and its tributaries are known to support winter concentrations of moose.

CARIBOU (*Rangifer tarandus*)

The barren ground caribou is a migratory big game animal that is seasonally abundant in parts of the Planning Area. This gregarious species typically uses different portions of its range for calving, summer, breeding, fall and winter activities. The characteristics of each of these seasonally used habitats is different and the degree of use they receive varies from year to year as herd size and movement patterns change. Because of these changes in use patterns, resource managers must consider historic use of range as well as present use. Such areas with little or no present use may become important again in the future as use patterns change. Wildlife overlay 15-1 presents known caribou range, including historic areas, in the Planning Area.

GAME MANAGEMENT UNIT 18, 22, AND WESTERN PART OF 21

These units will be discussed together since a disjunct herd or several small herds range through portions of all three units. This range is bounded by the Yukon River on the east and south and by Norton Sound on the west. Some confusion trhstfinh the composition of this herd or herds exists. Historic records indicate large migrations of caribou north and south along the highlands east of Norton Sound in the late 1800's (Skoog, 1968). Whether these aniamls were part of the herd presently identified as the Western Arctic Herd or were a herd endemic to the area is debatable. A remnant population (possibly the endemic herd), locally referred to as the Andreafsky herd, presently ranges in the headwaters of the Andreafsky River. To add confusion to this argument is the fact that the domestic reindeer were grazed along Norton Sound until the 1950's and some of the scattered caribou herds seen in this region today may be descendants of feral reindeer-caribou crosses. Local people from villages along Norton Sound report annual fall movements of caribou from the north and along the coastal highlands to as far south as the Blackburn Mountains. These animals are reported to move back north along the highlands adjacent to the Yukon River during late winter. The magnitude and southern extent of this migration

is reported to vary from year to year. It is, however, dependable enough that Natives maintain hunting camps along the Ungalik and Shaktoolik Rivers where animals ford. Some caribou may reside year-round in the Unalakleet drainage as small herds of mature bulls were observed along the North Fork of the Unalakleet by BLM biologists during the summer of 1980.

From these records and reports, it is probably safe to assume that the subject area in Game Management Units 18, 21, and 22 has the potential of being suitable caribou range.

GAME MANAGEMENT UNIT 19, 20, AND EASTERN PART OF 21

All of Game Management Unit 19 and major portions of units 20 and 21 within the Planning Area are identified as caribou range. These areas are used in part by the Beaver, Mulchatna and McKinley herds. Known winter concentration areas are located in the Iditarod River, Dishna River-Tolstoi Creek drainages, the Kuskokwim Mountains, the Mystery-Sunshine Mountains complex, Lake Minchumina-Alaska Range Foothills area and an area between Medfra, Nikolai and Big River. An additional winter concentration of caribou is known to occur in the headwaters of the Hoholitna River-Mulchatna River and Tundra Lake area.

Two calving areas have been identified, the Twin-Turquoise-Telequana Lakes area in Game Management Unit 19 and Beaver Mountains area in Game Management Unit 21.

Summer concentrations occur in the Beaver Mountains; Madison Mountain-Twin Mountain-Cloudy Mountain-Fossil Mountain complex. The seasonal movements between this summer concentration area and associated winter concentration areas is shown on wildlife overlay 15-1, Caribou Range. Summer concentration areas also occur in the Sischu Mountains, foothills of the Alaska Range and the Lyman Hills. Migration between the Lyman Hills summer area and the Pitka Fork winter area occurs along Big River and the Windy Fork of the Kuskokwim River. Seasonal movements also occur along the South Fork of the Kuskokwim River, Stony River and along the foothills of the Alaska Range.

BLACK BEAR (*Ursus americanus*)

The black bear is locally common throughout the Planning Area, with the possible exception of the Yukon-Kuskokwim delta. Typically, its distribution coincides closely with the distribution of forests. Black bears have a preference for open forests composed primarily of fruit-bearing pioneer shrubs and

herbs, lush grasses and succulent forbs rather than heavy mixed timber. Extensive open areas are generally avoided. Black bears are opportunistic feeders having a diverse and variable diet. In the spring grasses, sedges and herbaceous plants are consumed. These foods are supplemented by a variety of berries during the summer and fall. Generally, animal matter is a minor portion of the diet, however, when readily available such as during salmon runs, animal matter makes up a major portion of the diet for brief periods of time.

BROWN/GRIZZLY BEAR (*Ursus horribilius*)

This species is distributed over most of the planning unit; however, local population densities may vary from abundant to absent. The grizzly bear is most at home in open tundra and grasslands. Brown/grizzly bears winter in dens generally located on hillsides or high on mountain slopes. The grizzly bear's diet includes a wide range of animal and plant foods and varies considerably between different areas and at different seasons. Typically in the spring, grasses and herbaceous plants form a major portion of the diet. Fruit and berry producing plants are consumed during the summer and fall. Animal foods include small rodents, insect larvae, ungulates and carrion. Bears often concentrate along streams with

salmon runs during the run to feed on fish. Wildlife overlay 15-4 illustrates known denning areas and concentrations in the planning unit.

GAME MANAGEMENT UNIT 20

Grizzly/brown bears are common in the portion of GMU 20 that lies within the Planning Area. They are known to den in the high country to the south of Foraker River.

GAME MANAGEMENT UNIT 19

The brown/grizzly bear is locally abundant in this game management unit. Two major denning areas have been identified, one to the north and west of the upper Tutlawiksak River, and one at the headwaters of the Chukowan and Kogrukluk Rivers north and east of Nishlik Lake.

Several streams in this game management unit are also known to have bear concentrations during salmon spawning runs. These include Holitna River, Anvik River and Kogrukluk Rivers.

GAME MANAGEMENT UNIT 18

Brown/grizzly bears are found throughout this unit; however, they are more common on the higher-elevation portion along the east boundary. Streams known to have concentrations during salmon spawning runs include the upper portions of the Eek River, Kwethluk River, Kisaralik River and Tuluksak River.

GAME MANAGEMENT UNIT 21

Brown/grizzly bears occur in this unit; however, no denning sites or seasonal concentration areas are known.

GAME MANAGEMENT UNIT 22

Brown/grizzly bears are locally abundant in this unit. Seasonal concentrations occur along the upper Unalakleet and North Rivers during salmon spawning runs.

ENDANGERED SPECIES

The only endangered species known to occur in the Planning Area at this time is the Peregrine falcon (*Falco peregrinis arratun*). This species is migratory, generally arriving in

the boreal forests of Alaska in late April and departing for central and South America by September. Birds generally nest on traditional cliffs, bluffs, or cutbanks, but have been known to nest in trees. In the interior of Alaska peregrines feed primarily on shorebirds, waterfowl and various small birds. This feeding pattern results in a typical association of their nesting areas with water bodies or rivers.

Since the early 1950's populations of the peregrine have declined significantly throughout the world. The primary cause of this decline is attributed to poor reproductive success because of contamination by pesticide residues. Although Alaska is now the only state where significant numbers of peregrine falcons nest, numbers have declined by 40 to 60 percent during the last 20 years. In order to manage this endangered species and aid its recovery to acceptable numbers various Federal and state agencies have conducted surveys of active and historic nest sites during the last decade. This information is not only important in protecting active nests but also in protecting historic nests available for future use as populations rebound.

Known active and historic peregrine falcon nest areas are identified on wildlfe overlay 15-3. A historic nest site has been reported on the North Fork of the Kuskokwim River up-

stream from its confluence with the East Fork (Pers. Commun. Pete Shepard, ADF&G). A second historic nest on the Kuskokwim River is located in the Vinosale Mountain area. This nest was active until the mid-1950's (Pers. Comm. Pete Shepard, ADF&G). The Georgetown area supported peregrines until about 1976 (Pers. Commun., Pete Shepard, ADF&G) and a nest on the Tuluksak River during the early 1960's has been reported by Douglas Wier (Pers. Commun.). In 1978 Lawrence Hanslee, state fish and game biologist, located an active peregrine falcon tree nest on Folger Creek, a tributary of the Innoko River.

Active nest sites have been observed during 1979 and 1980 by BLM biologists and/or Alaska Fish and Game Biologists on the Tatlawiksuk, Lower Kuskokwim, Kisaralik and Holokuk Rivers. In addition, Springer et al (1979) reported 15 active nests on the Yukon River between Galena and St. Marys.

OVERLAYS, WILDLIFE HABITAT

15-1 Caribou Range
15-2 Game Management Units
15-3 Waterfowl, Peregrine Falcon, and Sea Birds
15-4 Bear, Moose, and Bison

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

INTRODUCTION

Wildlife habitat management, in line with the wildlife population management goals of the Alaska Department of Fish and Game, is one of the most important considerations on BLM managed land. The agencies' recent transfer of historically important hunting and fishing areas with programs that restrict this activity has increased the sports value of wildlife and habitat on BLM managed lands. As a result, wildlife habitat management opportunities must be given equal consideration with other resource development opportunities when weighing alternatives for land use allocations.

GENERAL OPPORTUNITIES

At a minimum, the status quo should be maintained. Following are studies and inventories that may be required before specific land use allocations are made that would change the habitat condition.

Detailed habitat information is currently available for only a few local areas. Most habitat information is extremely general and not sufficiently detailed to provide a basis for many management decisions. An opportunity exists to inventory wildlife habitat through remote sensing in all BLM administered blocks. Surface resources, including wildlife habitat, are currently being inventoried in parts of the planning unit through computer processing of satellite imagery and aerial photography. A continuation of this effort would assist in completing a more detailed habitat inventory.

Land use actions, such as permitting powerline rights-of-way, mining activities, and hydroelectric developments, are occurring now. In some instances, it is believed that these activities are interfering with the natural wildlife use patterns. An opportunity exists to determine where and when such activities have an impact on the wildlife community and to establish a plan to allow for conflicting use when and where the impact is minimal. Through cooperation with appropriate state and federal agencies the most acceptable locations for hydroelectric development and resulting utility corridors could be ascertained relative to impact on fish and wildlife resources, and practical mitigation of mining impacts could be determined and tested.

The Bureau's fire management program has effectively reduced over time the average number of acres by natural fires. Natural burns have played an important part in keeping the spruce forests open and in maintaining habitats with successional stage plants which are of primary importance to various kinds of wildlife. An opportunity exists to mainipulate some habitats and make openings in the forests of a predetermined size either by prescribed burns or by mechanical removal of vegetation. Location and optimal size of places where habitat manipulation would be most beneficial must first be determined. This manipulation would bring the overall landscape pattern back to a more natural configuration. BLM's current fire management study and fire management plans should provide recommendations and methods for this.

Detailed inventories of sensitive species such as the endangered Peregrine falcon have not been completed on all of the Planning Area. An opportunity exists to complete such surveys and explore habitat management techniques such as establishing Areas of Critical Environmental Concern that would improve, protect or increase sensitive species populations.

SPECIFIC WILDLIFE OPPORTUNITIES

The specific wildlife opportunities identified by federal, State and local agencies and private groups will be presented geographically by ADF&G game management units. These opportunities are by no means all-inclusive, but rather only those that were identified during interviews with the public during the planning process. Other opportunities will undoubtedly be identified as the Southwest Regional Plan is developed, refined, and implemented. The location of each opportunity presented in the following discussion is numerically identified on overlay 15-1 (Wildlife Habitat Opportunities).

GAME MANAGEMENT UNIT 18

That portion of the Fog River drainage on BLM-admministered land has been identified as potential moose wintering habitat (Shown the overlay as reference number 1). To improve availability of browse, portions of this drainage may benefit from controlled burning. A cooperative agreement with the U.S. Fish and Wildlife Service would allow manipulation for increase of moose habitat on contiguous portions of this drainage that lie within the Yukon Delta Wildlife Refuge.

The northern Kilbuck Mountains including the upper Tuluksak River may provide opportunity to manage habitat for furbearers (overlay reference 2). The abundance of seral plant stages associated with placer mining activities appears to support a large prey base for furbearing predators. This area also provides abundant forage and cover for moose and black bear and could be managed to benefit populations of these species.

BLM-administered lands in the Marshall/Russian Mission/Stuyahok area (overlay reference 3) should be managed to provide a good population of moose for subsistence and sport hunting. Such management could include controlled burning and coordination with ADF&G to utilize data from population studies being initiated in the area.

The U.S. Fish and Wildlife Service has identified benefits from fire on waterfowl nesting areas. Since BLM has fire control responsibility within the Department of Interior, interagency agreements might allow use of fire as a management tool on portions of the Yukon Delta National Wildlife Refuge (overlay reference 4).

A remnant caribou population inhabits the Andreafsky and neighboring drainages within the Yukon Delta Wildlife Refuge and on adjacent BLM-administered land (overlay reference 5).

In the past, when this herd was larger and/or animals from the western Arctic herd penetrated south into the area, these drainages and those to the north and east along Norton Sound provided important caribou habitat. Since herds typically undergo cyclical increases and declines, and since they depend upon all portions of available range at one time or another, detailed inventories of suitable range and the impacts of reindeer grazing on this range should be conducted before any grazing permits are considered. Interviews with local individuals have indicated that most of them want to obtain subsistence meat by hunting caribou rather than by entering into reindeer husbandry. In light of this attitude, the past failure of reindeer husbandry (Hanson, 1952; Stern; Arobio; Naylor; Thomas, 1977), and the presence of a remnant caribou herd in the area, building the Andreafsky caribou herd to harvestable numbers may be a valid alternative to permitting reintroduction of reindeer into the area.

GAME MANAGEMENT UNIT 19

Several known active Peregrine falcon nesting territories occur on or immediately adjacent to BLM-administered lands in this unit. Special precautions should be given to the management of federal lands around these nests to insure their continued success. Development on BLM lands in that portion

SPECIFIC WILDLIFE OPPORTUNITIES

The specific wildlife opportunities identified by federal, State and local agencies and private groups will be presented geographically by ADF&G game management units. These opportunities are by no means all-inclusive, but rather only those that were identified during interviews with the public during the planning process. Other opportunities will undoubtedly be identified as the Southwest Regional Plan is developed, refined, and implemented. The location of each opportunity presented in the following discussion is numerically identified on overlay 15-1 (Wildlife Habitat Opportunities).

GAME MANAGEMENT UNIT 18

That portion of the Fog River drainage on BLM-admministered land has been identified as potential moose wintering habitat (Shown the overlay as reference number 1). To improve availability of browse, portions of this drainage may benefit from controlled burning. A cooperative agreement with the U.S. Fish and Wildlife Service would allow manipulation for increase of moose habitat on contiguous portions of this drainage that lie within the Yukon Delta Wildlife Refuge.

The northern Kilbuck Mountains including the upper Tuluksak River may provide opportunity to manage habitat for furbearers (overlay reference 2). The abundance of seral plant stages associated with placer mining activities appears to support a large prey base for furbearing predators. This area also provides abundant forage and cover for moose and black bear and could be managed to benefit populations of these species.

BLM-administered lands in the Marshall/Russian Mission/Stuyahok area (overlay reference 3) should be managed to provide a good population of moose for subsistence and sport hunting. Such management could include controlled burning and coordination with ADF&G to utilize data from population studies being initiated in the area.

The U.S. Fish and Wildlife Service has identified benefits from fire on waterfowl nesting areas. Since BLM has fire control responsibility within the Department of Interior, interagency agreements might allow use of fire as a management tool on portions of the Yukon Delta National Wildlife Refuge (overlay reference 4).

A remnant caribou population inhabits the Andreafsky and neighboring drainages within the Yukon Delta Wildlife Refuge and on adjacent BLM-administered land (overlay reference 5).

In the past, when this herd was larger and/or animals from the western Arctic herd penetrated south into the area, these drainages and those to the north and east along Norton Sound provided important caribou habitat. Since herds typically undergo cyclical increases and declines, and since they depend upon all portions of available range at one time or another, detailed inventories of suitable range and the impacts of reindeer grazing on this range should be conducted before any grazing permits are considered. Interviews with local individuals have indicated that most of them want to obtain subsistence meat by hunting caribou rather than by entering into reindeer husbandry. In light of this attitude, the past failure of reindeer husbandry (Hanson, 1952; Stern; Arobio; Naylor; Thomas, 1977), and the presence of a remnant caribou herd in the area, building the Andreafsky caribou herd to harvestable numbers may be a valid alternative to permitting reintroduction of reindeer into the area.

GAME MANAGEMENT UNIT 19

Several known active Peregrine falcon nesting territories occur on or immediately adjacent to BLM-administered lands in this unit. Special precautions should be given to the management of federal lands around these nests to insure their continued success. Development on BLM lands in that portion

of the Tatlawiksuk River drainage (overlay reference 6) where an active eyrie occurs should be limited to assure minimal disturbance to the nesting pair while providing maximum hunting territory. This may be accomplished by declaring the area an Area of Critical Environmental Concern.

Through joint agency efforts, the hunting territories of Peregrine falcons nesting on state or private lands (overlay reference 7) along the Kuskokwim and Yukon rivers and their tributaries should be determined so that special management considerations can be given to those portions of adjacent BLM administered land that are used by the birds. In addition, surveys of rivers on or adjacent to BLM lands should be made to determine if additional nesting territories exist. Known active nesting territories and historical territories on BLM lands should be visited annually by qualified raptor biologists to monitor use and nesting success.

GAME MANAGEMENT UNIT 21

Optimum big game and furbearer production is the major ADF&G objective in this management unit. Since this unit includes lands extending from near Norton Sound to the western base of the Alaska Range, specific management objectives vary locally. The identification and accomplishement of objectives will

require close coordination between habitat and population managers as well as intelligent management decisions. Many of the wildlife populations inhabiting this unit are healthy and located in remote areas. ADF&G feels that maintaining the status quo of these areas is a primary objective. A complete and thorough inventory of wildlife and habitat should be completed by BLM and ADF&G before habitat manipulations are considered. Such inventories should be a joint effort. Moose is an important species in Unit 21, supporting both locally heavy subsistence and sports hunting. Populations are high in much of the northern part of the Kuskokwim Mountains (overlay reference 8) along the headwaters of the Nowitna, North Fork of Kuskokwim, Nixon and Sulukna rivers. (R. Quimby, ADF&G, Pers. Comm.). Access to this area is very limited, and hunting pressure is low. To insure optimum habitat use and allow more effective management through removal of excess animals by hunters, BLM should either develop or allow development of unimproved landing strips in the northern Kuskokwim Mountains.

Brown/grizzly bears are abundant along several BLM-managed drainages in Game Management Unit 21. Little is known about these populations, and their numbers and habitat use should be quantified. One of the better populations inhabits the relatively inaccessible Anvik River drainage (overlay reference 9). This population is, in part, the result of large numbers

of salmon spawning in the Anvik (see fisheries discussion). The ADF&G would like to insure continued high bear productivity while increasing the opportunity for sports hunters to take trophy bears. Maintaining large salmon runs, prohibiting domestic animal herding, and limiting access would assist considerably with this goal. BLM, with the assistance of ADF&G should consider permitting the construction of unimproved airfields and cabins in inaccessible areas to provide access and shelter to hunting parties. These developments would not only improve access and distribute hunting pressure throughout the drainage but would also provide ADF&G with a tool for population management by allowing them to monitor and control the number of animals harvested. Population and habitat use inventories should be conducted jointly by BLM and ADF&G before a decision is made to allow the above mentioned development.

The furbearer population in Unit 21 (overlay reference 10) is considered to be good and supports a thriving trapping industry (Quimby, ADF&G, Pers. Comm.). Since little is known about the furbearer populations and habitat use on BLM-administered lands, ADF&G would like to maintain the status quo and delay management through habitat manipulation until the populations and their dependence on the habitat is ascertained. It may be practical to include studies of small game, an important

producer of subsistence meat to the villages, in such efforts. Studies should be conducted jointly by BLM and ADF&G.

GAME MANAGEMENT UNIT 22

Again, The ADF&G has identified optimum big game and furbearer production as the major management objective for this game unit. Accomplishment of this objective will require close coordination between habitat and population managers and intelligent management decisions.

The moose population in the Unalakleet drainage (overlay reference 11) is presently below carrying capacity (Grauvogle, ADF&G, Pers. Comm.). ADF&G feels that adequate winter habitat is available to support a larger population than presently exists and that this habitat is maintained through natural occurrences such as meandering stream channels. There is a high level of subsistence hunting pressure on the population near Unalakleet; however, pressure is lower on animals inhabiting BLM administered lands. Pressure on this portion of the population will likely increase during the next few years, requiring more stringent management. BLM could assist with the management of habitat by assisting ADF&G wth moose inventories and habitat use analysis investigations.

The furbearer populations are high in this game unit (overlay reference 12) and support a growing trapping industry. Since a majority of the furbearing species are dependent upon mature flood plain forests, fire should be suppressed and timber harvest minimized in such habitat. Also, BLM should consider allowing permits for trapline shelters. This would allow trapping farther from settled areas, distributing pressure more evenly throughout the Unalakleet River drainage. Opportunities to assist ADF&G with furbearer habitat use-investigations will likely develop as the trapping industry grows in this region.

Brown/grizzly bear populations are good in portions of the Unalakleet River drainage (overlay reference 13) on BLM-administered land in Unit 22. Trophy hunting for these animals is presently concentrated around accessible areas. This pressure could be more evenly distributed throughout the unit by allowing permits for cabins. These shelters would allow hunters to operate in more remote areas and would assist ADF&G with the monitoring of harvests and with population management. Location of areas to be designated open for cabin permits should be identified with the assistance of ADF&G. This would provide a tool for population management by directing hunting pressure toward portions of the unit supporting harvestable numbers of bears.

That portion of the southeastern coast of Norton Sound administered by BLM appears to be seasonally important to brown/-grizzly bears (overlay reference 14). Animals emerging from winter dens concentrate along the beaches of this area to feed on the carrion, (primarily marine mammals), that washes ashore. Special management consideration should be given to this area to insure its continued availability.

A final concern for the continued quality of wildlife habitat in Game Management Unit 22 is centered around the possibility of BLM's allowing reindeer on public lands (overlay reference 15). Based on the history of reindeer herding on the Seward Peninsula, predators would be extirpated from the range and caribou/reindeer conflicts would arise. Since much of the BLM-administered land in this unit support good predator populations, a real concern for their continued value as a wildlife resource exists. A Caribou population is at least occasionally dependent upon portions of this planning block. The Northern Arctic herd is known to use portions of the Unalakleet drainage occasionally during its winter southerly migration. The Planning unit has historically supported relatively high numbers of caribou (Vanstone, 1979; Skoog, 1918; Lent, 1966) indicating its potential as habitat. Reindeer were herded on portions of the Unalakleet River drainage during the first part of this century (R. Stern; E. Arobio; L. Naylor; and W. Thomas, 1977). Much of the range was severely

overgrazed during this period and has not yet fully recoverd (Pegau, ADF&G, pers. commun.). Detailed inventories of suitable range and the impacts of reindeer herding on both the range and resident wildlife populations should be conducted before any grazing permits are considered. While a cursory range inventory by BLM was initiated in 1980, no investigation of the impacts of reindeer herding on wildlife populations has been developed. Such an effort should involve at least BLM and ADF&G as well as other local, State, and federal agencies and groups such as the Institute of Arctic Biology or Cooperative Wildlife research Unit at the University of Alaska.

To maintain quality furbearer and predator populations as well as optimize big game production, the development of the petroleum, timber, and mineral industry in this planning block should be closely monitored. Their impacts should be quantified and compensatory measures developed before any permits for development are authorized. Loss of valuable wildlife habitat on the river flood plains should be minimized by limiting road construction in these areas. Crossing of flood plains by roads should be limited and should only occur in a way that keeps impacts minimal, i.e., crossing by the shortest route possible and perpendicular to valley. Other forms of public access to BLM lands should also be improved. This would distribute use pressure more evenly over the entire area

and could be accomplished by identifying and developing more trail and camp easements along waterways that will be transferred to private ownership. ADF&G should participate in the selection of such easements to insure that they are located where they will be most effective as a wildlife management tool.

OVERLAYS, WILDLIFE OPPORTUNITIES

15-5 Wildlife Habitat Opportunities

CHAPTER 16

FISHERIES

F I S H E R I E S

INTRODUCTION

DRAINAGES

The western planning area includes portions of four major drainages in western Alaska, all draining into the Bering Sea; (1) the Unalakleet River drainage, which drains into Norton Sound, (2) Yukon River drainage, draining into Norton Sound (3) the Kuskokwim River drainage, draining into Kuskokwim Bay and (4) the Goodnews River drainage, which drains into Goodnews Bay off of Kuskokwim Bay. The Yukon and Kuskokwim drainages comprise most of the water flowing from central Alaska. The Yukon River alone is the largest river in Alaska, draining approximately 35 percent of the state.

FISH

Historical information fish in the planning area is limited. The Alaska Department of Fish and Game (ADF&G) has some information on the major salmon producing streams in the drainages.

Information concerning other indigenous species and their habitat is also limited. Most information accumulated by ADF&G is related to commercial and subsistence fisheries, and typically includes commercial and subsistence catches, escapement estimates, and special studies.

Species of fish indigenous to the streams in the Planning Area are presented in table 16-1. Some of the more important species from a subsistence, commercial, and sport fish standpoint are all five species of Pacific salmon, Arctic grayling, whitefish, cisco, rainbow trout, inconnu, northern pike, char, burbot, and Alaskan blackfish.

FISHERIES

In 1978, the Alaska State Legislature passed the subsistence law. The law formally recognized subsistence hunting and fishing as the highest priority use. Culture in the bush is changing and will probably continue to change. In some areas subsistence fishing has declined, allowing ADF&G to liberalize commercial fishing regulations.

Generally, the commercial salmon fishery has increased since statehood in southcentral Alaska. If bush communities continue to attempt to make a transition from a subsistence-based

Table 16-1. Annotated Species List of Fishes in the Southwestern Planning Area 1/

Common Name	Scientific Name	Unalakleet River Drainage	Kuskokwim River Drainage	Yukon River Drainage
Arctic lamprey	Lampetra japonica	X	X	X
Pink Salmon	Oncorhynchus gorbuscha	X	X	X
Chum (dog) salmon	Oncorhynchus keta	X	X	X
Coho (silver) salmon	Oncorhynchus kisutch	X	X	X
Sockeye (red) salmon	Oncorhynchus nerka	X	X	X
Chinook (king) salmon	Oncorhynchus tshawytscha	X	X	X
Rain bow	Salmo gairdneri		X	
Arctic char	Salvelinus alpinus	X	X	X
Dolly Varden	Salvelinus malma		X	X
Lake trout	Salvelinus namaycush	X	X	X
Bering cisco	Coregonus laurettae	X		X
Arctic cisco	Coregonus autumnalis		X	
Least cisco	Coregonus sardinella	X	X	X
Humpback whitefish	Coregonus pidschian	X	X	X
Broad whitefish	Coregonus nasus	X	X	X
Pygmy whitefish	Procopium coulteri			X
Round whitefish	Prosopium cylindraceam		X	X
Inconnu (sheefish)	Stenodus leucichythys	X	X	X
Arctic grayling	Thymallus arcticus	X	X	X
Pond smelt	Hyponesus olidus		X	X
Rainbow smwlt	Osmerus mordas			X
Boreal smelt	Osmerus eperlanus	X	X	
Alaska blackfish	Dallia pectoralis	X	X	X
Northern pike	Esox lucius	X	X	X
Longnose sucker	Catostomus catostomus	X	X	X
Burbot	Lota lota	X	X	X
Threespine stickleback	Gasterosteus aculeatus	X	X	
Ninespine stickleback	Pungitus pungitus	X	X	X
Trout - perch	Percopsis omiscomaycus		X	X
Coastrange sculpin	Cottus aleuticus	X	X	
Slimy sculpin	Cottus cognatus	X	X	X
Lake chub	Couesinus plumbeus		X	X

1/ Modified from Alaska Department of Fish and Game, Division of Commercial Fisheries, Annual Salmon Management Reports, 1979.

culture to a cash economy, commercial fishing will play an important role in providing the economic base for the transition.

The sport fishery within the Planning Area is very limited. Except for use by a few established outfitters, lodges, and local residents, use of the resource by sport fishermen is low compared to the other fisheries.

Development of a sport fishery is limited, in part, by the remoteness of the area, by the difference of lifestyles in the bush and by availability excellent sport fishing (for non-residents) in other areas of the state such as Bristol Bay/-Illiamna area. However, it is not inconceivable that sport fishing demands could increase in the future.

HABITAT

The Alaska Department of Fish and Game has management responsibility over the species; in addition, the Department's habitat protection section is responsible for protection of fish and wildlife habitat. Therefore, BLM's efforts to maintain and improve habitat should be coordinated with ADF&G.

Most fish habitat within the planning area is undisturbed. Important components of habitat (water quality and quantity, spawning and rearing areas) are pristine. In planning future land-use activities, managers should consider the high values of fisheries and fish habitat early in the planning process.

UNALAKLEET DRAINAGE

The Unalakleet River drainage is in ADF&G's Norton Sound-Port Clarence-Kotzebue management districts. Major tributaries include the South River, North River, Chiroskey River, North Fork, and Old Woman River.

Table 16-1 lists the species present in the Norton Sound-Port Clarence-Kotzebue district (ADF&G, 1979). Most of these species are endemic to the Unalakleet River or Norton Sound. Some of the more important species include chingok, chum, pink, coho salmon, Arctic char, Arctic grayling, and white fish.

Water quality and fish habitat is, for the most part, pristine. ADF&G, 1979, indicated a number of land use projects have been initiated or are pending in the district.

SIGNIFICANT SPECIES

Chinook Salmon

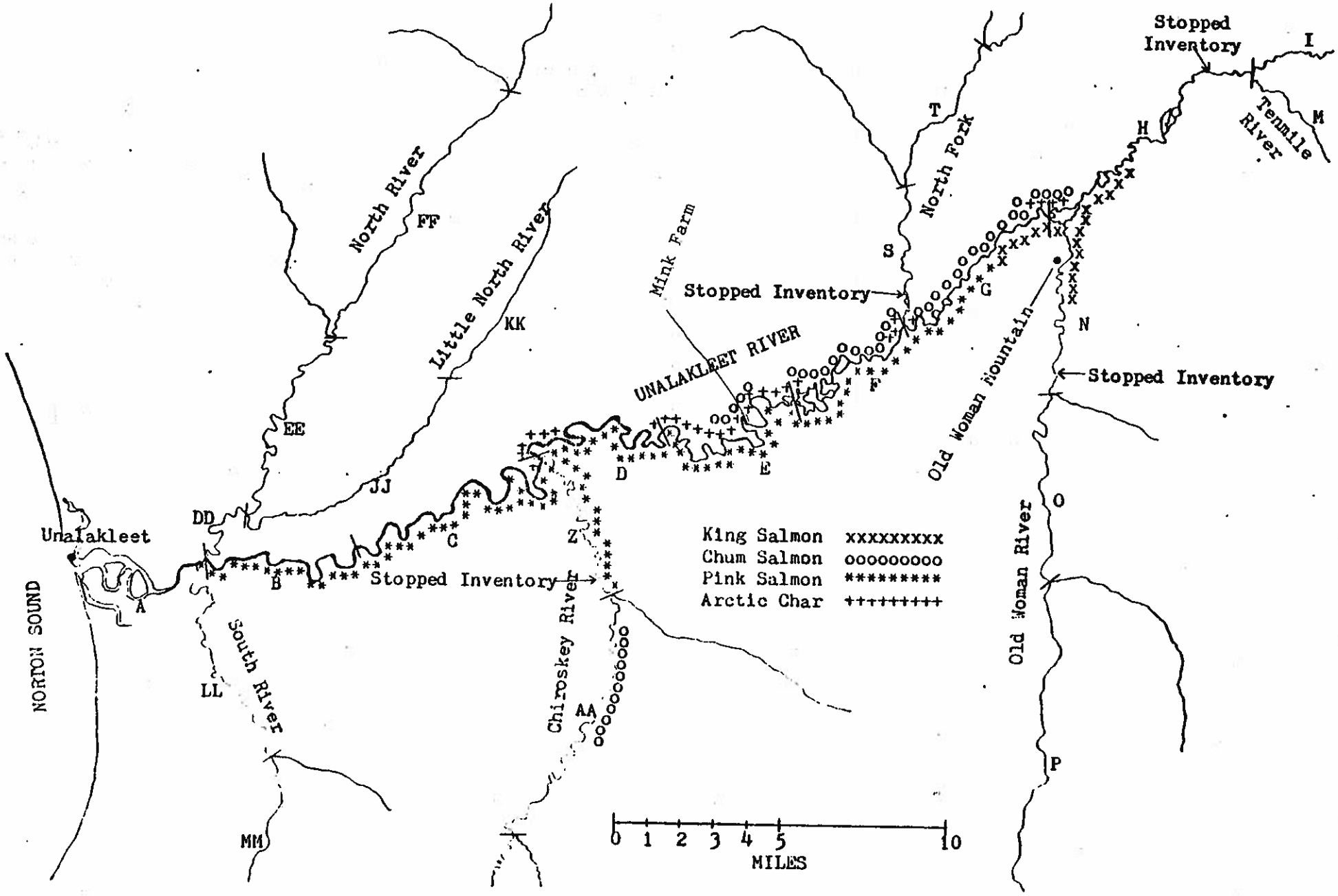
Chinook salmon are taken by subsistence, commercial and sport fishermen. Spawning is probably discontinuous in the tributaries and the main streams. However, Krieger and Humphreys (1975) observed chinook salmon spawning in the upper reaches of the river near Old Woman River. The main spawning area observed was a one mile length of Old Woman River at the base of Old Woman Mountain (figure 16-1).

Chum Salmon

Typically, chum enter the fishery during early June, with the peak occuring during late June to early July. ADF&G 1979 escapement data (which was incomplete due to inclement weather and poor counting conditions) showed 1,700 chum salmon for the Unalakleet River system. They also indicated this to be an average escapements level for chum salmon.

Major chum salmon spawning areas on the Unalakleet River observed by Krieger and Humphreys, 1975, include (1) from the braided area downstream of the North Fork to Old Woman River,

Figure 16-1 Major Observed Salmon and Char Spawning Areas, Unalakleet River Drainage



(2) a section two miles on each side of the Old Mink Farm. They also observed several large schools of spawning chum salmon downstream of Chiroskey Creek.

Pink Salmon

Pink Salmon are the most numerous salmon species that spawn in the Unalakleet system. Escapement in 1979 was 11,200 pink salmon, which was judged to be above average (ADF&G, 1979).

Pink salmon enter the river about the second or third week in June, peak about the second week in July and continue until early August. Krieger and Humphreys, 1975, reported that spawning occurred throughout the Unalakleet River from North River to Old Woman River. ADF&G reported concentrated spawning in section Z on the Chiroskey River (figure 16-1).

Coho Salmon

Coho usually enter the river system during the latter part of July and continue into late September or early October. Escapement numbers are not known, since ADF&G does not conduct aerial surveys (as of 1979). Little additional data concerning the coho salmon in the Unalakleet system are available.

Arctic Char

Krieger and Humphreys (1975) reported char entering the system about the first of July. Anadromous Arctic char migrate to the ocean during summer and return to freshwater systems in the fall. Krieger and Humphreys (1975) observed scattered concentrations of Arctic char below section C and large populations at the mouths of Chiroskey, North Fork and Old Woman Rivers (figure 16-1).

Arctic Grayling

This ubiquitous species is present throughout the Unalakleet River and its tributaries. Arctic grayling up to 2.5 pounds and 20.5 inches were taken by Krieger and Humphreys during their study.

IMPORTANT STREAMS

Krieger and Humphreys (1975) stated the North River, a tributary to the Unalakleet River, may be the single most important salmon-producing tributary in the drainage. During a stream survey with an ADF&G biologist there appeared to be more fish present in the North River than in the Unalakleet River and its other tributaries (Krieger and Humphreys, 1975).

FISHERIES

Commercial Fishery

ADF&G established a commercial fishery on the mouth of the Unalakleet River in 1961. Since then, an average of 57 permits a year have been issued.

In 1979, there were 62 commercial fishery entry permits issued. Fifty-three fishermen caught 6,354 chinook, 5 sockeye, 23,696 coho, 49,647 pink and 30,445 chum salmon (ADF&G, 1979).

The average annual commercial salmon catch from 1961 through 1979 has been 5,742 coho, 29,220 pink, 27,504 chum, and 2,836 chinook. The total average annual catch during the same period has been 65,617 salmon. The annual commercial salmon catch has ranged between 20,965 (1964) and 186,546 (1978) (See Table 16-2 for data between 1975 and 1979).

A limited commercial fishery exists for Arctic char on the Unalakleet River. In 1979, two permits were issued for a Unalakeet River beach seine fishery (ADF&G, 1979). A harvest limit of 2,500 pounds of char was applied to the subdistrict. There were no reported char catches in the Unalakleet River in 1979.

Table 16-2. Norton Sound Subdistrict Six (Unalakleet) Commercial Salmon Catch Data 1975-1979.

	SPECIES				
Year	Chinook	Chum	Pink	Coho	Total
1975	1,635	48,740	12,137	3,167	65,682
1976	1,211	24,268	37,203	5,141	67,824
1977	2,691	32,936	21,001	2,781	59,410
1978	7,525	37,079	136,200	5,737	186,546
1979	6,354	30,445	49,647	23,696	110,150
		173,468	256,188	40,522	489,612
5-year Average		34,696	51,238	8,104	97,922

Subsistence Fishery

State law requires that subsistence be considered the primary use of the fishery resource. Residents in the Unalakleet drainage utilize salmon, Arctic grayling, Arctic char, herring, smelt, cod, and whitefish for subsistence purposes.

In recent years there has been a trend of declining subsistence use of the fishery resource in the Arctic-Yukon-Kuskokwim area. The decline has been attributed to increased welfare payments, employment opportunities, and a decreased use of sled dogs. However, catch statistics do not indicate a downward trend in the Unalakleet River subdistrict (table 16-3).

Sport Fishery

The Unalakleet River provides excellent sport fishing opportunities. Besides use by residents, a lodge and guides presently operate on the river; this attracts non-residents to the area.

Krieger and Humphreys (1975) reported 35,500 summer hours were spent sport fishing by residents, mainly for coho, chum, and Arctic Char. Other species sought by sport fishermen include Arctic grayling and chinook.

Table 16-3. Norton Sound Subdistrict Six (Unalakleet) Subsistence Salmon Catch Data.

Year	Chinook	Chum	Pink	Coho	Total
1964	488	6,726	7,030	2,227	16,471
1965	521	8,791	11,488	4,562	25,362
1966	90	3,387	6,083	789	10,349
1967	490	—	9,964	484	10,938
1968	186	2,982	11,044	1,493	15,705
1969	324	4,196	4,230	1,483	10,233
1970	495	7,214	10,104	3,907	21,721
1971	911	7,073	2,230	3,137	13,351
1972	643	4,132	3,132	1,818	9,725
1973	323	3,426	6,233	213	10,915
1974	313	588	7,341	706	8,948
1975	163	2,038	4,758	74	7,033
1976	142	2,832	4,316	694	7,984
1977	723	6,085	8,870	1,557	17,035
1978	1,044	3,442	13,268	2,538	20,292
1979	640	1,597	6,960	3,330	12,527
Total	7,496	64,509	117,051	29,012	217,869
Average	468	4,032	7,316	1,813	13,616

Source: Kuhlmann et al, 1979

Non-residents spent 4,392 hours sport fishing. Sport fishing accounted for 97.2 percent of the total non-resident recreation use-hours.

The time and numbers of people sport fishing has undoubtedly increased on the Unalakleet River. It is now a Wild and Scenic river, and a well established and well known lodge operates on the river.

YUKON RIVER DRAINAGE

The Yukon River is the fifth largest drainage in North America. Originating in British Columbia, Canada, it flows over 2,300 miles to its mouth at the Bering Sea. The river drains about 333,000 square miles.

The Yukon River and its tributaries support all five species of Pacific salmon. Other common indigenous species include Arctic grayling, Arctic char, Dolly Varden, inconnu, burbot, sculpin, and several species of whitefish. Table 16-1 lists those species occurring in the river and some common marine species.

The Alaska Department of Fish and Game divides the drainage into two areas and six subdistricts for management and regulatory purposes (figure 16-2).

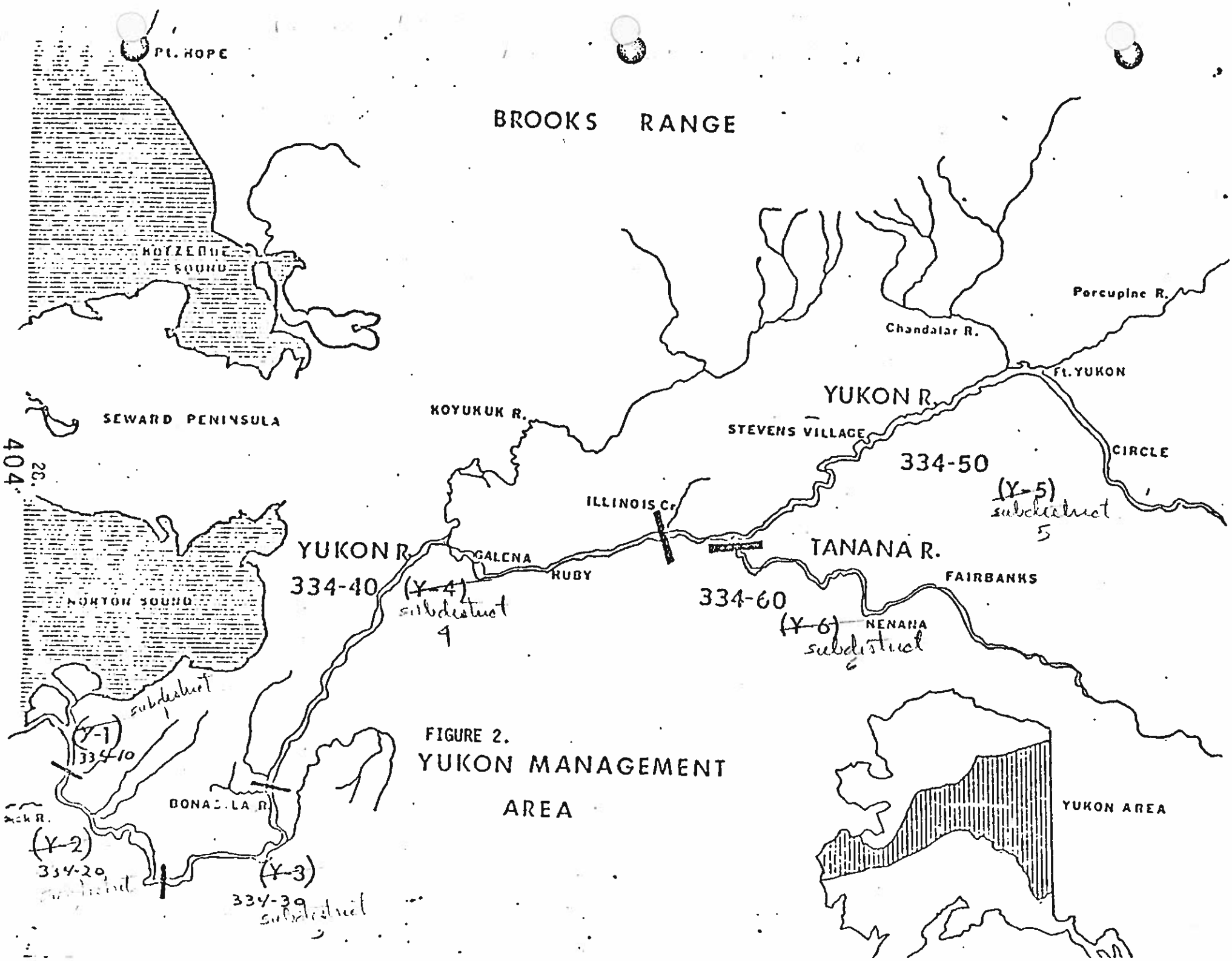


FIGURE 2.
YUKON MANAGEMENT AREA

Three subdistricts are in the lower Yukon area. The lower area includes coastal water and extends from the mouth to the Bonasila River. The upper Yukon area includes the Yukon River and its tributaries upstream of the Bonasila River to the US/Canada border.

The majority of fish habitat in the Yukon River drainage that ADO-BLM will retain lies in subdistricts three and four. The major water bodies are portions of the Innoko, Bonasila, Anvik, South Fork and Nulato Rivers.

SIGNIFICANT SPECIES

All five species of Pacific salmon are indigenous to the Yukon River drainage. Chum salmon are the most abundant, followed (in order of abundance) by chinook, coho, pink, and sockeye salmon (ADF&G, 1979).

Of the five species of salmon, chinook, chum and to a lesser extent coho are significant to residents along the river. The decline of subsistence and the expansion of the commercial salmon fishery has provided a cash income for residents. Table 16-4 indicates the dollar value estimates of the Yukon district commercial fishery.

Table 16-4 Dollar value estimates of Yukon district commercial fishery, 1961-1979. 1/

Year	Gross value of catch to fishermen				Wages earned 2/	Total income to district	Wholesale value of pack 3/	Tax revenues to state 4/
	King	Coho	Chum	Total				
1961	420,900	1,400	14,700	437,000			1,292,300	37,500
1962	330,300	11,500	20,100	361,900			1,275,250	50,400
1963	409,500	2,800	-	412,300			1,550,400	42,000
1964	351,000	1,200	2,200	354,400			1,203,800	35,000
1965	531,400	200	10,700	542,300			1,412,700	42,000
1966	419,900	9,600	25,000	454,500			1,308,100	37,000
1967	583,700	5,500	17,200	606,400	250,000	856,400	1,864,800	41,700
1968	494,300	6,700	34,000	535,000	264,000	799,000	1,655,200	47,000
1969	415,000	8,200	96,000	519,200	234,000	753,000	1,976,200	40,000
1970	401,300	10,300	211,500	623,100	185,800	808,900	2,113,100	45,000
1971	590,100	10,000	182,900	783,000	357,700	1,140,700	2,106,600	42,000
1972	547,800	20,400	215,800	784,000	445,400	1,229,400	2,405,200	45,300
1973	561,400	46,500	609,100	1,217,000	585,800	1,802,900	4,453,900	62,800
1974	881,300	28,400	1,011,300	1,921,000	500,100	2,421,100	6,035,900	84,100
1975	589,000	3,500	1,201,400	1,793,900	596,600	2,390,500	4,939,700	87,100
1976	983,500	8,600	1,158,900	2,151,000	687,600	2,838,600	6,815,500	96,900
1977	1,928,400	143,000	1,997,300	4,068,700	850,000	4,918,700	10,499,400	151,000
1978	2,133,700	79,200	3,101,800	5,314,700	1,085,700	6,400,400	14,194,800	179,400
1979	3,008,000	84,400	4,527,100	7,619,500	1,210,000	8,829,500	19,048,800	248,600

1/ Information not available for wages earned during 1961-1966.

2/ Includes wages paid to tender boat operators and resident processing plant employees in district.

3/ Based on type of processing when fish were shipped out of the district.

4/ Processors tax and vessel and crewmember licenses fees. Does not include CFEC permit fee.

Source: Geiger et al, 1979

Additional species important to residents include whitefish, sheefish (inconnu), blackfish, burbot, pike, and char.

IMPORTANT TRIBUTARIES IN THE URA

The most important tributary of the Yukon that lies within BLM planning blocks is the Anvik River. The Anvik River was inventoried in 1979. The report is included in the appendix. The data in the report indicates the large numbers of summer chum salmon that utilize the habitat of the Anvik River. Regnart (1979) indicated the Anvik River with its tributaries constitutes the single most important chum salmon producing tributary on the Yukon River drainage.

FISHERIES

Commercial Fishery

The first commercial salmon harvest in Alaska was in 1918. The fishery has evolved through various regulations and changes. Prior to 1961, most commercial catches consisted of chinook salmon. Since statehood the chum salmon commercial fishery has developed. Commercial salmon set net and drift gill net licenses have doubled and tripled respectively since 1961. Catches by subdistrict are presented in table 16-5.

Table 16-5 Commercial salmon catches by species and subdistricts, Yukon district, 1960-1979.

KING SALMON

Year	Lower Yukon Area 334-10	334-20	334-30	Subtotals	Upper Yukon Area 334-40	334-50	334-60	Subtotals	Totals
1960	50,713	15,994	-	66,707	-	-	-	884	67,591
1961	84,463	29,028	4,965	118,456	-	-	-	1,804	120,260
1962	67,099	22,224	4,687	94,010	-	-	-	724	94,734
1963	65,004	24,211	6,976	116,191	-	-	-	803	116,994
1964	67,555	20,246	4,705	92,506	-	-	-	1,081	93,587
1965	89,268	23,763	3,204	116,235	-	-	-	1,863	118,098
1966	70,788	16,927	3,612	91,327	-	-	-	1,988	93,315
1967	104,350	20,289	3,618	128,257	-	-	-	1,449	129,706
1968	79,465	21,392	4,543	105,400	-	-	-	1,126	106,526
1969	70,862	14,799	3,577	89,238	-	-	-	985	90,223
1970	57,681	17,210	3,712	78,603	-	-	-	1,666	80,269
1971	86,042	19,226	3,490	108,758	-	-	-	1,749	110,507
1972	70,052	17,855	3,841	91,748	-	-	-	1,092	92,840
1973	56,981	13,859	3,204	74,044	-	-	-	1,309	75,353
1974	71,680	17,947	3,471	93,098	685	2,663	1,473	4,821	97,919
1975	44,585	11,187	4,207	59,979	389	2,872	500	3,761	63,740
1976	62,632	17,413	4,239	84,284	385	2,900	1,102	4,387	88,671
1977	69,456	16,781	3,943	90,180	959	4,267	1,008	6,234	96,414
1978	57,890	32,335	2,917	93,142	701	3,115	644	4,460	97,602
1979	76,269	41,357	5,108	122,734	1,969	3,520	833	6,322	129,056

COHO SALMON

Year	Lower Yukon Area 334-10	334-20	334-30	Subtotals	Upper Yukon Area 334-40	334-50	334-60	Subtotals	Totals
1960	-	-	-	-	-	-	-	-	-
1961	2,855	-	-	2,855	-	-	-	-	2,855
1962	22,926	-	-	22,926	-	-	-	-	22,926
1963	5,572 1/	-	-	5,572	-	-	-	-	5,572
1964	2,446	-	-	2,446	-	-	-	-	2,446
1965	350	-	-	350	-	-	-	-	350
1966	19,254	-	-	19,254	-	-	-	-	19,254
1957	9,925	-	1,122	11,047	-	-	-	-	11,047
1968	13,153	-	150	13,303	-	-	-	-	13,303
1969	14,041	-	845	14,886	-	-	-	95	14,981
1970	12,245	-	-	12,245	-	-	-	-	12,245
1971	12,165	-	-	12,165	-	-	-	38	12,203
1972	21,705	506	-	22,211	-	-	-	22	22,233
1973	34,860	1,781	-	36,641	-	-	-	-	36,641
1974	13,728	176	-	13,904	-	909	1,427	2,336	16,240
1975	2,288	-	-	2,288	-	5	53	58	2,346
1976	4,084	17	-	4,101	-	-	1,096	1,096	5,197
1977	30,588	5,312	521	36,421	-	-	1,600	1,600	38,021
1978	16,262	5,835	758	22,855	32	7	3,066	3,105	25,960
1979	11,244	2,920	-	14,164	155	-	2,791	2,946	17,110

Table 16-5 Commercial salmon catches by species & subdistricts, Yukon district 1960-1979 (Continued)

CHUM SALMON

Year	Lower Yukon Area 334-10	334-20	334-30	Subtotals	Upper Yukon Area 334-40	334-50	334-60	Subtotals	Totals
1960	-	-	-	-	-	-	-	-	-
1961	42,577 1/	-	-	42,577	-	-	-	-	42,577
1962	53,160 1/	-	-	53,160	-	-	-	-	53,160
1963	-	-	-	-	-	-	-	-	-
1964	8,347	-	-	8,347	-	-	-	-	8,347
1965	22,936	-	-	22,936	-	-	-	381	23,317
1966	69,836	-	1,209	71,045	-	-	-	-	71,045
1967	46,148	1,425	1,880	49,453	-	-	-	-	49,453
1968	62,852 1/	1,407	3,136	67,395	-	-	-	-	67,395
1969	184,411	5,024	1,722	191,157	-	-	-	703	191,860
1970	320,138	22,394	3,265	346,357	-	-	-	907	346,724
1971	282,461	6,112	50	288,623	-	-	-	1,061	289,684
1972	250,945	33,805	1,840	286,590	-	-	-	1,254	287,844
1973	395,431 1/	109,138 1/	463	505,032	-	-	-	13,003	518,035
1974	641,663	127,644	2,273	771,580	37,079	30,382	40,202	107,663	879,243
1975	576,607	150,259	5,590	732,456	178,720	40,209	33,474	252,403	984,859
1976	382,216	120,959	14,504	517,679	213,019	6,247	24,564	243,830	761,509
1977	385,972	159,051	19,310	564,333	183,932	26,881	22,595	233,328	797,661
1978	523,557	277,086	38,728	839,371	375,617	25,907	47,934	449,458	1,288,829
1979	491,475	270,979	69,395	831,849	222,653	57,282	54,196	334,131	1,165,980

TOTAL SALMON

Year	Lower Yukon Area 334-10	334-20	334-30	Subtotals	Upper Yukon Area 334-40	334-50	334-60	Subtotals	Totals
1960	50,713	15,994	-	66,707	-	-	-	884	67,591
1961	129,895	29,028	4,965	163,888	-	-	-	1,804	165,692
1962	143,185	22,224	4,687	170,096	-	-	-	724	170,820
1963	90,575	24,211	6,976	121,763	-	-	-	803	122,566
1964	78,348	20,246	4,705	103,299	-	-	-	1,081	104,380
1965	112,554	23,763	3,204	139,521	-	-	-	2,244	141,765
1966	159,878	16,927	4,821	181,626	-	-	-	1,988	183,614
1967	160,423	21,714	6,620	188,757	-	-	-	1,449	190,206
1968	155,470	22,799	7,829	186,098	-	-	-	1,126	187,224
1969	269,314	19,823	6,144	295,281	-	-	-	1,783	297,064
1970	390,064	39,604	6,997	436,665	-	-	-	2,573	439,238
1971	380,568	25,338	3,540	409,546	-	-	-	2,848	412,394
1972	342,702	52,166	5,681	400,549	-	-	-	2,368	402,917
1973	487,272 1/	124,778 1/	3,667	615,717	-	-	-	14,312	630,029
1974	727,071	145,767	5,774	878,034	37,764	33,954	43,102	116,061	993,402
1975	623,480	161,446	9,797	794,723	179,109	43,086	34,027	256,222	1,050,945
1976	448,932	138,389	18,743	606,064	213,404	9,147	26,762	249,313	855,377
1977	486,016	181,144	23,744	690,934	184,691	31,066	25,203	241,162	932,096
1978	597,709	315,256	42,403	955,368	376,350	29,029	51,644	457,023	1,412,391
1979	578,988	315,256	74,503	968,747	224,777	60,302	57,820	343,399	1,312,146

1/ Includes small numbers of pink or red salmon.

Source: Geiger, et al, 1979

Most of the chinook salmon commercial harvest occurs in the two lowermost subdistricts shown in table 16-5. For example, in 1979, some 91 percent of the harvest was in the lower two subdistricts.

Chinook salmon harvest has declined since 1970. The annual average harvest between 1961 and 1970 was 104,371; however, the 1971-1978 annual average was 89,808 (ADF&G, 1979).

ADF&G indicates the decline can be partially be attributed to the Japanese high seas fishery. Additional restrictions on commercial fishing during the 1970's have somewhat increased escapements (ADF&G, 1979).

The chum salmon commercial fishery has been developing since statehood. Development of the chum salmon fishery was mainly a result of a decline in the subsistence chum fishery. As subsistence decreased the fall chum fishery expanded; commercial catches averaged 145,295 between 1966 and 1970 as compared to an average of 31,850 between 1961 and 1965 (ADF&G, 1979).

In 1967, commercial regulations regarding summer chum salmon were relaxed because of a decline in subsistence use of the fish. Since that time the commercial summer chum fishery has expanded sharply (table 16-6).

Table 16-6. Comparative Summer and Fall Chum Salmon Commercial Catches, Yukon District, 1961-1979. 1/

Year	Lower Yukon Area	Upper Yukon Area	Total
1961	42,577	-	42,577
1962	53,160	-	53,160
1963	-	-	-
1964	8,347	-	8,347
1965	22,936	381	23,317
1966	71,045	-	71,045
1967	47,453	-	47,453
1968	67,395	-	67,395
1969	191,157	703	191,860
1970	345,817	907	346,724
1971	288,623	1,061	289,684
1972	286,590	1,254	287,855
1973	504,931	13,003	517,934
1974	769,030	108,338	877,368
1975	740,915	252,397	993,312
1976	517,679	243,830	761,509
1977	564,333	233,264	797,679
1978	839,371	449,458	1,288,829
1979	831,849	334,131	1,165,980

1/ Modified from Geiger et al, 1979

Coho salmon play a smaller role in the commercial fishery than chinook and chum salmon (table 16-5). Harvest is usually concurrent with the chum salmon fishery. Coho salmon harvest has averaged 18,619 between 1970 and 1979.

Subsistence Fishery

About 10,000 to 15,000 Natives live in more than 45 villages along the Yukon River drainage (ADF&G, 1979). Tables 16-7 and 16-8 show the comparative chum and chinook subsistence salmon catches since 1961 by villages along the Yukon River.

In 1979, ADF&G estimated 35,205 chinook, 442,534 chum and 9,794 coho salmon were taken for subsistence purposes. Estimates on other species were 53,734 whitefish and 10,162 sheefish. Other fish that were captured by various methods for subsistence use mainly during fall and winter included blackfish, burbot, pike, char, and saffron cod.

The average catch per family of chum salmon (which is mainly used for dog food) has declined since 1961 (table 16-9). ADF&G attributes the decline to the airplane's replacing the dog sled as a mail and supply carrier and the increasing uses of snowmachines instead of the dog sled for general transportation. The slight increase in the chum salmon catch after 1975 is due to a renewed interest in sled dog racing.

Table 16-7 Comparative Yukon River c[illegible]almon subsistence catches by village, 1961 - 1979. 7/

Village	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Mouth to Anuik River											
Sheldon's Point	12,683	10,899 1/	32,577 1/	8,701	10,884	3,007	2,757	8,693	5,573	4,238	4,355
Alakanuk	8,932	5,747	17,953	11,333	21,473	9,830	9,964	14,184	15,806	10,994	7,895
Emmonak-Kwiguk	15,670	9,074	27,749	16,954	47,386	11,824	15,314	16,569	12,836	7,265	5,087
Aproka Pass & Vicinity	8,409	6,071	8,915	7,712	20,129	10,741	7,910	4,853	4,048	565	559
Kotlik-Hamilton	3,931	5,362	9,942	4,076	4,728	3,003	7,251	1,709	6,391	4,878	4,682
Subtotal	49,805	37,153	97,136	48,776	104,600	38,405	43,196	46,008	44,654	27,940	22,578
Anuik River to Owl Slough											
Mountain Village	7,373	8,331	10,106	13,593	11,475	7,548	8,305	7,312	10,676	4,865	8,214
Pitkas Point - St. Marys	8,771	10,510	7,001	12,508	14,130	8,460	9,790	9,166	11,586	14,604	13,533
Pilot Station	5,605	13,926	5,553	10,776	7,865	5,587	6,520	4,770	7,515	5,882	4,171
Marshall	5,992	6,595	8,023	10,125	6,631	3,640	3,070	3,530	6,606	4,910	6,154
Subtotal	27,741	39,362	30,683	47,002	40,101	25,235	27,685	24,778	36,383	30,261	32,072
Owl Slough to Bonasila R.											
Russian Mission	4,098	9,994	5,354	10,069	4,888	2,707	4,897	3,836	3,668	3,114	2,378
Holy Cross	21,144	20,424	12,532	31,447	25,709	4,228	22,341	10,309	6,037	4,188	2,387
Subtotal	25,242	30,418	17,886	41,516	30,597	6,935	27,238	14,145	9,705	7,302	4,765
Bonasila R. to Illinois Cr.											
Anvik	61,406	43,404	28,064	34,341	37,179	14,239	20,793	10,020	8,925	9,924	8,121
Grayling	56,284 2/	32,737 2/	18,358 2/	23,784	36,436	11,437	22,852	8,225	18,037	12,548	6,900
Kaltag	23,395	25,824	23,193	35,961	29,382	21,729	27,028	12,090	9,942	12,465	10,662
Nulato	63,163	27,948	31,742	62,446	43,988	22,017	22,521	13,242	23,853	26,456	18,369
Koyukuk	13,544	6,282	7,966	36,167	11,232	7,443	4,613	3,541	3,359	3,789	3,125
Galena	10,585	1,673	6,731	3,100	2,741	8,296	2,650	1,079	2,422	3,179	2,015
Ruby-Kokrines	15,654	18,243	15,585	30,122	17,603	5,530	10,690	2,382	5,201	8,068	13,356
Subtotal	244,031	156,111	131,639	225,921	178,561	90,691	111,147	50,579	71,739	76,429	62,548
Illinois Cr. to U.S.-Canadian Border											
Tanana	12,775	7,245	16,646	15,348	14,885	10,421	11,938	13,406	12,455	23,017	25,273
Rampart	11,722	6,962	11,209	14,963	13,462	4,056	15,763	2,636	8,935	5,252	11,435
Stevens Village	3,490	4,355	8,247	6,979	7,346	1,900	3,145	2,022	2,725	8,292	7,957
Beaver	2,975	2,334	12,119	11,359	3,274	4,135	4,292	3,619	1,965	2,378	1,870
Fort Yukon	13,252	10,255	31,219	19,407	19,402	3,960	8,983	6,564	3,338	6,354	3,498
Circle	992	800	100	2,300	-	-	-	-	-	-	2,940
Eagle	150	100	125	1,582	256	-	-	-	-	-	490
Subtotal	45,356	32,051	79,665	71,938	58,625	24,472	44,121	28,247	29,418	45,293	53,463
Innoko River											
Shageluk		3,500									
Holikachuk		100									
Subtotal		3,600									
Koyukuk River											
Huslia	-	16,000	5,455	13,913	5,101	-	5,489	3,677	2,466	4,018	1,468
Hughes	-	-	767	559	-	-	5,837	2,237	3,112	6,367	16,902
Alatna	-	-	-	-	-	-	170	99	830	1,226	609
Allakaket	-	-	1,972	-	-	-	3,929	1,391	3,254	7,759	8,773
Subtotal	-	16,000	8,194	14,472	5,101	-	15,425	7,404	9,662	19,370	27,752

able 16-7 cont.

1972	1973	1974	1975	1976	1977	1978	1979
4,355	3,554	2,720	6,247	2,033	1,327	3,420	2,177
5,696	6,551	12,743	3,656	10,866	6,591	9,583	11,252
4,828	10,135	7,388	5,336	8,397	7,501	9,826	12,634
344	580	1,460	229	231	25	473	-
3,976	7,639	6,098	6,578	10,289	7,152	9,127	9,053
18,398	27,625	33,936	17,258	31,816	22,596	32,429	35,116
5,909	7,524	11,661	6,720	8,278	11,368	6,920	13,304
11,072	9,201	14,478	8,644	12,060	12,347	10,097	12,275
7,026	8,474	8,567	7,849	5,498	5,708	4,000	6,489
5,174	4,934	6,763	5,710	3,938	2,896	2,562	7,002
29,181	30,133	41,469	28,923	29,774	32,319	23,579	39,070
2,919	2,459	4,740	4,113	2,407	2,262	1,256	1,927
3,421	3,532	4,611	4,691	1,546	5,404	939	3,474
6,340	5,991	9,351	8,804	3,953	7,666	2,195	5,401
3,689	20,850	29,261	30,924	26,660	23,847	16,021	14,950
6,428	12,778	27,421	26,476	27,500 2/	17,102	18,824	20,630
4,285	23,135	14,920	11,699	13,106	16,588	19,291	31,424
7,648	13,568	37,312	22,552	13,253	12,065	9,056	11,336
1,772	1,964	14,978	5,667	2,440	3,946	5,268	10,133
1,353	4,612	8,307	11,500	13,435	5,527	11,945	6,815
6,725	12,932	19,235	8,820	10,777	4,349	14,709	16,731
31,900	89,839	151,434	117,638	107,171	83,424	95,124	112,019
13,108	10,795	12,447	26,342	21,592	19,790	22,683	39,218
3,674	8,936 3/	1,527 3/	8,117	14,175	10,056	2,771	25,010
1,118 3/	6,078 3/	6,728 3/	2,297	1,170 9/	4,926 9/	16,460	12,413 9/
3,157	1,372	1,583	1,270	517	716	1,717	1,826
1,597	3,074	142	19,458	1,143	13,630	21,580	22,266
752	592	1,266	1,283	153	203	859	3,541
587	2,109	66	1,825	1,141	7,432	5,027	27,048
23,993	33,006	23,759	60,592	39,891	56,753	71,097	131,322
				1,577			6,647
				1,577			6,647
534	4,482	6,601	5,026	8,791	3,753	8,656	21,255
2,777	2,541	8,786	5,429	4,280	4,856	6,555	12,865
490	27	3,510	950	650	210	681	104
867	2,465	7,034	5,609	4,215	3,686	9,833	8,505
4,668	9,515	25,931	17,014	17,936	12,505	25,725	43,229

Table 16-7 cont.

Comparative Yukon River chum salmon subsistence catches by village, 1961 - 1977. (continued)

Village	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Tanana River											
Minto-Manley Hot Springs	6,486	17,228	15,493	17,628	11,358	7,152	22	740	330	540	8
Nenana	6,426	13,821	13,599	11,129	7,363	12,023	3,517	6,055	3,247	11,398	19,007
Fairbanks	-	-	-	-	-	-	-	-	-	1,072	5,655
Subtotal	12,912	31,049	29,092	28,757	18,721	19,175	3,539	6,795	3,577	13,010	24,670
Chandalar River											
Venetie	-	1,000	200	-	9,856	1,098	2,626	551	3,116	2,400	801
Subtotal	-	1,000	200	-	9,856	1,098	2,626	551	3,116	2,400	801
Porcupine River											
Canyon Village	-	210	1,566	2,316	1,531						
Chalkytsik	-	500	64	742	1,438						
Old Crow, Y.T.	-	2,800	20,000	-	7,535	7,175	11,768	10,000	3,411	620	100
Subtotal		3,510	21,630	3,058	10,504	7,175	11,768	10,000	3,411	620	100
Yukon Territory Villages 5/											
Dawson	725	3,000	1,500	3,331		50	50	50		60	
Stewart River											
Mayo-Stewart Crossing											
Fraser Falls											
Burwash-Kluane R.							250	200	760		100
Fort Selkirk					1,000	450	1,000	500	500	500	
Pelly		1,500 4/	1,500 4/		100			50	300		
Faro											
Ross River											
Minto				600	623	450	50	100	100		
Tatchun Creek											
Carmacks		2,000	2,500	250	260	100	500	200	400	50	
Lake Laberge-Whitehorse											
Takhini											
McClintock R.											
Carcross											
Teslin-Johnson's Crossing										2	
Subtotal	5,800	6,500	5,500	4,181	2,265	1,425	1,832	1,100	2,089	580	13,900
Total:	412,889 6/	358,441 6/	421,625	485,621	458,931	214,611	288,577	189,607	213,754	223,205	214,368

1/ Includes Black River catches.

2/ Includes Shageluk-Holkachuk fish camp catches.

3 Includes Fairbanks fish camp catches.

4/ Includes Minto catches.

5/ Data by village obtained from annual reports. Subtotals include revised catch data and summation of village catches may not equal subtotal.

6/ Includes pinks and cohos not provided in breakdown of catch by village data.

7/ Includes small numbers of pink and coho salmon.

8/ Catch by village not available.

9/ Includes catches made by Fairbanks permit holders who fished in Yukon River near bridge crossings.

Table 16-7 cont.

1972	1973	1974	1975	1976	1977	1978	1979
6	7	20	6,000	9,400	16,192	15,494	22,213
20,864	14,154	26,340	26,634	14,345	24,167	27,625	33,525
8,608	1,657	2,958	1,615	2,826	725	3,917	6,843
29,478	15,818	29,318	34,249	26,571	41,084	47,036	62,581
50	410	---	2,401	508	1,660	2,606	3,943
50	410	---	2,401	508	1,660	2,606	3,943
					600		
5,000	5,827	7,000	11,600	3,125	5,592	5,000	11,000
5,000	5,827	7,000	11,600	3,125	6,192	5,000	11,000
						728	2,000
	199	32					
2,000							
		14		100	650		
	327					132	
	487	1,590		200	780	350	
3,000	1,111	1,636	6,500 B/	300	2,929	1,210	2,000
151,008	219,275	323,834	300,379	262,622	267,127	299,791	452,328

Table 16-8 Comparative Yukon River king salmon subsistence catches by village, 1961-1979.

Village	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Mouth to Anuk River											
Sheldons Point	180	116 1/	921 1/	52	49	127	755	30	728	1,093	882
Alakanuk	165	53	81	87	177	263	287	205	852	589	1,116
Emmonak-Kwiguk	137	21	120	63	145	160	541	42	810	151	627
Aproka Pass & vicinity	179	181	293	73	281	645	959	147	238	23	42
Kotlik-Hamilton	111	35	195	53	131	47	162	53	551	394	328
Subtotal	772	406	1,610	328	783	1,242	2,704	477	3,179	2,250	2,995
Anuk River to Owl Slough											
Mountain Village	1,110	619	2,427	985	510	217	1,345	238	557	348	2,036
Pitkas Point - St. Marys	1,810	391	1,254	521	826	499	993	168	737	575	1,915
Pilot Station	753	219	801	237	502	440	1,534	784	367	647	1,400
Marshall	1,265	503	2,012	290	942	350	306	365	564	598	985
Subtotal	4,938	1,732	6,494	2,093	2,780	1,506	4,178	1,555	2,225	2,168	6,336
Owl Slough to Bonasila R.											
Russian Mission	1,563	641	1,392	1,185	1,393	800	2,019	2,170	707	993	839
Holy Cross	2,648	1,111	3,123	2,243	2,351	2,645	2,876	1,418	1,877	1,678	3,032
Subtotal	4,211	1,752	4,515	3,428	3,744	3,445	4,895	3,588	2,584	2,671	3,871
Bonasila R. to Illinois Cr.											
Anvik	22	51	163	153	118	144	54	114	71	67	152
Grayling	25 2/	37 2/	197 2/	124	246	85	199	208	187	155	416
Kaltag	33	224	102	330	57	47	199	60	232	124	154
Nulato	513	171	835	355	305	218	578	209	771	734	470
Koyukuk	483	423	629	209	228	93	262	398	357	30	410
Galena	626	123	282	158	260	407	210	456	263	313	574
Ruby-Kokrines	1,060	226	1,514	2,555	1,843	887	820	881	1,619	1,313	2,465
Subtotal	2,762	1,255	3,722	3,884	3,057	1,881	2,322	2,326	3,500	2,736	4,641
Illinois Cr. to U.S. Can. Border											
Tanana	2,379	332	1,414	329	524	421	151	627	683	361	428
Rampart	605	1,438	1,231	990	1,041	869	368	922	321	150	1,190
Stevens Village	650	831	1,073	325	910	620	534	787	350	851	750
Beaver	185	442	491	710	480	31	210	495	458	773	777
Fort Yukon	2,958	1,822	2,831	2,098	2,747	1,074	692	632	75	1,019	706
Circle	496	393	250	1,200	-	-	-	-	-	-	666
Eagle	875	400	500	17	100	-	-	-	-	-	111
Subtotal	8,148	5,658	7,790	5,669	5,802	3,015	1,955	3,463	1,887	3,154	4,628
Innoko River											
Shageluk											
Holikacnuk											
Subtotal											

Table 16-8 cont.

1972	1973	1974	1975	1976	1977	1978	1979
462	165	283	108	122	302	546	91
647	461	569	130	363	213	1,125	893
300	1,071	208	55	398	62	2,738	1,362
37	106	5	0	-	-	64	-
342	1,008	394	204	472	173	773	533
1,788	2,811	1,459	497	1,355	750	5,246	2,879
932	912	460	394	397	172	817	1,025
1,517	1,270	878	438	1,273	576	1,314	1,718
1,558	1,508	517	107	502	556	1,027	804
713	1,163	1,068	436	694	364	806	721
4,720	4,853	2,923	1,375	2,866	1,668	3,964	4,268
975	1,387	1,243	2,098	1,328	639	1,498	1,476
2,359	3,708	2,243	2,792	1,492	1,920	2,404	1,787
3,334	5,095	3,486	4,890	2,820	2,559	3,902	3,263
72	67	111	83	84	67	180	261
185	516	547	100	117 2/	149	292	391
83	148	616	192	57	216	127	435
364	307	1,161	1,119	968	1,531	1,354	1,245
417	564	604	50	437	752	518	495
608	510	706	1,294	435	1,155	945	1,591
2,076	2,418	2,899	912	1,959	735	1,539	2,221
3,805	4,530	6,644	3,750	4,057	4,605	4,955	6,639
1,461	965	789	80	1,338	858	1,851	1,604
1,457	2,614	452 3/	517	581	1,194	987	1,820
1,002 3/7/	1,027 3/	590 3/	362	643 7/	1,252 7/	3,178	2,194 7/
241	358	34	168	188	299	558	394
520	536	1,030	215	1,158	1,061	2,642	1,922
345	225	406	15	528	304	212	1,175
353	421	66	20	633	1,171	963	2,888
5,379	6,146	3,367	1,377	5,069	6,129	10,391	11,997
				11	-	-	62
				11	-	-	62

Table 16-8 cont.

Koyukuk River											
Huslia	-	100	32	112	9	-	7	35	16	12	5
Hughes	-	-	47	18	-	-	65	82	10	116	378
Alatna	-	-	-	-	-	-	-	1	8	2	0
Allakaket	-	-	85	-	-	-	70	3	15	128	268
Subtotal	-	100	164	130	9	-	142	121	49	258	651
Tanana River											
Minto-Manley Hot Springs	347	92	325	468	276	146	-	12	76	138	7
Nenana	310	115	213	194	157	272	252	462	465	357	2,357
Fairbanks	-	-	-	-	-	-	-	-	-	132	98
Subtotal	657	207	538	662	433	418	252	474	541	627	2,462
Chandalar River											
Venetie	-	-	-	-	-	-	-	-	7	10	-
Subtotal	-	-	-	-	-	-	-	-	7	10	-
Porcupine River											
Canyon Village	-	-	17	35	-	-	-	-	-	-	-
Chalkytsi & Kevinjik R. Fish Camp	-	-	2	2	-	-	-	-	-	-	-
Old Crow, Y.T.	-	-	44	-	94	65	43	28	27	8	9
Subtotal	-	-	63	37	94	65	43	28	27	8	9
Yukon Territory Villages 5/											
Dawson	2,231	2,000	1,500	3,476	351	50	50	100	-	40	-
Stewart River	-	-	-	-	-	-	-	100	-	30	-
Mayo-Stewart Crossing	-	300	250	150	400	100	30	-	-	-	250
Fraser Falls	-	-	-	-	-	-	-	-	-	-	-
Burwash-Kluane R.	-	-	-	-	-	-	-	-	-	-	-
Fort Selkirk	-	-	-	-	100	125	400	200	22	11	-
Pelly	-	2,000 4/	2,000 4/	1,000	300	350	600	600	200	450	450
Faro	-	-	-	-	-	-	-	-	-	-	-
Ross River	-	500	600	-	500	120	150	200	-	120	-
Minto	-	-	-	600	170	350	-	100	-	-	-
Tatchun Creek	-	-	-	-	150	-	250	100	100	60	-
Carmacks	-	3,000	2,500	700	600	1,050	1,450	1,200	450	700	1,400
Lake Laberge-Whitehorse	-	-	-	-	-	-	-	-	-	20	180
Takhini	-	-	-	-	-	-	40	-	-	-	-
McClintock R.	-	-	-	-	-	-	-	-	-	8	-
Carcross	-	-	-	-	-	-	-	-	-	-	-
Teslin-Johnson's Crossing	-	1,000	900	720	450	300	200	200	175	605	60
Subtotal	10,376	10,500	7,750	6,646	3,021	2,635	3,170	2,872	973	2,092	2,791
Total:	31,864	21,610	32,970	22,877	19,723	14,272	19,661	15,006	15,000	15,974	28,384

1/ Includes Black River catches. 2/ Includes Shageluk-Holikachuk fish camp catches. 3/ Includes New Minto fish camp catches.
4/ Includes Minto catches. 5/ Data by village obtained from annual reports. Subtotals includes revised catch data and summation of village catches may not equal subtotals. 6/ Catch by village not available.
7/ Includes catches made by Fairbanks permit holders who fished in Yukon River near bridge crossing.

Table 16-8 cont.

1	35	69	23	21	50	132	146
27	32	10	25	155	72	216	180
3	1	17	0	0	1	7	2
25	73	138	151	231	172	239	236
56	141	234	199	407	295	594	564
99	58	176	213	326	752	298	269
887	683	1,431	533	864	742	807	800
190	26	38	32	31	67	126	264
1,176	767	1,645	778	1,221	1,561	1,231	1,333
-	-	-	-	-	-	9	0
-	-	-	-	-	-	9	0
-	20	100	100	23	29	-	0
-	20	100	100	23	29	-	0
-	-	-	-	500	531	421	1,200
100	99	-	-	-	-		
-	25	233	-	-	61	105	-
-	25	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	45	-	-	-	-	-	-
380	53	433	-	200	265	500	-
-	75	-	-	-	-	-	-
35	75	30	-	-	-	-	-
15	261	-	-	-	-	-	-
-	-	-	-	-	-	-	-
1,080	1,384	2,563	-	800	1,121	1,280	3,000
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	54	20	-	-	800	600	-
1,647	2,096	3,279	2,900 6/	1,500	2,778	2,906	4,200
21,905	26,459	23,137	15,866	19,329	20,374	30,297	35,205

Table 16-9: Yukon River comparative subsistence catch and effort data, 1961-1979 (numbers per fishing family are in parenthesis).

Year	Total Catch		Equivalent Catch 1/		Mean Equivalent Catch per Family	
	King Salmon	Other Salmon 2/	King Salmon	Other Salmon 2/	King Salmon	Other Salmon 2/
1961	31,864	405,632	20,117	403,765	32	647
1962	21,610	356,754	10,217	325,244	18	577
1963	32,790	408,381	23,919	376,440	40	625
1964	22,677	485,630	14,847	458,609	25	762
1965	19,723	458,379	16,499	430,949	30	788
1966	14,272	214,235	11,507	204,913	23	416
1967	19,661	288,595	16,306	256,956	35	546
1968	15,006	189,607	11,883	170,552	25	358
1969	15,000	213,725	13,916	195,476	30	426
1970	15,794	223,237	13,474	199,163	34	498
1971	27,953	228,849	24,058	191,011	48	383
1972	21,868	151,008	19,314	129,343	46	311
1973	26,459	219,275	23,530	198,054	44	374
1974	23,137	323,834	19,014	284,977	38	580
1975	15,466	300,379	12,600	262,741	21	448
1976	19,329	262,624	16,196	235,056	25	358
1977	20,388	267,127	15,740	235,401	27	408
1978	30,297	299,791	25,496	255,447	36	360
1979	35,205	452,328	26,616	315,661	33	387

Year	Fishing Families surveyed	People in fishing families 1/	Snowmachines 1/	Sled dogs 1/	Gear operated 1/	
					Gill nets	Fishwheels
1961	624	3,626 (5.8)		4,806 (7.7)	577	169
1962	564	3,279 (5.8)		3,848 (6.8)	613	138
1963	602	4,154 (6.9)		4,214 (7.0)	716	156
1964	602	3,612 (6.0)		4,003 (6.6)	840	155
1965	547	3,993 (7.3)		3,993 (7.3)	645	127
1966	492	3,149 (6.4)		3,112 (6.3)	582	116
1967	471	2,779 (5.9)	192 (0.4)	2,752 (5.8)	530	86
1968	476	3,094 (6.5)	262 (0.6)	2,719 (5.7)	565	71
1969	459	2,984 (6.5)	349 (0.8)	2,448 (5.3)	930	63
1970	400	2,680 (6.7)	346 (0.9)	2,214 (5.5)	647	55
1971	499	3,244 (6.5)	460 (0.9)	2,226 (4.5)	795	63
1972	416	2,621 (6.3)	438 (1.0)	1,589 (3.8)	755	59
1973	530	3,339 (6.3)	571 (1.1)	2,375 (4.5)	991	83
1974	491	3,093 (6.3)	534 (1.1)	2,105 (4.3)	668	90
1975	587	3,698 (6.3)	762 (1.3)	2,585 (4.4)	1,119	126
1976	657	4,139 (6.3)	882 (1.3)	3,401 (5.2)	1,071	154
1977	577	3,635 (7.3)	785 (1.4)	3,413 (5.9)	755	164
1978	711	3,929 (5.5)	843 (1.2)	3,722 (5.2)	943	178
1979	615	4,386 (5.3)	914 (1.1)	4,623 (5.7)	1,324	179

1/ Data from villages surveyed each year since 1961: Mouth to Fort Yukon and Tanana River (does not include Fairbanks or Shageluk).
2/ Mostly chum salmon, some pinks and cohos.

Source: Geiger, et al, 1979

Sport Fishery

At the present time sport fishing pressure is light. Most pressure within the drainage is probably concentrated outside of the Planning Area near Fairbanks, Alaska.

Air operators and a limited number of outfitters provide float trips and fishing trips down tributaries of the Yukon. One of the more popular activities by parties floating rivers is fishing.

Most tributaries in the drainage would provide excellent sport fishing opportunities; however, access is limited and costs are prohibitive for many people.

Important sport species present year-round or seasonally in most systems in the area include: inconnu, Arctic grayling, lake trout, Arctic char, Dolly Varden, pike, and five species of salmon.

KUSKOKWIM DRAINAGE

The Kuskokwim River flows approximately 540 miles draining 50,000 square miles before discharging into Kuskokwim Bay in southwestern Alaska. ADF&G divides the river into three

subdistricts. Area 1 runs from Kuskokwim Bay to Tuluksak; Area 2 is from Tuluksak to Napaimiut; and Area 3 is from Napaimiut upstream to the headwaters (figure 16-3).

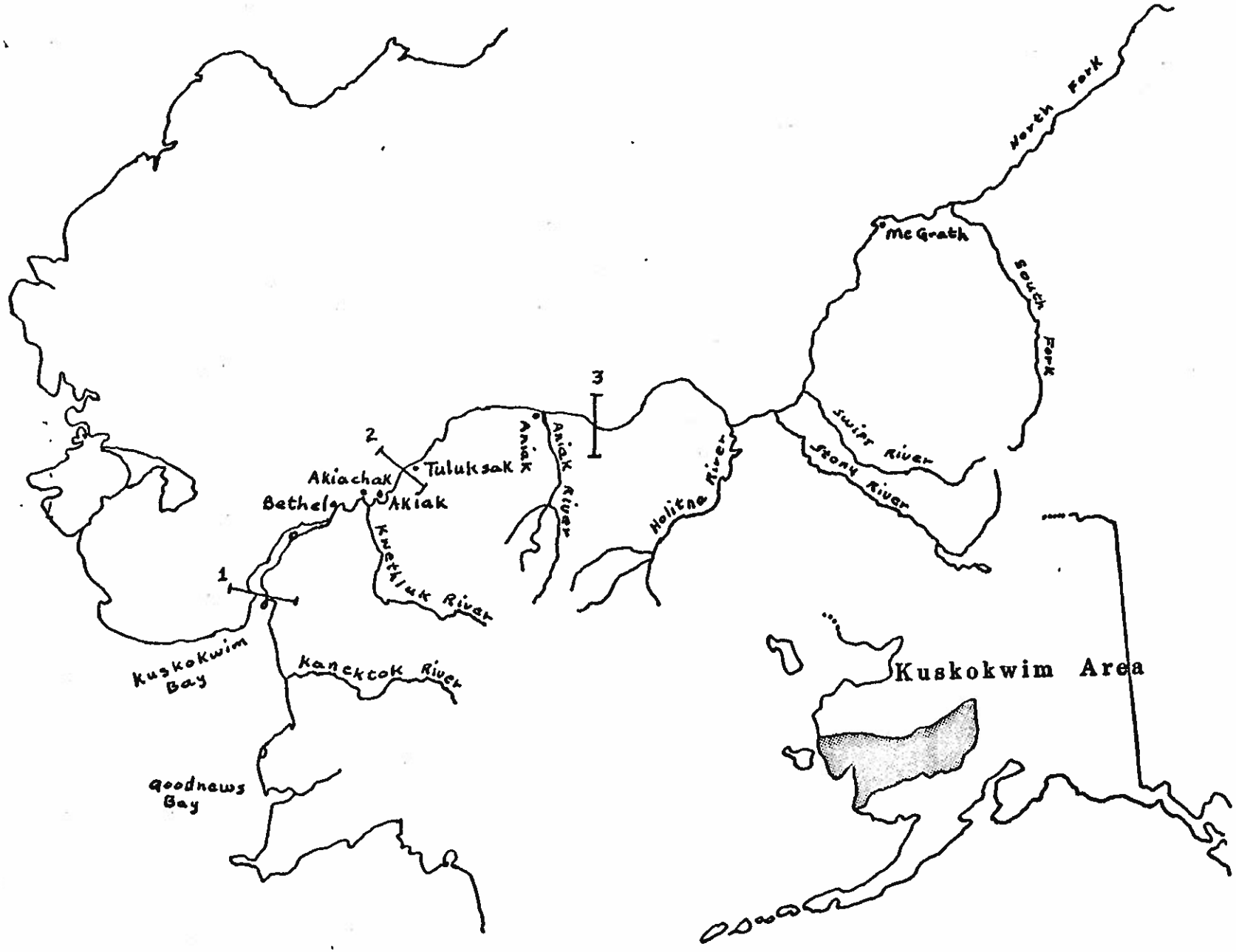
The Kuskokwim's being a large, turbid river like the Yukon probably contributes little to propagation of salmon species. The rivers major role is that it is primarily a migration corridor used by salmon to reach their spawning grounds on its tributaries. However, as with systems such as the Susitna, it could very well serve as an important overwintering area for fish.

SIGNIFICANT SPECIES

Five species of Pacific salmon are indigenous to the river and its tributaries. Other species of subsistence, commercial or sport importance that inhabit the system include: inconnu, whitefish, cisco, Alaska blackfish, northern pike, Arctic grayling and burbot. Table 16-1 lists freshwater and some estuarine species present in the system.

IMPORTANT STREAMS

Several major tributaries or portions of them will remain under BLM administration. These streams include: the Tuluksak, Oskawalik, George, East Fork, Swift, Cheenmeetmuk,



KUSKOKWIM AREA

Figure 16-3

Tatllawiksuk, Big Windy, and the Salmon (Pitka Fork) rivers. Of these streams only the Tuluksak lies within that portion of the Kuskokwim open to commercial fishing. None of these streams have the significance to salmon production on the Kuskokwim River that the Anvik River has to production on the Yukon River. Nevertheless these rivers are important to the overall production of chinook, sockeye, coho, chum, and pink salmon as well as other species in the Kuskokwim River drainage.

FISHERIES

Commercial Fishery

Most of the commercial fishing effort occurs in subdistrict 1 which runs from the Eek Island to Mishevik Slough downstream of Tuluksak. Some effort occurs in subdistrict 2 which extends from Mishevik Slough upstream to Kokmakof River near Aniak. Subdistrict 3, upstream of Kolmakof River, has been closed to commercial fishing since 1966.

Most of the lands retained by BLM lie within subdistrict three. Salmon that utilize the spawning and rearing habitat of these streams must pass through the subdistricts open to commercial fishing; therefore stream in subdistrict 3 are important to the fisheries.

Like the Yukon River commercial fishery, the Kuskokwim commercial fishery has grown since statehood. The chum salmon fishery is responsible for most of the increase, although the coho catch has also contributed (table 16-10).

The chum salmon commercial fishery has increased from a 5 year average of 15,615 (1967 to 1971) to 221,793 (1975 to 1979). Coho salmon catch during the same periods was 62,248 and 168,852 respectively. Chinook salmon catch has remained relatively stable.

Table 16-11 presents the estimated value of the Kuskokwim district commercial fishery (1969 - 1979). The district is comprised of the Kuskokwim, Ouimagak and Goodnews Rivers. Specific data on the Kuskokwim River were not available; however, for comparative purposes the Kuskokwim River supplied approximately 75 percent of the district's commercial catch during the past five years. Using the above assumption, the significance of the fishery to the residents as a cash income is apparent. In 1979, the total income to the Kuskokwim district was $3,953,000.

Subsistence Fishery

The subsistence fishery on the Kuskokwim River is important, although there is a trend toward commercialization mainly evident in the chum salmon catch (table 16-12).

Table 16-10. Kuskokwim Districts Commercial Catch by Drainage, 1960 - 1979.

Kuskokwim River1/	King	Red	Coho	Pink	Chum	Total
1960	5,969	0	2,498	0		8,467
1961	18,918	0	5,044	0		23,962
1962	15,341	0	12,432	0		27,773
1963	12,016	0	15,660	0		27,576
1964	17,149	0	28,613	0		45,762
1965	21,989	0	12,191	0		34,180
1966	25,545	0	22,985	0		48,530
1967	28,986	0	56,313	0	148	86,447
1968	34,278	0	127,306	0	187	161,771
1969	43,997	322	83,765	0	7,165	135,249
1970	39,290	117	38,601	44	1,664	79,716
1971	40,274	2,606	5,253	0	68,914	117,047
1972	39,454	102	22,579	8	78,619	140,762
1973	32,838	369	130,876	33	148,746	312,862
1974	18,664	136	147,269	37	171,887	337,984
1975 4/	21,720	23	81,945	10	181,840	285,538
1976	30,735	2,971	89,501	133	177,864	300,204
1977	35,830	9,379	241,364	203	248,721	535,451
1978	45,641	733	213,393	5,832	248,656	514,255
1979	38,966	1,054	219,060	78	261,874	521,032
5 year average	30,518	2,648	154,494	1,243	205,794	394,337

1/ Includes subdistrict 335-10, 335-20. Commercial fishing in 335-30 has been prohibited since 1966.

4/ Final catch data used.

Source: Jonrowe et al, 1979

Table 16-11. Dollar Value Estimates of Kuskokwim District Commercial Fishery, 1964 - 1979 1/

Year	Gross Value of Catch to Fishermen	Wages Earned 1/	Total Income to District	Wholesale Value of Pack 3/	Tax Revenues to State
1964	$ 83,030.00	$	$	$ 409,700.00	$ 6,100.00
1965	90,950.00			370,00.00	8,200.00
1966	87,466.00			406,500.00	8,100.00
1967	138,647.00	20,000.00	158,647.00	727,000.00	
1968	290,370.00	40,000.00+	330,370.00+	1,135,000.00	17,000.00
1969	297,233.00	60,435,00+	357,668.00+		
1970	362,470.00	127,327.00	489.797/00	1,300,000.00	20,000.00
1971	371,220.00	80,510.00	451,730.00	672,180.00	16,770.00
1972	360,727.00	86.895.00	447,622.00		
1973	827,735.00	150,000.00+	997,735.00	3,600,000.00	32,000.00
1974	1,056,042.00	150,000.00	1,206,042.00		
1975	899,178.00	165,000.00	1,064,178.00	2,000,000.00	25,000.00
1976	1,380,229.00	175,000.00+	1,555,229.00		
1977	3,891,950.00	200,000.00+	4,091,950.00		
1978	2,337,470.00	250,000.00+	2,587,470.00		
1979	3,678,000.00	275,000.00+	3,953,000.00+		

1/ Information not available for wages earned during 1964 to 1966.

2/ Includes wages paid to tenderboat operators, processing plant employees in district.

3/ Based on type of processing when fish were shipped out of the district.

Source: Jonrowe et al, 1979

Table 16-12. Utilization of Kuskokwim River Chum Salmon, 1960 - 1979. 3/

Year	Commercial Catch 1/	Subsistence Catch 2/	Total Utilization
1960		327,297	327,297
1961		185,447	185,447
1962		165,626	165,626
1963		141,550	141,550
1964		189,660	189,660
1965		283,459	283,459
1966		174,550	174,660
1967	148	205,263	205,411
1968	187	260,024	260,210
1969	7,165	198,628	205,793
1970	1,664	245,550	247,214
1971	68,914	116,391	185,305
1972	78,619	120,316	198,935
1973	143,746	179,259	328,005
1974	171,887	277,170	449,057
1975	181,840	176,389	360,560
1976	177,864	227,765	405,629
1977	248,721	213,418	462,629
1978	248,656	131,049	379,705
1979	261,874	260,836	422,710
Previous 5 Year Average	205,794	205,158	410,952

1/ Subdistricts 335-10 and 335-20.

2/ Catches are expanded and include all villages surveyed each year, 335-10, 335-20, and 335-30 to the Swift River.

3/ Includes minimal numbers of red, pink, and coho salmon.

Source: ADF&G, 1979

Chum salmon commercial catch prior to 1967 was non-existent while the subsistence catch averaged 209,169 (1960 - 1966). The average 1975 - 1979 catch distribution was 223,791 and 217,169 for the commercial and subsistence catch, respectively. Distribution of chinook salmon between commercial and subsistence fishery since 1960 has remained relatively consistent (table 16-13).

All of the commercial catch occurs in the lower two subdistricts on the Kuskokwim River. In the upper subdistrict (closed to commercial fishing) where BLM will retain management of most of the land in the drainage, traditional subsistence fishing is still important to residents.

The 1979 Kuskokwim River subsistence harvest by 850 fishing families was 55,524 chinook; 160,836 chum; and 25,099 coho salmon (ADF&G, 1979). The survey included 12 villages in the upper subdistrict that have about 94 fishing families among them (table 16-14). The combined catch among these families in 1979 was 3,268 chinook; 34,427 small salmon (chum, red, pink, and some small chinook); and 4,511 coho salmon.

Table 16-13. Utilization of Kuskokwim River Chinook Salmon, 1960-1979.

Year	Commercial Catch 1/	Subsistence Catch 2/	Total Utilization
1960	5,696	20,361	26,330
1961	18,918	30,910	49,828
1962	15,341	14,642	29,983
1963	12,016	37,246	49,262
1964	17,149	29,017	46,166
1965	21,989	27,143	49,132
1966	25,545	49,606	75,151
1967	29,986	57,875	87,861
1968	34,278	30,230	64,508
1969	43,997	40,138	84,135
1970	39,290	69,204	108,494
1971	40,274	42,926	83,200
1972	39,454	40,145	79,599
1973	32,838	38,526	71,365
1974	18,664	26,665	45,329
1975	21,720	47,784	69,504
1976	30,735	58,185	88,920
1977	35,830	55,577	91,407
1978	45,641	35,881	81,522
1979	38,966	55,524	94,490
Previous 5 yr. average	30,518	44,818	75,336

1/ Subdistricts 335-10, 335-20 and 335-30 to the Swift River.

2/ Catches are expanded and include all villages surveyed each year. Data includes a few villages not included in comparative catch tables.

Table 16-14. Kuskokwim District Subsistence Fishery Summary, 1979.

Estimated Catch and Family Data, Fishing Families Only								
Village	Families	People	Dogs	Snow-Machines	King Salmon	Small* Salmon	Coho Salmon	Fish Wheels
Eek	33	167	88	53	2,003	625	500	0
Tuntutuliak	34	211	116	67	2,268	5,300	332	0
Kasigluk	38	237	117	66	1,142	2,179	438	0
Nunapitchik	35	244	140	65	2,109	5,189	548	0
Atmautluak	25	167	175	22	2,242	5,170	117	0
Napakiak	40	218	201	50	2,191	6,281	1,738	0
Oscarville	8	48	30	15	629	956	13	0
Napasakiak	33	198	63	56	2,085	5,251	522	0
Bethel	236	1,433	710	259	11,564	21,240	9,800	0
Kwethluk	66	390	281	88	6,919	14,173	2,688	0
Akiakchak	48	352	254	72	4,818	8,403	2,056	0
Akiak	27	181	315	32	3,567	11,705	513	0
Tuluksak	29	226	185	42	1,489	4,874	375	0
Lower Kalskag	31	159	144	39	2,821	8,659	475	0
Upper Kalskag	19	116	99	26	1,590	5,955	162	0
Aniak	42	166	200	52	2,634	14,936	311	1
Chuathbaluk	12	74	77	17	2,189	5,513	1,133	3
Kapamute	3	8	19	5	149	2,057	46	1
Crooked Creek	12	59	35	9	728	3,105	36	0
Red Devil	11	49	67	6	488	7,782	504	2
Sleetmute	9	46	25	10	755	1,200	66	1
Holitna River	10	32	57	8	233	5,239	1,757	0
Stony River	9	66	48	7	171	3,355	+	2
Subtotals	810	4,847	3,446	1,066	54,780	149,147	24,130	10
Lime Village	5	25	37	0	38	3,580	75	1
Deacon's Lnd	1	4	0	0	0	0	30+	0
McGrath	18	73	122	23	581	5,398	864	2
Takotna	3	-	-	-	65+	?	?	0
Nikolai	9	-	-	-	60	2,711	15	0
Telida	4	19	-	-	?°	?	?	0
Subtotals	40				744	11,689	969	3
Totals								
Kuskokwim R.	850				55,524	160,836	25,099	13

Source: ADF&G, 1979

Sport Fishery

Sport fishing pressure is relatively light within the Kuskokwim River drainage. Most sport fishing is done on a limited basis by residents along the river. Several factors affect the amount of sport fishing in the drainage. Among them are the remoteness and cost involved to get there.

Several areas such as Bristol Bay and the Woods River system are closer and provide better fishing opportunities for sport fishing. Of the many tributaries to the Kuskokwim, the Kisaralik, Holitna and Hoholitna Rivers (which will not remain under BLM jurisdiction) have the most potential for developing for viable non-resident sport fishing.

GOODNEWS BAY

Goodnews River originates in Goodnews Lake and flows about 60 miles before discharging into Goodnews Bay. The drainage area is relatively small, and the fishery resource is used primarily by the villages of Goodnews Bay and Platinum.

SIGNIFICANT SPECIES

Species indigenous to the system are similar to those found in the Kuskokwim drainage (See list for Kuskokwim drainage table 16-1). However, sockeye salmon are more abundant in the Goodnews system. All five species of Pacific salmon are found in the system. Other species that occur in the river include lake trout, rainbow trout, burbot, Arctic grayling, whitefish, Arctic char and Dolly Varden.

FISHERIES

Commercial Fishery

Traditionally residents of Goodnews Bay village have gone to Bristol Bay to fish or work in the canneries (ADF&G, 1979). In 1968, ADF&G opened a commercial season in Goodnews Bay. However, the fishery has been marginal because of inconsistent processing capabilities. In 1979, commercial fishermen harvested 3,204 chinook; 19,581 sockeye; 42,098 coho, 201 pink; and 9,298 chum salmon. Table 16-15 indicates the commercial catch of salmon since 1968.

Table 16-15. Salmon Catch from Goodnews River Drainage

Goodnews Bay Goodnews River 3/	King	Red	Coho	Pink	Chum	Total
1968			5,485			5,485
1969	3,978	6,256	11,631	298	5,006	27,169
1970	7,163	7,144	6,974	12,183	12,346	45,630
1971	477	330	1,771	0	301	2,879
1972	254	924	925	66	1,331	3,510
1973	3,543	2,072	5,017	324	15,781	26,737
1974	3,302	9,357	21,340	16,373	8,942	59,314
1975 4/	2,151	8,928	17,127	403	6,459	35,068
1976	4,417	5,575	9,852	8,453	10,354	38,661
1977	3,336	3,723	13,335	29	6,531	26,954
1978	5,218	5,412	13,764	9,103	8,590	42,087
1979	3,204	19,581	42,098	201	9,298	74,382
5 year average	3,685	6,599	15,084	6,872	8,175	40,415

1/ Includes subdistricts 335-10, 335-20, and 335-30. Commercial fishing in 335-30 has been prohibited since 1966.

2/ Subdistrict 335-40

3/ Subdistrict 335-50 and includes Chagvan Bay

4/ Final catch data used

Source: Jonrowe et al, 1979

Subsistence Fishery

ADF&G 1979 surveyed 21 fishing families from the villages of Platinum and Goodnews Bay. A total subsistence catch (1979) was 338 chinook, 226 coho, and 1,082 chum salmon. Although subsistence fishing is important, as with other areas, there is a trend toward commercialization by residents of the fishery resources.

Sport Fishery

Sport fishing pressure is probably light on the Goodnews River. Bowman, 1980 indicated there was a hunting and fishing guide operating out of Togiak that operates in the Goodnews River drainage.

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F I S H E R I E S M A N A G E M E N T
O P P O R T U N I T I E S

INTRODUCTION

Commercial fishing and tourism are two of the top three industries in the state. To many tourists, sport fishng is an important part of visiting the state. In addition to this increasing use of the resource, there is a trend toward commercialization of the subsistence fishery that will increase the importance of the commercial fishery, while the emphasis on subsistence as a priority use may compound allocation problems. Therefore, protection and improvement of aquatic habitat and access to assure adequate fish stock for user groups should be emphasized in planning efforts.

GENERAL OPPORTUNITIES

Current information concerning many of the lakes and streams in the Planning Area is limited. The Alaska Department of Fish and Game (ADF&G) has catch and escapement data on most

species of salmon that utilize major streams in the Planning Area. The department also has some data on spawning locations for some other species. However, data gaps exist concerning species, numbers of salmon, and spawning locations on many tributaries to major rivers in the planning unit, especially for coho salmon and non-salmon species.

There is an opportunity to aquire baseline data concerning the quantity and quality of aquatic habitat, species abundance and distribution, and water quality and quantity data as related to fish habitat. Specifically, salmon spawning areas in tributaries to the Unalakleet and Anvik rivers could be identified. Distribution numbers and spawning locations are generally lacking for coho salmon in the drainages. The same types of data are lacking for non-salmon species in almost all the streams in the planning unit.

Currently, the Alaska Department of Fish and Game, as well as private aquaculture associations are working on several types of fish and habitat enhancement projects. These projects include habitat modification and manipulation techniques and various fish-producing techniques.

An opportunity for habitat and salmon population enhancement presently exists on the Tuluksak River at NYAC. A program could be initiated to improve or increase salmon spawning and

rearing areas on the Tuluksak River. The potential for a salmon populaton enhancement program to increase the numbers of chinook or coho salmon by artificial means (such as a small hatchery) also exists at NYAC.

Other sites that have not been inventoried in the Southwest Planning Area may be conducive to such improvement techniques. In cooperaton with ADF&G, fish or habitat enhancement projects should be initiated on sites as they are identified.

Access could be increased and improved in many areas in the Planning Area. Airstrips and public use cabins could be constructed at selected locations to provide access for fishing activities as well as other recreational activities.

Specific areas where access could be increased and improved include the Unalakleet River drainage and the Anvik River drainage. Other streams could be inventoried to determine their potential as sport fishing recreational areas.

Special attention should be given to streams that produce large numbers of salmon. The Anvik River is such a stream. It is the single largest chum salmon producing stream on the Yukon River drainage. To protect its valuable habitat the stream should be considered for ACEC status.

Hydroelectric and mineral, oil, and gas projects will require that data be gathered to evaluate their impacts on fish and fish habitat. These types of activities can conflict with fish and fish habitat. Detailed baseline information will be required in areas where activities which conflict with fish and fish habitat are proposed.

Most streams should be left in their pristine state as much as possible. Maintaining these undisturbed ecosystems presents an important opportunity to achieve continuing production of fish resources at the least possible cost.

CHAPTER 17

RECREATION

R E C R E A T I O N

INTRODUCTION

Outdoor recreation activities play a very important role in the lives of most Alaskans. The Southwest Planning Area now fills a very limited amount of the state's recreational demands for the state's population. Recreational use of the area is limited mainly by difficult access.

Hunting and fishing are the two recreational activities that attract most of the visitors to the planning area. The rest of the recreational activities (floatboating, hiking, bird watching, snowplay, etc.) receive sporadic use and vary from area to area each year.

RESOURCE EVALUATION

The description of the resources used for recreational activities was derived from conversations with people who had been in the area and used those resources. The resources are discussed as they relate to each type of recreation use.

Table 17-1. Comparison of Floatboating Rivers

River	Usable Length (Miles)	Water Quality	Whitewater Class	Fishing	Scenic Quality	Wildlife Viewing Opportunities	Access	Water Volume
Unalakleet	45	average	I	very good	average	good	helicopter	not rated
North Fork (Unalakeet)	45	good	I	average	average	good	helicopter	good
North	50	good	I, II, III	good	excellent	good	helicopter	good
Old Woman	35	good	I, II	good	average to good	good	helicopter	good
Chiroskey	35	good	I, II	good	average to good	good	helicopter	good
Golsovia	30	good	---	average	excellent	good	helicopter	low
Otter Creek	25	good	*	good	average to good	good	helicopter	good
Anvik	114	good	I	excellent	average	same	*	good
Innoko	500	good	---	average	---	good	small plane	usually good
Aniak	140	good	---	good	high	good	float plane	usually good
E. Fork George	35	good	I	good	---	good	helicopter	good
George	55	good	I	good	average	good	helicopter	usually good
Stony	139	poor	I, II	none	average to high	good	float plane	usually good
Tatlawiksuk	45	poor	---	average	average	good	helicopter	usually good
Cheetneetnuk	55	good	II, III	average	good	some	helicopter	usually good
Gagaryah	45	good	II, III	average	good	good	helicopter	low at times
Swift	85	poor	I, II	---	average	good	helicopter	usually good
Big	95	poor	I	poor	poor to average	good	helicopter	usually good
Kuskokwim	750	poor	---	good	average	good	---	good
Selatna								

* See text for this information

WATERSPORT - BOATING

Powerboating constitutes an important recreational use of many of the major rivers near the villages. These rivers are moderately hazardous to use, with cold water, rapids, hidden boulders and rocks, and are subject to strong winds. The rivers studied are of medium size, allowing for most types of powerboating activity (Unalakleet, Kuskokwim, Yukon, Anvik, Stony, Innoko, Iditarod, and Nowitna Rivers).

Twenty one rivers were evaluated individually for their float-boating potential. All of these either cross or border at least one of the planning blocks. Every river was found to have a free-flowing stream passing through a natural, primitive setting. All but two rivers were clearwater streams, and these two, the Swift River and Big River, were streams of glacial origin that were silty but in other respects had good water quality. Scenic quality along the rivers baried considerably from one location to another, as described below. In the individual river descriptions, the location and total length given for each stream were taken from Orth's Dictionary of Alaska Place Names, 1971. Table 17-1 gives a quick comparison of some characteristics that were rated for all streams.

Unalakleet River

This stream heads in the Kaltag Mountains at 64° 20' N, 159° 16' W, flows southwest 90 miles to empty into Norton Sound. It is an intermediate-sized, stream, very well suited to boating. There are no rapids or serious obstacles on the river, and it falls in the Class I classification of the international white water scale. The scenic quality is average throughout the entire river course. This river affords good opportunities for wildlife observation, and very good salmon fishing.

An historic trail, the Kaltag Portage Trail, runs along the Unalakleet River for approximately three quarters of its length. This trail is a dogsled trail, forms part of the historic Iditarod Trail system.

Due to access problems, most recreational use of the river is concentrated between the mouth and Old Woman River, 45 miles upstream, (about the halfway point), the upper limit of powerboat navigability. Floatplane access is limited to a few straight stretches with deep water along the lower river up to

Old Woman River. Above Old Woman River, access must be provided by helicopter. The entire length of the river is 90 miles, and the usable length of the river is approximately 45 miles.

North River

Heading in the central part of the Nulato Hills at 64° 30' N, 159° 40' W, the North River flows southwest 60 miles to join the Unalakleet River 3.8 miles east of the community of Unalakleet. The river usually has good water volume throughout the use season, and has good water quality. Providing a diversity of boating experiences along its water course, this river is mainly Class I, with some isolated Class II and Class III rapids. Fishing is good, and the opportunity to see wildlife is also good. The best access is by helicopter. The river has a usable length of approximately 50 miles.

Chiroskey River

The Chiroskey flows northeast 50 miles to enter the Unalakleet River 14 miles east of the village. This river usually has good water volume throughout the use season, with good water quality. The water character provides some diversity of

boating experiences along its course. The river is mainly Class I with isolated Class II rapids. Fishing is good along the river and the opportunity to see wildlife is also good. The scenic quality surrounding the river is average to good. The best access is by helicopter. The usable length of the river is approximately 35 miles.

North Fork

The North Fork of the Unalakleet River heads at 64° 25' N, 159° 22' W and flows southwest 40 miles to the Unalakleet. The river generally Class I on the white water scale, this river has many meanders. It usually has good water volume and good water quality throughout the use-season. Fishing is average, and there is good opportunity to see wildlife. The scenic quality of the country surrounding the river is average. Helicopters provide the best means of access. The usable length of the river is approximately 45 miles.

Old Woman

This stream flows north 50 miles from its headwaters at 63° 28' 30" N, 159° 54' 50" W, to enter the Unalakleet River 31 miles northeast of the village of Unalakleet. The Old Woman

River usually has good water volume throughout the use season, with good water quality. This river's water character provides some diversity of boating experience along its course. The river is mainly Class I with isolated Class II rapids. Both fishing and the opportunity to see wildlife are good along the river. The quality of the scenery surrounding the river is average to good. The best access is by helicopter. The river's usable length totals approximately 35 miles.

Golsovia River

This stream flows northeast for 50 miles, emptying into Norton Sound 4.5 miles south of Tolstoi Point near Unalakleet. During much of the use season, the Golsovia has low water volume. There is adequate water only after heavy rains or at times of high runoff during spring. Water quality is good, but the character of the water makes it for floatboating only during high water. Fishing opportunities are average and wildlife observation opportunities are good. The scenic qualities of the river corridor are excellent. The best access is by helicopter. The usable length of the river is approximately 30 miles.

Innoko River

The Innoko has its headwaters in the Kuskokwim Mountains south of Cloud Mountain, about 20 miles northwest of McGrath at 63° 09' N, 156° 02' W. It flows northeast, then southwest for 500 miles to empty into the Yukon River near Holy Cross. The river is an easy float trip, since it is a slow, flat stream with a great many meanders. Fishing is average, but the opportunity to see wildlife is good. The river usually has good water volume throughout the use season, with good water quality. Access is by small plane. The usable length of the river is approximately 500 miles.

Anvik River

The Anvik River heads in the Nulato Hills at 63° 39' N, 160° 08' W, and flows in a long curve to the south and southeast for 140 miles to empty into the Yukon 1.5 miles north of the town of Anvik. This stream usually has good water volume and good water quality throughout the use season. The entire river rates as Class I except for a few isolated rapids that are Class II. Although the river's scenic quality is just average, it affords excellent salmon fishing. There is some opportunity to see wildlife along the river. Fixed-wing

access is limited to areas downstream of Swift River. It is possible to go farther upstream by power boat, but the best access above Swift River is by helicopter. The usable length of this river is approximately 114 miles.

Otter Creek

This stream heads at 63° 05' N, 161° 15' W and flows 30 miles to the Anvik River, 43 miles southeast of Unalakleet. The Otter Creek is an easy flatwater boating stream. It usually has good water volume throughout the use season, with good water quality. Fishing is good, and the opportunity to see wildlife is also good. Scenic quality along the river varies from average to good. The best access is by helicopter. The usable length of the river is approximately 25 miles.

Kuskokwim River

One of the two great rivers that shape the character of the land and people of southwest Alaska, the Kuskokwim, from its beginnings at the confluence of its East and North Forks, near Medfra curves 500 miles in a general southwestern direction. It empties into Kuskokwim Bay from a broad delta of grassy lowlands dotted with innumerable lakes. The Kuskokwim served

as an ancient watercourse for Natives, and later was used by prospectors and trappers. The North Fork reaches far north to the Tanana Basin. The river has good water volume throughout the use season, with murky water lowering the water quality. The river is flat and slow moving but the stretch from Lake Minchumina to Medfra has a faster current. The scenic quality is average throughout the river corridor. Fishing opportunities on the river are good and the opportunity to view wildlife is also good. The usable length of the river from Lake Minchumina to Aniak is approximately 750 miles.

Aniak River

Only a mile or so of this river actually crosses BLM administered land in planning block _____. The Aniak heads at 60° 21' N, 159° 13' W; from there it flows north for 95 miles to join the Kuskokwim River just east of the town of Aniak. Although it is generally a flatwater river, the Aniak has a 20-mile stretch of many channels filled with sweepers, logjams and uprooted trees. The river usually has good water volume throughout the use season, with good water quality. Fishing opportunities are good and the opportunities to see wildlife are also good. The scenic quality of the landscape along the

river corridor is high. The best access is by floatplane to Aniak Lake. The usable length of the river is approximately 140 miles.

George River

Named by local residents for George Frederiks, who operated a trading post at the mouth of this river around the turn of the century, the George River has its headwaters at 62° 34' N, 157° 10 W. It flows southwest for 80 miles, emptying into the Kuskokwim 23 miles northwest of Sleetmute. Throughout the use season, the river usually has good water volume, and good water quality. The George River is a flat, meandering river which falls into the Class I whitewater classification. Although the scenery along the river rates as just average, the George offers good opportunities for both fishing and wildlife observation. The best access is by helicopter. The usable length of the river is approximately 55 miles.

East Fork George River

This stream heads at the confluence of Munther Creek and Little East Fork. It flows southwest for 60 miles to empty into the George River about 25 miles north of Sleetmute. The

East Fork is a flat, meandering river which falls into the Class I whitewater classification. The river generally has good water volume throughout the use season, with good water quality. Fishing is good along the river, and the opportunity to observe wildlife is also good. The best access is by helicopter. The usable length of the river is approximately 35 miles.

Stony River

This stream heads at the Stony Glacier in the Alaska Range at 61° 36' N, 153° 45' 30" W. It curves southwest and northwest for 190 miles, entering the Kuskokwim River at the community of Stony River. Although Stony River usually has good water volume throughout the use season, the water is very silty, making the water quality poor. The river offers a pleasant, easy float trip on Class I water with an occasional Class II rapid. The scenic quality along the river is average to high. The river is too silty for sport fishing, but the opportunity to see wildlife is good. Access is either by floatplane to Two Lakes and floating down the Necons River, or to Telaquana Lake and floating down the Telaquana River. Floatplanes can also land on straight stretches of water near the confluence

of Necons River with the Stony River. The usable length of the river is approximately 139 miles, from the Necons River confluence to the mouth.

Swift River

The Swift River draws its headwaters from several glaciers in the Alaska Range at 61° 36' 30" N, 153° 58' 50" W. It flows west and northwest for 100 miles to the Kuskokwim, 13 miles northeast of Sleetmute. This river usually has good water volume throughout the use season, but has poor water quality. Providing some diversity of water character along its course, the river is mainly Class I with some isolated Class II rapids. In parts of the river there are numerous meanders. There are good opportunities to see wildlife along the rivers. Scenic quality is average. The best access is by helicopter. The usable length of the river is approximatley 85 miles.

Cheetneetnuk River

Cheetneetnuk River heads at 62° 12' N, 154° 50' W, flowing 70 miles to the southwest to join the Swift River 11 miles above its junction with the Kuskokwim. The water character of this river is very good, providing considerable diversity in the

boating experience. The river generally has Class II water, with isolated Class III rapids. Fishing is average and there is some opportunity to see wildlife. The scenic quality of the surrounding landscape is good. The river usually has good water volume throughout the use season, with good water quality. Helicopters offer the best means of access. The usable length of the river is approximately 55 miles.

Gagaryah River

The Gagaryah River heads in the Lyman Hills, then winds 60 miles southwest to empty into the Swift River 50 miles east of Sleetmute. This river sometimes has low water volume that exposes a lot of rocks, but the character of the water is very good, providing considerable diversity in the boating experience. The water quality is good. Generally the Gagaryah rates as Class II on the whitewater scale, with Class III rapids. While fishing is only average, there is good opportunity to see wildlife, and there is good scenic quality along the river. Helicopters provide the best means of access to the river. The usable length of this river is approximately 45 miles.

Tatlawiksuk River

The Tatlawiksuk originates at 62° 19' 40" N, 155° 14' W, flows southwest 80 miles, and empties into the Kuskokwim River 3 miles northeast of its junction with the Swift River (34 miles northeast of Sleetmute). The river has a moderate amount of organic matter in the water, making the water quality poor. It usually has good water volume throughout the use season. The Tatlawiksuk is a flat, meandering stream that affords average fishing and good opportunities to see wildlife. The scenic quality surrounding the river is pretty mundane. Helicopters offer the best access. The usable length of the river is approximately 45 miles.

Big River

This river heads at a Glacier at 61° 45' N, 154° W and flows 130 miles northwest to the Middle Fork Kuskokwim River, 24 miles east of McGrath. The river usually has good water volume throughout the use season, but has poor water quality. The middle and upper portions of the river are braided, and in the lower portion has a great many it meanders and numerous oxbow lakes. The water characteristic of this river is Class I. The opportunity to see wildlife is good, but the fishing

opportunity is poor. The scenic quality is poor to average. Access is by floatplane to an adjacent lake with a short overland portage. The usable length of the river is approximately 95 miles.

Selatna River

This stream heads at 62° 19' N, 155° 08' W, and flows northwest 50 miles to empty into the Kuskokwim River 31 miles south of McGrath. The Selatna usually has good water volume throughout the use season. There is a moderate amount of organic matter in the water, making the water quality poor. The river is flat and meandering. Fishing is average along the river, and the opportunity to see wildlife is good. The scenic quality surrounding the river is pretty mundane. The best access is by helicopter. The usable length of the river is approxiamtely 40 miles.

TRAILS

Iditarod National Trail

A major network of trails stretching 2,037 miles from Seward to Nome came to be known as the Iditarod Trail because it was used to service the Iditarod mining district during the gold

rush (see overlay 17-1, River Use and Iditarod). It was primarily a winter use trail, because it winds through marshes, muskegs, and over rivers that would make it difficult to travel except in the wintertime when everything is frozen. Today some portions of the trail are much the same as they were in the gold rush era, but other sections are overlain by highways and rail lines. West of Knik and the Alaska Range, none of the trail is accessible via the major highway network, although there are a few local roads which may cross or parallel it. What remains of this section of trail is in a primitive, isolated area. The Iditarod Trail is important now because it offers an historic environment unique to the national trails system. In addition to its historic significance the trail route has high scenic qualities, as it parallels rivers and streams, traverses mountain ranges and dense forests, and winds through muskeg and marshes in some of the most primitive country in the nation. There is some hazard in using this trail because of its primitive location and its demand of endurance and skill during the winter travel season.

Iditarod Sled Dog Racing Trail

The 1,049 mile Iditarod Trail Sled Dog Race is an annual race from Anchorage to Nome that uses many portions of the original Iditarod route. This race was first run in 1973 to commemor-

ate the historic trail and the important role the sled dog played in opening up the Alaskan frontier. The actual race course length varies each year from 1,200 to 1,400 miles depending on the snow and ice conditions. The race course changes from year to year because of the snow and ice conditions and on a rotating basis the Iditarod loop is added one year and skipped the next. This trail route has high scenic qualities as it passes through a primitive environment and traverses mountain ranges. There are no major hazards along the trail except for its isolation and the harsh winter climate.

Kaltag Portage Trail

The 60 mile Kaltag Portage Trail was used by the Eskimos and Athabascan Indians for hundreds of years before white men came to Alaska. With the discovery of gold in Nome some means of supplying the gold camps was necessary, and in the early 1900's the trail was constructed. For many years, the trail was the only winter means of travel to Nome and points north. It is likely with the opening of the trail it expanded the winter hunting and trapping range of the Unalakleet people. The Kaltag Trail route is also a portion of the Iditarod National Trail. This trail has high scenic qualities as it

parallels the Unalakleet River for approximately 40 miles. There are no major hazards along the trail except for its isolation and harsh winter climate.

Fish

Fishing takes place on many of the lakes and rivers in the planning area. In the water quality evaluation of all lakes studied, the water was determined to be uncontamined and clear. The rivers, in contrast, are somewhat murky and have a less desirable water quality than the lakes. All five species of Pacific salmon, Arctic grayling, burbot, rainbow trout, inconnu, lake trout, northern pike, and whitefish can be found in the area's water bodies. The major drawback to fishing in the Planning Area is access. Some of the bodies of water can only be reached by plane or helicopter while others can be reached by motorboat.

Game Animals

The habitat and populations of moose, caribou, and bear are excellent in parts of the Planning Area. Poor access makes hunting difficult except for the Innoko, Swift, Stony, Unalakleet, Shaktoolik, and Nowitna drainages. People fly into the

Innoko, Nowitna, and Unalakleet river drainages to hunt for moose. The Stony and Swift River drainages offer good caribou hunting, while the Shaktoolik is a good bear hunting area.

VISUAL RESOURCES

The following is the visual resource input to the URA Step 3 of the Bureau's planning system and has been designed to aid the resource manager's and public's understanding of the resource base. This information, and its interpretation by the Bureau's landscape architects, will also provide a general understanding of the relative visual vulnerability of the landscape to proposals involving physical change. The data can be used as a basis for staff recommendations for visual resource management. The information is not, however, adequately scaled or detailed to provide answers or guidance to site-specific question.

Documenting the visual attributes of a site is a well established early step in a sound professional approach to any planning or design project. It is, in fact, a key to idea development and decisions on how a site might be used. When visual values are integrated with other resource and social values, a comprehensive and useful planning approach can be mounted.

The focus of the Bureau's Visual Resource Management Program is placed on documenting the landscape's visually perceived natural structural components and cultural modifications. The natural components include the surface form of the land, the extent, color, and textural pattern of the vegetation. The narrative description of these components, a selective assortment of photographic records which captures the essence of each type, maps, and other graphics form the information base. It is the various compositions of these natural components and the manmade pattern operating on each that result in one or a limited number of characteristic visual impression(s) of each landscape segment.

The preplanning analysis identified a series of issues that the southwest plan was ultimately to address. Of that list a number of development issues could directly affect the integrity of the visual resource. For this study these issues were organized into three classes. They are: (1) area impacts such as those caused by reservoirs, strip mines, grouped placer mines, or fire management activities, (2) point impacts such as microwave transmitter developments, airstrips, or individual placer mine sites, and (3) linear impacts such as transmission lines, roads, pipelines, seismic testing alignments, or bulldozer trails. It is recognized that occasionally a project proposal will exhibit area, point, and linear

impacts such as in the case of a hydroelectric development. Thus, these classes should only be thought of as a shorthand way of thinking about development activities.

Often limited field verification of existing data is the most that can be hoped for in creating a descriptive inventory. This was the situation with this study. The following data were identified as relevant to the descriptive inventory:

> Potential Natural Vegetation of Alaska - 1:7,500,000: This map was authored by A.W. Kuchlet in 1966 and shows the plant community boundaries of the "vegetation that would exist today if man were removed from the scene and if the plant succession after his removal were telescoped into a single moment."
>
> Major Ecosystems of Alaska - 1:2,500,000: This map and description was compiled by the Joint Federal/-State Land Use Planning Commission in July 1973. Twelve land based and seven marine based ecosystems are identified, described by major components, and mapped.

Regional Profiles, 1976: The Terrestrial Vegetation Sections of the Northwest, Yukon, and Southwest Regional Profiles were consulted for the mapped vegetation community patterns and the narrative and graphic characterizations of the community makeup and types. The mapped community patterns are at a scale of slightly less than 1:1,000,000. These have been aggregated from original data by Spetzman (1963) and Viereck and Little (1972).

Spetzman, 1963: The Alaska Resources Library has original vegetation maps at 1:250,000 scale on file. These are essentially color coded U.S.G.S. topographic maps which identify nine classes of dominant trees, shrubs, and grasses. The smallest map increment is approximately one square mile at the map scale. Most patterns are considerably larger.

Classes of Land-Surface Form - 1:7,500,000: This map was authored by E.H. Hammond in 1964 and is particularly useful and directly applicable in that it is based on the "visual image of the surface form" and "broadly suggestive of potential land

use." Hammond's original map at 1:5,000,000 was based on an empirical analysis of the land surface.

Physiographic Divisions of Alaska - 1:2,500,000: This map and descriptive text was authored by Clyde Wharhaftig in 1965. Wharhaftig also used physical appearance of the topography as a basis for delineating one division from another. This pattern is then modified by geologic structure which may or may not have a significant visual attribute. It is for this reason that Wharhaftig's classification, even though focused specifically on Alaska, was judged to be slightly less useful to a strictly visual inventory than that of Hammond's. Wharhaftig's detailed narrative descriptions were very useful, however. (5, 6, 7)

Topographic Maps - 1:250,000 and 1:63,360: The U.S.G.S. topographic map coverage with 200' and 50' contour intervals respectively is complete for the entire study area.

Topographic Maps: The U.S.G.S. maps provided specific locational information on the river channel types as well as the location and character of other surface water features.

CD11, World Aeronautical Chart - 1:1,000,000. The Department of Commerce aeronautical charts provided a primary base for locating airstrips.

Topographic Maps: The U.S.G.S. topographic maps once again played a key role in the location and extent of cultural modifications including roads, villages, mine sites, airstrips, etc.

The planning unit's visual character is based on five types of land surface form which are dissected by two major river systems and covered by eight distinct vegetation and exposed rock color patterns. The overall visual impression is one of nearly complete naturalness with only an occasional minor indication of man's presence.

The land area is large. Its generally contiguous 20,000 square miles are slightly larger in size than the combined land mass of New Hampshire and Vermont. A flight line from

the easternmost to the westernmost boundary would be approximately 260 miles long and, in two places, the unit extends +150 miles in a north-south direction.

There are a half dozen Native villages within the boundary of the study area and another 20 or so adjacent to it located along the Yukon and Kuskokwim Rivers. Each of these villages can be broadly characterized by envisioning a small scale gravel paved grid street layout, with the longest street extending no more than one-half mile, a gravel airstrip, and ±50 buildings, mostly roofed by corrugated sheet metal. The villages of Lime Village, Stoney River, and Holy Cross are typical.

Bethel (population 3,854) McGrath (population ±300) and Unalakleet (population ±600) are the largest communities in the study area. They serve as the regional transportation and commercial centers.

There are no interconnecting roads between communities. Transportation is totally dependent on riverboats or ATV's in the summer; snow machine, dog sled, bulldozer sled, or snowshoe in the winter; and small aircraft year-round.

LANDFORMS

The planning unit is traversed by the Kuskokwim Mountains and the Nulato Hills which run in a northeast-southwest direction. Each range is 2,000 to 3,000 feet above its base and each is characterized by relatively gentle slopes and rounded, usually forested peaks. Alpine tundra vegetation is in evidence on a few of the peaks.

The easternmost edge of the unit bisects a portion of the outlying low peaks of the Alaskan Range. The Lime Hills and the mountains which form the watershed of the Cheetneetnuk River are prominent examples. Cairn Mountain, elevation 3,799 feet, is the highest point in the Planning Area.

The mountain ranges are drained by tributaries of the Kuskokwim and Yukon Rivers. These drainage channels cut through irregular and seemingly flat plains as they approach their confluence with the major rivers. The plains are relatively undifferentiated in form and make up about 30 percent of the unit. In the plains it is the vegetative color pattern and the presence of standing water which help to distinguish one place from another.

SURFACE WATER

There are concentrations of thaw and meander-scroll lakes in both the Innoko and Holitna lowlands and to a greater extent in the Tanana-Kuskokwim Lowland (Wharhaftig, 1965). These lakes are of various shapes and sizes with most not exceeding 300 acres. The largest exception to this size is Lake Minchumina in the northeastern segment of the unit. The area of this lake is over 20 square miles.

There are numerous ways to classify rivers and segments within them. From a perceptual point of view, the surface pattern (dendritic, angular, etc.) the width and cross section of the channel (braided, fixed, etc.) the clarity of the water (clear, silty, milky, etc.) and the presence or absence of rapids and falls (a function of steepness, rockiness, and depth) become useful descriptors.

The Yukon and Kuskokwim Rivers are very wide and form the major drainage spines of the Planning Area. The water is fast-flowing and full of silt. This muddy appearance forms a marked contrast in areas where clear tributaries join the main stream. In fact most of the rivers and streams in the unit

transport surface runoff and are clear flowing. There are stretches of rapids but the norm is a deep and dark fast-flowing channel.

In the eastern section of the Planning Area the South Fork of the Kuskokwim, the Big, Stoney, and Swift Rivers are glacial-fed. In stretches their channels are wide and braided, the water is milky in appearance, and gravel bars are in abundance between the braids. In other segments these and other rivers take on a more meandering or fixed channel character.

The North Fork of the Kuskokwim River in the eastern section of the area and the Innoko River to the west are especially interesting for the distinctive looped meander pattern they exhibit. These and other oxbow type rivers are bounded in many places by rather distinctive "cut-off" lakes which mark the former path of the channel.

Planning Process Application

How will the gathered, referenced and mapped information be made useful in the planning process and at such time as an impact assessment is necessitated?

Litton's work (1974) on the relative visual vulnerability of different sections of the landscape holds some promise as a guide for use in the planning process. In it he suggests that certain compositional types, parts and locations, outside influences, and inherent effects either singly or in combination affect landscape visual vulnerability.

A brief example under each of these vulnerability factors will provide some direction on how a second level inventory could be organized.

1. Compositional Types ("Feature", "enclosed" and "focal" have been highlighted as potentially vulnerable types).

Example: Feature Compositions

Numerous feature landscapes exist in the study area. One particularly vivid example is the Cheetneetnuk River headwaters area in the Lime Hills. The combination of high vegetation color diversity, dramatic hills with exposed limestone bluffs and a clear, relatively fast flowing river lend feature status to this landscape. Clearly any development which would modify the existing views of the limestone bluffs - as an isolated example - would likely create a highly noticeable

contrast. Thus, this landscape would satisfy high vulnerability criteria and management activities within it would have to be implemented with high sensitivity.

2. Parts and Locations (edges and high elevations)

Examples: Edges

The topographic edge which exists between the Holitna lowland and the Kuskokwim Mountains at the Kuskokwim River (Wharhaftig, 1965) is vivid because of its relatively quick elevational change juxtaposed on a essentially flat plan. This is another example of a particularly vulnerable segment of the landscape. The topographic edge is sensitive to any dramatic large scale changes in land form such as those associated with surface mining or oil and gas development.

3. Outside Influences (orientation, climate and seasonal effects)

Example: Slope Orientation

Slope orientation can dramatically affect vegetation type growth in an extreme climate. For example, black spruce of sparse density might be expected to thrive on certain north

oriented topographic slopes whereas it may be in less abundance or replaced by white spruce and certain hardwoods on south facing slopes. The individual form, spacing, nature of understory, and height of the black spruce may be more vulnerable to certain kinds of visual change than the side supporting the different species mix. This would be the case because a landscape of uniform pattern, color and texture is more likely to show a contrasting change than would one with a visually diverse setting. In other words, the details and interrelationships present on different slope orientations may suggest alternative vulnerability determinations.

4. Inherent effects (slope, soil and vegetative cover characteristics)

Example: Slope

Routing a road through an area of steep slope may be a more difficult task from the standpoint of creating a low contrast visual effect between activity and place than routing one through an area of minimum topographic slope. This would be the case because, among other things, cut and fill slopes are more extensive on steep slopes and are more likely to be seen from greater distances.

Impact Assessment

The information this inventory process has assembled can, when studied, provide a basis from which to respond to questions of visual impact associated with Bureau or non-Bureau development projects. There are at least two analytic steps involved in this process.

The first is a detailed analysis of the development proposal and its component parts. The landscape architect must be thoroughly familiar with the physical attributes of components of the project and with available alternative technologies. What level of detail is necessary to understand the project? At a minimum there is a need to understand the proposed construction technology for the project's implementation and the visual details down to colors, forms, lines, and textures of the expected product. A microanalysis of each of these project components and the maintenance plans and technologies will provide part of the grist for recommending alternatives when deemed necessary. Active landscape design involvement from the outset of the project is the surest means of gaining the appropriate understanding and most creative response.

The second step requires a detailed analysis of the site. Particular emphasis on the details of vegetation color and successional pattern, soil color, existing slopes, views to and from the site, etc., will provide the basis to understand the degree of contrast to be created by the development.

An aid to both of these investigations is the Bureau's Prototype Contrast Rating Procedure (Smardon, 1980). Reliance on its logic and use of the information gathered in this inventory and more site specific analysis will provide the background necessary to respond to demand work.

CURRENT RECREATION USES

COMMERCIAL RECREATION

Guided River Trips

Presently the rivers in the planning area receive very little use because of their inaccessibility. There are some guided river trips, but they are sporadic -- one year an outfitter will float down one river and the next year he may float down another river. The trips are combined trips, float trips in

conjunction with hunting or fishing. As the demand for river trips increases, some of the rivers in the Planning Area may receive more use.

Guided Hunting Trips

Presently there are 18 guides that take hunters into the Planning Area or around the borders of it to hunt for moose, caribou, and bear. They are not in conflict with the local hunters, because they hunt away from the subsistence hunting areas near the villages. In the spring they take some hunters in to hunt for bear and in the fall they hunt mainly for moose and caribou.

Guided Fishing Trips

Currently, the Unalakleet River receives most of the guided fishing use. During the king and silver salmon runs the Silvertip Lodge on the Unalakleet River takes non-resident fishermen upriver to fish. During the month of August the lodge is usually filled with non-resident fishermen. Also in the last couple of years the people living in the village of Unalakleet have been hiring out and taking non-residents up the Unalakleet River to fish for salmon.

Air Taxi Operations and Air Guides

Currently, non-resident people are hiring planes to fly them into the area to hunt and fish. Most of the hunters are flown into the Innoko, Swift, Stony, and Nowitna River drainages to hunt for moose. Hunters are also flown into the Stony and Swift River drainages to hunt for caribou. The hunting pressure in these areas has been increasing each year mainly due to the increasing number of non-resident hunters being flown in.

The Innoko River drainage is the only place in the planning area that has waterfowl hunters flown into it.

Currently, non-resident people are flown in to only a few places in the planning area to fish. This is mainly due to the difficulty of reaching other good fishing water bodies. The water bodies that are receiving most of this use are the Anvik, Innoki, Swift, Nowitna, Telaquana, and East Fork Andreafsky Rivers, and Aniak Lake, Two Lake, and Telaquana Lake.

BUREAU OF LAND MANAGEMENT FACILITIES

The Bureau provides no campground or recreational facilities in this Planning Area except for some unmaintained trails.

TRAILS

Iditarod National Trail

The Iditarod National Trail is a 2,037 mile trail that stretches from Seward to Nome. Portions of the trail were used by Eskimos and Athabascan Indians hundreds of years before the white man came to Alaska. The Iditarod and its many branch trails saw their heaviest use from 1896 to the 1920's. The Iditarod was mostly a winter trial used to haul supplies and mail. The importance as a link with the outside world was emphasized in 1925 when a diptheria epidemic threatend the town of Nome. A relay of 20 dog mushers and their teams rushed the serum 674 miles from Nenana to Nome in a record 127½ hours during cruel winter weather conditions.

Currently, sections of the Iditarod National Trail are used in the winter for access between villages and to areas of subsistence hunting and fishing. The portion of the trail near Nome is used for access by miners for beach mining and recreational mining. During winter some portions of the trail near the villages receive some snowmobile use and cross-country ski use, while in summer some portions are used for hiking. Portions of the trial are used for the Iditarod Sled Dog Race.

Kaltag Portage Trail

Because of the relatively short ice-free summers in the Norton Sound region, a 60-mile overland trail from Kaltag to Unalakleet was built in the early 1900's to provide a means of hauling supplies to the gold camps in Nome. For many years the trail was used to bring supplies into Nome. Portions of the trail are used in the winter for subsistence hunting and fishing, snowmobile use, cross-country ski use and for dog mushing. The trail is also used in the Iditarod Sled Dog Race.

Iditarod Sled Dog Race Trail

The Iditarod Sled Dog Race from Anchorage to Nome has been an annual race since 1973 on portions of the Iditarod National Trail. The race usually takes two to three weeks to complete and its length is between 1,200 to 1,400 miles depending on the snow and ice conditions.

There are probably other trails in the planning area but a completed inventory of the trails have not been made.

RECREATION ON BUREAU LANDS

The activities that draw the most people to the area are hunting and fishing. Recreation activity is unevenly dispersed throughout the Planning Area, with concentrations occurring at prime hunting and fishing areas such as the Unalakleet River, Innoko River, Stony River, Swift River, and Nowitna River.

Sport fishing use in the planning area as a whole is low. The Alaska Department of Fish and Game estimates that there are only 7,000 user days in the Yukon River drainage. The Unalakleet River receives most of the fishing pressure in the Planning Area. Use has been increasing every year for the last three years because more non-residents have been coming into the area to fish for salmon.

Hunting is the recreational activity which attracts most of the visitors to the Planning Area. The Innoko, Swift, and Stony river drainages receive most of the hunting pressure in the Planning Area. In the Swift and Stony river drainages hunting pressure has been increasing drastically. More and more people are flying into the Swift and Stony rivers to hunt caribou each year.

In the winter, dog mushing is the recreational activity which attracts most of the visitors to the planning area. In 1979, the Iditarod Sled Dog Race attracted 55 dog mushers, and in 1980, 62 dog mushers participated in the race. The race takes thousands of people to support it -- judges, veterinarians, pilots, trail workers, sponsors, etc.

Currently, the rivers in the planning area receive very little recreational boating use, because they are hard to reach. The three rivers that do receive some use right now are the Unalakleet, Innoko, and Nowitna Rivers. The reason for floating these rivers is not solely for the trip along the river, but for a combination of activities. People float the Unalakleet River to fish, and people float the Innoko and Nowitna rivers to hunt moose. As the demand for river trips increases, there will be more more use of other rivers such as the Telaquana, Necons, Stony, Swift, and Aniak.

The use information for these activities was obtained form conversations with people who have been out in the planning area and have used these resources. The information was just general; no use estimates could be derived from it. But the information is useful in that it illustrates the use trends and concentrations for different recreational activities.

USE PROBLEMS

Access

Access to the area is a major problem. The visitors are restricted to a few accessible areas. These areas will be over-impacted in the future and other areas will be left unused. This is the main limiting factor to river use in the area, because a lot of the rivers can only be reached by helicopter. Recreational use in the whole area is low and limited because it can only be reached by helicopter.

Hunting

Increased hunting pressure from nonresident fly-in hunters is causing some problems in a few of the drainages in the Planning Area. Four or five years ago the pressure by fly-in nonresidents who were hunting for moose started to increase dramatically on the Innoko River drainage. Local subsistence hunters started to complain about how it was more difficult to get a moose, and the moose herds also were starting to decrease because of this growing hunting pressure. Because of the decreasing moose population and the conflict between subsistence and sport hunters the Alaska Department of Fish

and Game created the Paradise Management Unit. In the Paradise Management Unit, (the portion of the Innoko River drainage below the Iditarod River confluence), the use of an airplane for hunting was banned. Anybody can hunt in the area, but they have to use a boat to gain access to the area. The portion of the Innoko River drainage above the Iditarod River confluence is still open to fly-in hunting, and this area is utilized mainly by non-resident hunters.

In the Swift and Stony River drainages air taxi operators are bringing in increasing numbers of caribou hunters each year. Because of these increasing numbers of caribou hunters the herds are starting to suffer from hunting pressure, and the subsistence hunters are also complaining that it is getting more difficult to get a caribou. The Alaska Department of Fish and Game stated that there will be some drastic changes in the hunting restrictions in these two river drainages next year (1981).

The subsistence hunters in the Iditarod River drainage around Flat are complaining to the Alaska Department of Fish and Game that there are too many fly-in moose hunters coming into the area. They are saying because of this increased hunting pres-

sure it is getting more difficult to get a moose because the population is decreasing. Presently ADF&G is just monitoring the area to evaluate the situation.

Fishing

Presently there are no conflicts between the commercial, subsistence, and sport fishermen in the planning area. Even on the Unalakleet River which receives the most sport fishing use there is not a conflict, because the sport fishermen go further upriver away from the commercial and subsistence fishing areas.

Information

Another use problem is the lack of information concerning the recreation activities in the area. There are no brochures, pamphlets, or other information available to the public to inform them of what recreational activities the Planning Area has to offer.

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R E C R E A T I O N O P P O R T U N I T I E S

INTRODUCTION

The lands in Southwest Alaska offer a wide range of recreational opportunities during all seasons of the year. An important factor will be the accessibility of the area. There are many dispersed recreational activities which require open space for their pursuit, as described in the discussion of the current situation for recreation.

In discussing the recreational opportunities for Southwest Alaska, primary focus will be on those lands most likely to remain under Bureau administration.

TRAIL OPPORTUNITIES

The planning block presents an opportunity for a backcountry trail system. Besides the trails described in the discussion of the current situation for recreation there are probably

other trails that were developed through use by local resident's by miners, hunters, fishermen, berrypickers, and others seeking a backcountry experience. After a trail inventory is completed for the area, there is probably a good opportunity to improve these trails to provide access to different parts of the area. These trails could serve summer hikers, winter cross-country skiers, dog mushers, and snowmobilers. A well-planned trail system could provide for year long use of the area.

The primary recreational potential of the Iditarod National Trail besides interpretation and historic preservation is for winter use by dog mushers, cross-country skiers and snowmobilers. Some parts of the trail, for example the Kaltag Portage section, could be improved for hiking use in the summer.

Some parts of the Planning Area probably have terrain suitable for off-road vehicle (ORV) use. These opportunities should be explored, and the ORV trails should be located so as to protect the environment, while providing a quality recreatonal experience for the visitor. These ORV trails should just be located near the villages where most of the use will occur instead of throughout the Planning Area.

CABINS

A series of backcountry cabins could be developed in association with the rivers and trails. These cabins could serve the hikers and river users as overnight stopping points, or if locations were suitable, serve fly-in fishermen or hunters, cross-country skiers and snowmobilers. The cabins could also be used as emergency shelters. The cabin system would offer a diversity in the recreational opportunities by serving numerous classes of recreationists concurrently. It would become a focal point and a real asset to the Bureau. The need for backcountry cabins is one that is often identified by recreationists. The demand for backcountry cabins is many times more than what is provided.

RIVER SYSTEMS

The Andreafsky, East Fork Andreafsky and Nowitna rivers have been nominated for inclusion in the National Wild and Scenic Rivers system. These three rivers are not in the Planning Area but their proximity will influence the recreational use of the region. Because of their national status they will draw more people into the area to float them. These rivers will be managed by the US Fish and Wildlife Service (USF&WS). Specific decisions for their management and development will be formulated by the USF&WS.

The Unalakleet, Innoko, Telaquana, Necons, Stony, Swift, and Aniak rivers offer a diversity of opportunities for the recreational user. These rivers offer considerable potential for increasing river use of the area by rafters, canoers, kayakers, fishermen, hunters, and hikers.

The Unalakleet, Innoko, Stony and Swift rivers could be managed by the Bureau for their recreational use under the Bureau's management authority. The Unalakleet River provides more diversity for recreational activities than the other three rivers, and could be managed to provide a quality recreational experience.

As a group, these ten rivers could offer the recreationists a diversified recreational opportunity while increasing he overall regional use of rivers and not severely impacting any one river. These opportunities could be explored further for the four rivers (Unalakleet, Innoko, Stony, and Swift) that will remain under the Bureau's administration through the development of river managemment plans.

INTERPRETATION

A pamphlet or brochure could be used to inform the public about the recreational opportunities that the area has to offer. One brochure could describe the river systems and

another one could describe the different types of trails in the area. These brochures could describe the water characteristics of each river, type and use of each trail, access, mileage points, unique natural features, biological occurrences, and significant historical or archeological areas along each river or trail. This would be good opportunity for informing the public of what the area has to offer, warning them of the hazards. Brochures could be used as a means to manage the type of recreational activities that the public participates in. The brochures would also become a real asset to the Bureau.

VISUAL RESOURCES

OPPORTUNITIES

The scenic quality of those lands likely to remain under BLM-administration is virtually undisturbed by man. Since the most common view is from aircraft, any large scale development would be highly visible.

The Lime Hills and the break between the Kuskokwim Mountains and the Holitna lowlands are highly vulnerable to visual change due to development. There is an opportunity to prioritize these areas for more intensive VRM evaluations.

Prior to development anywhere within the Planning Area, site-specific VRM plans will be needed.

CHAPTER 18

CULTURAL RESOURCES

CULTURAL RESOURCES

INTRODUCTION

For thousands of years people possessing only a stone-age technology occupied the southwestern region of Alaska. Through hundreds of generations they maintained a lifeway based upon what the land provided. When white men first visited the region these people were living in balanced co-existence with their local environment and the parameters of their economic system were long-established and well understood.

In 1832, while American commerce was undergoing an industrial revolution in New England, the first white outpost was built in the region at the mouth of the Holitna River by Russian fur traders. Little more than a one-room log shed, it established a new and revolutionary source of material goods for the indigenous people, soon the fur trade economy eclipsed many of their traditional aboriginal economic pursuits. After 1867 the fur trade became even more intense and pervasive under American entrepreneurs.

After two generations of economic reorientation to the fur trade, a momentous change, in the form of the gold rush, again redirected the region's economy -- this time toward exploiting its mineral wealth. The flood of people in the next few decades brought an ever more elaborate economic system in which the Native people played little part. With their traditional lifeway thoroughly disrupted by more than a half century of change, by communicable diseases and other social ills, the Native people of Alaska entered the twentieth century much neglected while the development of the country's resources proceeded frantically.

The Russians had not regarded the indigenous population of either Siberia or Russian America in the same way that Americans did. The Russians associated with the Alaskan Natives on terms of equality, with no real sense of racial superiority. Though the treaty of cession provided Natives the same rights they had enjoyed under the Russians, the gold rush interrupted the acculturative process begun by the Russian fur trade.

Processes of change were intensified and redirected by the flood of Americans into the region. The impact of this period was mitigated somewhat by an emerging "Alaskan" identity that incorporated many unique aspects of the land and its people.

However, social and economic changes occurred so quickly that the Natives were left unprepared to participate in the management of their own land.

The Natives became second class citizens, wards of the government, who were a burden rather than an asset to Alaska's development. In the 1930's and 1940's the administrative policy of the Bureau of Indian Affairs changed to one that strongly encouraed local autonomy and divested the Bureau of its paternalistic functions.

Social Impacts. Throughout the American period before 1930, Natives in the region were considered wards of the government. While they were very much needed, federal- and state-supported services also in many ways reinforced and perpetuated the social and economic segregation of Natives and whites that started during the gold rush years.

From earliest times there emerges a pattern of expanding populations making ever-broadening use of available resources. This enduring theme is a familiar one today, and the history of the region highlights its continuing importance. Yet at times valuable resources were overlooked or wasted. Sometimes resources were thoughtlessly depleted, or ventures were launched with little regard for what the environment, including the human element, would sustain.

Today the region remains strongly imprinted with elements of Native and Russian cultural heritages, as well as with long-established lifestyles traditionally associated with the American frontier experience. Historic waterways, portages and trails also reflect the past roles of different transportation modes in the region. All of these traditions contribute to the diversity of cultural heritage that colors the lives of inhabitants and gives special character to the communities of southwest Alaska.

Cultural resources in the area comprise evidence remaining from human utilization of the region for at least the last 10,000 years. This evidence includes a wide range of physical remains such as prehistoric and historic districts, sites, structures or objects. It also includes a wide range of socio-cultural values that are attached to those remains or to the environment, that are important to the heritage of a group or of the entire population.

To indicate the full range of cultural resources present in the region and provide a cultural context for those that are known, past human use and occupation is described in a brief historical summary. This is followed by a description of known cultural resources on public lands and then a description of management opportunities for those resources.

HUMAN USE AND OCCUPATION*

The dominant physical features of the southwest region, its climate, and its resulting biological regime have made human use and occupation more concentrated there than in many other regions of Alaska. An unusually wide coastal plain and an interior of dissected uplands with broad valleys and lowland basins drained by Alaska's two largest rivers have invited human access. This coastal plan and its rivers have been major corridors for past movements of people. This physiographic pattern has existed since the last ice age, and even today governs man's access to the region.

The region's subarctic climate is transitional between the continental and maritime climates of Alaska, with average annual temperatures of 22° F to 35° F and average annual precipitation of 17 inches. Because of its latitude, the entire coast is bordered by sea ice during the winter. However, because of warm sea currents and the extreme productivity of drifting plant life which grows in the lower levels of the sea ice during the early spring, the coast supports abundant marine life.

* The Class I Inventory, a more detailed history of the Southwest Planning Area, is on file at the Anchorage District Office, BLM (file number).

This productivity results in concentrated human food resources in the form of fish and game along the coastline. The many freshwater lakes and streams also offer abundant fish and game. Because of its abundant water surface, the region provides extensive summer nesting grounds for migratory waterfowl that have long been a major food resource for man.

The physiography, climate and food resources of the region have permitted human use and occupation of the land from the remote past to the present. Technology has been the principal limiting factor, yet from earliest evidence found, even humans with limited technology have successfully occupied and used this vast and seemingly inhospitable region.

THE PREHISTORIC PERIOD

The period of human use and occupation in the region before the coming of white man is termed prehistoric because aboriginal populations possessed no written history. Throughout this long span of time the aboriginal population had effective means of livelihood that enabled them to persist for thousands of years even though they were isolated from cultural and technological innovations developing elsewhere in the world. Cultural traditions unique to these people perpetuated their

means of livelihood successfully through countless generations, changing relatively little because there was little need for change.

We can follow this core of adaptive continuity from earliest evidence of man's presence there, to Native cultures existing at the time of white contact, and even to present-day Eskimo and Athapaskan inhabitants. Through thousands of years, relationship of these people with the land and its resources remained one of balanced coexistence, a concept that atomic age society is only now beginning to understand and appreciate.

EARLIEST PEOPLE

The southwest coast of Alaska borders on a broad offshore shelf of land that is only shallowly covered by the Bering Sea. During the last major ice age, temperatures were cooler, and snow and ice accumulated on the continents so that by 18,000 years ago continental ice held enough water to lower the ocean level more than 300 feet. This exposed the Bering Sea shelf as dry land that connnected Siberia and Alaska in a 1,000-mile-wide plain. Some later alternating periods of lesser exposure and limited inundation occurred between 14,000

and 10,000 years ago, after which the land bridge disappeared. Though it is generally accepted that aboriginal people first entered North America via this land bridge (called the Bering land bridge), prehistorians disagree as to when this occurred.

Because the Alaskan subarctic was and still is a relatively dry region with low annual precipitation, it was not covered with ice as was the Canadian subarctic, but had broad, wind-swept tundra-steppe plains that were continuous from the lowlands of Alaska across the land bridge into northern Siberia. Only the mountains of the Alaska Range and south coast ranges built up large ice masses. These and the Canadian ice masses to the east effectually isolated Alaska geographically and environmentally from the rest of the North American continent, making it rather an extension of Northern Asia. Over this dry tundra-steppeland ranged mammoths, mastodons, bison, yaks, musk ox, horses, antelopes, elk, camels, and moose, as well as predators like wolves, grizzly bears, lynx, wolverines, saber-toothed cats, lion-like cats, and great short-faced bears.

Probably among these predators, but less conspicuous, were nomadic men, hunters who possessed a spoken language and all the tools of survival, including a full size human brain.

These earliest people were presumably highly mobile, living in temporary dwellings at short-term camps as they followed the roaming herds of large game on which they depended. Their stone and bone tools were not primitive, but display highly developed techniques of manufacture. These toolds are distinguished by their large fluted stone points and beveled-base bone points. These people soon ranged over the ice free areas of Alaska and southward across the entire continent.

The stone tools of these earliest immigrants are about all we have on which to base our knowledge of them, and few examples have been found, none of these in an undisturbed context. Most materials used by people in this time, such as wood and animal skin, perished long ago. The stone and bone artifacts that have survived are difficult to find because they are relatively inconspicuous and may be deeply buried or obscured by surface vegetation. Often they have been found only because of their association with large animal bones, such as at kill sites and campsites, because the bones are highly noticeable once exposed. That the tools have been found with the bones of mammoths, mastodons, and huge bison indicates that these people hunted those animals successfully.

Many of the artifacts of this early period that are found in the region have been exposed on the ground surface and are difficult to distinguish from tools of later periods. Manufacturing techniques and tool forms are often similar, and stone artifacts themselves cannot be accurately dated.

Although evidence of these earliest hunters is sketchy in southwestern Alaska, there is ample evidence that the area was inhabitable in this period (12,000 to 10,000 years ago). Placer mining and riverbank erosion have exposed the bones of mammoth, horse, and bison at numerous localities in the region. These finds, coupled with geological and paleoenvironmental data, indicate an environment that could have been utilized by early man. They also indicate the possibility of discovering kill sites where these extinct animals were killed and butchered and the bones and discarded tools left behind.

These earliest people entered a previously unpeopled continent, rapidly crossed it, and soon traversed South America to Patagonia, a distance of 10,000 miles, all within a few centuries.

By 10,000 years ago Alaska was still environmentally an extension of Asia, and there was a widespread population occupying the vast tundra-steppe plains of southwestern Alaska. These people were primarily still terrestrial hunters, but along the coast, rivers and lakes had begun to settle more permanently, even constructing substantial houses. Marked regional variations began to appear in their stone tools, though artifact complexes specific to different ways of life were not yet evident. These people universally used small wedge shaped cores of suitable stone material from which microblades were pressed, presumably to be set in the edges of bone or wood projectiles like teeth on a saw blade. Some of them also made leaf-shaped, or lanceolate, stone projectile points and other chipped stone tools. The areas they occupied are all areas that were ice free during the latest local glaciations. After about 9,000 years ago, as ice barriers south and east disappeared, these people spread eastward and southward onto the main continent.

In this period there was evidently a general broadening of the resource base used, with consequent changes in tool technology. Food was obtainable only by hunting, fishing, and gathering of limited plant foods. Instead of ranging the land following the wandering herds of game, inhabitants began to focus on exploiting seasonally abundant foods as they became

COASTAL PEOPLE

By about 10,000 years ago the Bering land bridge had disappeared and warmer Pacific Ocean waters began entering the Arctic Ocean, accelerating a warming trend that continued until about 5,000 years ago. During this time the sea rose appreciably and the northern forests advanced as much as several hundred miles north of their present limits. In southwestern Alaska there is evidence in this period of distinct differences between coastal occupants and inhabitants more to the interior, although the distinctions are somewhat fogged.

However, by 4,000 years ago the ancestors of the modern Eskimo people occupied the coastal tundra zone and lower reaches of the major rivers. These people were still highly nomadic, primarily hunting sea mammals along the coastline and caribou on the tundra, but also fishing along streams for salmon and other fish. After about 3,000 years ago there occurred a definite orientation toward a truly maritime economy which led directly over the next 2,000 years to a characteristically Eskimo lifeway. This may have resulted from pronounced climatic changes that occurred in this period.

The artifacts of these people show a greater emphasis on use of the sea coast. At Unalakleet one large occupation site on the coast from this period has nearly 200 house depressions, suggesting a substantial community. Still, in this period the sea mammal hunting had a relatively simple technology.

In the following millenium there was a continuing elaboration of specialized tools for sea mammal hunting and related tasks, indicating that a highly successful way of life was developed and was reflected in the flowering of this material culture. In Southwest Alaska this way of life, with its relatively permanent settlements and its ability to utilize a variety of maritime resources as well as animals and fish of the interior, was marked by an increase in population and expansion into inland regions. By about 1,200 A.D. Eskimo settlements existed well up the Yukon and Kuskokwim rivers, even into forested regions. The yearly runs of salmon in the rivers enabled the expansion to push on into areas where the Eskimo peoples of southwestern Alaska were found by the first white explorers who entered the region in the eighteenth century.

INTERIOR PEOPLE

In inland areas, land-animal hunting continued to remain the major economic endeavor in a largely Boreal forest environ-

available, moving from one source to another during their seasons. Migratory fish and waterfowl, and marine mammals assumed greater importance as food resources.

The general broadening of food sources increased survival potential and also precipitated the beginnings of diversification in the population As movement gradually became more restricted, with greater reliance on food resources of specific localities, development of more specialized tools developed and probably distinct cultural identities began to form between groups. By 6,000 years ago two general types of subsistence strategies had evolved, based on a general differentiation between inhabitants of the coast and those of the interior.

Although this development reflected increased reliance on particular food resources, it did not mean that other resources were not used, but that they had become less important. The general distinction between coastal and interior groups that began in this period should not be equated with later Eskimo and Athapaskan populations. Any similarites probably stem from similar adaptations to similar environments.

ment, with salmon fishing later becoming a major focus. Data relating to this period of prehistory in the inland region of southwestern Alaska is practically non-existent at present.

As late as 1,000 A.D., however, artifact assemblages from the Lake Minchumina area were not highly distinctive from those of other regions. Whether this indicates stronger ties with coastal populations than with the rest of interior Alaska is uncertain.

At any rate, after about 4,500 years ago a variety of artifact assemblages generally showed adaptaton to a northern forest environment. These assemblages include microblade and burin industries which disappear by about 1,000 A.D. as a result of some basic cultural change, either a new population, an outside influence, or a response of to environmental change. The general pattern of a northern forest lifeway continues thereafter in most areas of interior Alaska to the time when white explorers first encounter Athapaskans occupying their traditional areas. In some areas of southwest Alaska this contact did not occur until well into the nineteenth century.

THE RUSSIAN ERA

When white men began to penetrate the Bering Sea in the eighteenth century the Natives of the southwest region were probably more knowledgeable about the newcomers than these white men were of the Native inhabitants. Tobacco as well as iron and copper had both preceded the Russians by means of Eskimo trade across the Bering Strait with Siberian people who had already had contact with Russian explorers and traders. These goods were traded widely almost everywhere in the region and when white men finally arrived there, they found that their material goods had preceded them.

But the material goods of the European cultural tradition were not the only commodities that the explorers, traders, missionaries, and whalers brought. They also brought a language, a religion and a trade economy with them which became permanently implanted in the region within less than 50 years. From about 1818 to 1867, the Russian colonials explored most of the region, established missions and settlements, exploited certain resources, and profoundly changed the Native people living there. Much detail of this era is now lost, except as it survives in the scanty written history and ten to twelve historic sites in the region.

Early Explorations and Expansion

Various Russians may have glimpsed the Diomedes or the tip of Seward Peninsual prior to Vitus Bering's voyage in 1741, but it was his reports of rich new fur sources that brought the fur traders, or promyshlenniki, of Siberia pushing eastward into the new-found territory. Their earliest fur hunting expeditions proceeded eastward along the Aleutian Islands, reaching the mainland coast in less than two decades. For several decades thereafter they made little effort to explore the Bering Sea coasts, but pushed eastward and then southeast down the coast in pursuit of sea otter pelts.

It was not until 1818, after southeastern furs began to dwindle, that an expedition under Petr Korsakovski was sent from Kodiak to explore north of the Alaska Peninsula. This expediton crossed overland from the east side of the Alaska Peninsula, and reportedly went as far north as the "Ryka Kuskokvim" or Kuskokwim River, and down the river as far as the village of Ohagamiut.

By 1819, a fortified post, or redoubt, had been built at the mouth of the Nushagak River. Called Novo-Aleksandrovski

redoubt, it soon became the base for exploring the southwest region and establishing other outposts along the Nushagak and Kuskokwim Rivers.

In the first years of the 1830's, a network of trading posts was built. The following table lists the principal trading posts, the date they were built, and their locations.

Year	Trading Post	Location
1832	Holitna Odinochka	Confluence of Holitna River with Kuskokwim
1833	Lukin's Odinochka	At village of Kwigiwmpainu-kamiut on the Kuskokwim
1835	Nushagak Odinochka	Confluence of King Salmon River with the Nushagak
1842	Russian Mission	Mouth of Unalakleet River
1845	Andreevski Odinochka	On Yukon at mouth of Andreafsky River
(1840's)	Komarovski Odinochka	Lower Yukon delta
(1840's)	Alekseevski Odinochka	Lower Yukon delta

At strategic locations, the Russians also built fortified outposts, or redoubts:

Year	Name	Location
1819	Aleksandrovske redoubt	Mouth of Nushagak River
1833	Mikhailovski redoubt	East side of St. Michael Island in Norton Sound
1841	Kokmakov redoubt	On Kuskokwim, just downstream from Lukin's Odinochka

By 1855, the Russian settlements and outposts in the region had become stabilized.

Occupancy and Fur Trade

In the period 1841 to 1867 Russian became more sedentary, less concerned with opening up new territory. From 1842 to 1844, Lieutenant Lavrenti Zagoskin explored the lower Yukon-Kuskokwim region and made detailed observations on the Native people of Norton Sound, the Unalakleet and Innoko Rivers and the lower Yukon and Kuskokwim drainages. He also described the Russian outposts, trade relations, and travel routes. His maps and charts of the region were used into the twentieth century. Because of Zagoskin's report, more is known about this period of Russian occupancy than is known of either earlier or later times.

The Russian population in the region was never large, and though the number of outposts increased in this period, the Russian population increased little. In 1845 there were only 26 Russians in the entire northern region. By 1860, there were still only 30 adult Russians. There were no Russian women at all in the region, and intermarriage with Native women was prevalent. Most of the Russians were lower and

middle class townsmen from the northern regions of European Russia and Siberia where intermarriage was probably not unusual. The company hoped that the creole offspring of the marriages with Native women would provide a link between Russians and Natives, but in reality the creoles were isolated from both worlds, unable to participate fully either. Many were educated in Russia and were highly able individuals, like Glazunov, Malakhov, Kolmakov, and others. Their ability to speak the Native language and their knowledge of the land, its resources, and Native customs made them particularly well suited for service in the trading outposts where they came to form a large part of the workforce. The scanty Russian population and their wide dispersal resulted in their close contact with the Natives and probably helped mitigate the cruel treatment afforded the Natives during earlier periods.

The redoubts and odinochkas in the region were little more than trading stores with quarters for the workers. Sometimes they were enclosed by palisades with corner towers armed with small caliber cannon. An odinochka was usually a small rectangular log building divided midway into a storeroom and living quarters. Sometimes there were adjoining barracks for the creole and Native workers, usually a steambath, and possibly other huts for storage or living. A redoubt usually

differed from an odinochka only by having the buildings enclosed within a pole palisade, often with walls of the buildings incorporated as part of the palisade.

In 1838 a smallpox epidemic swept the region and raged through the Native population, finally dying out in 1840. Smallpox had a devastating effect on the Natives because they lacked any natural immunity to the disease from previous exposure. It is estimated that as many as two thirds (66 out of 100) of the inhabitants died at some villages in the region.

Although the smallpox epidemic resulted in a tremendous setback for the fur trade, the Russians tried to bolster their trade in the region as much as possible in the decade that followed. On his trip, Zagoskin was expressly directed to investigate the best means of accomplishing this, especially for intercepting furs leaving the region via an age-old trade route from Seward Peninsula across Bering Strait to Siberia. Throughout the period, furs remained the only resource of real concern to the Russians. Although they exported some ivory, baleen, beaver tails and beaver castors, these were considered merely adjuncts of the fur trade. And although the Russians had discovered deposits of coal and cinnabar, these deposits were never worked.

The fur pelts most eagerly sought for export were otter (both sea and river species), beaver, fox, marten (sable), lynx, and bear. They traded caribou, wolf and wolverine skins to coastal Natives, and used mink, muskrat and squirrel for their own parkas. They also obtained harbor seal, sea lion, and walrus skins, as well as seal oil, on the coast.

In exchange, the Russians brought the Natives tobacco, tea, iron and copper kettles, knives, lances, hatchets, kindling steels, iron and copper wire (for making bracelets), needles and beads. Tobacco was the chief trade item, however, and the inhabitants of Southwest Alaska had already become accustomed to its use, through the Bering Strait trade, before the Russian traders arrived. (Thus tobacco had made an eastward circle of the globe back to North America after it was taken to Europe from the new world.) Soon, however, the trade item most desired by Natives was firearms. The company was reluctant to permit their trade to the Natives for several good reasons; even so, they would soon obtain firearms from other sources.

Before 1840 the Natives of the southwest region had had little direct contact with Russian fur traders or others of European cultural tradition. Up to that time there had been few ships

entering the Bering Sea except for the periodic ships of the Russian-American Company. Because of its northern location, poor navigability, and Russian sovereignty on bordering coasts, the Russians thought that the Bering Sea was safe from foreign interlopers, but in the 1840's a serious threat surfaced: American whalers.

By 1845 whalers had discovered the bowhead whale population of the Bering Sea, and by 1850 hundreds of British and American whaling vessels were frequenting those waters. Virtually all the whalers doubled as traders, bartering liquor, firearms, gunpowder and tobacco for whalebone, furs, walrus ivory, and other goods from the Eskimo. The liquor and firearms were soon passed on the by the Eskimos in trade with interior groups for furs to be traded back in turn to the whalers. In 1846, the Russians banned all hard liquor, but they had no means of enforcing the rule. By 1847, some flintlock rifles were also entering the southwest region from Hudson Bay traders at Fort Yukon, but the most firearms came from coastal Eskimo trade with whaling ships.

By the mid-1850's the bowhead whale taken in the North Pacific had peaked and was beginning to decline. To boost profits, the whalers began to hunt walrus for their oil and tusks.

Between 1860 and 1880 approximately 200,000 walrus had been taken. This caused a depletion of both bowhead whales and walrus that most severely affected the coastal Eskimos further north, but that undoubtedly was also felt by the coastal Eskimos of southwestern Alaska as well.

Thus at the time that the Russian-American Company was expanding its fur trade with Natives in northern Alaska, influences from whaler-traders on the coast and from Hudson Bay Company traders to the east also began to impinge upon the region. There was also one additional influence that appeared in this period: the Russian Orthodox Church.

Before 1842 a priest from Aleksandrovski redoubt had made sporadic visits to the Kuskokwim River and the shore of Bristol Bay. In 1842, a chapel was built at Mikhailovski redoubt for the use of visiting priests from Unalaska. This led to the establishment of a permanently staffed mission on the Yukon in 1845 at the village of Ikogmiut.

Chapels were soon built at many outlying odinochkas and villages, to be used for ceremonies when the priest made his periodic rounds. At first many of the Natives were afraid of the priest and thought that, like vaccinations, baptism might somehow be associated with smallpox. This fear apparently was overcome, but the size of the territory made it impossible for the priest to visit all areas even once a year, and visits to outlying villages more often than once every two years were probably a rarity. For this and other reasons, the Orthodox religion made only superficial inroads in replacing traditonal Native beliefs and educating the Natives before the United States purchased Alaska.

From the first contact the Native people were quick to accept trade goods. To acquire these trade goods they concentrated more on hunting and trapping for furs. However, fur animals were plentiful in the region, and traditional territories were well established, so that little change in Native occupation patterns resulted from this shift in emphasis; traditional use of local resources changed relatively little. Yet by the 1850's the Native people in the region were beginning to be caught in a spiraling increase in dependence upon the material culture of the European tradition. As they spent more time in

trapping, they had less time to spend for traditional subsistence pursuits and had to trade furs for necessities like food and clothing.

At the same time that international forces in the 1860's began to work against the continuation of Russian ownership of Russian America, the interior fur trade -- which had been helping to offset decreased harvests of sea otters and whales -- began to decline.

By 1861 the company had had to close the outposts at Ikogmiut, Alekseevski and Komarovski, and the remaining posts were more poorly supplied than ever.

By 1866 negotiations began that would transfer sovereignty of Rissian-America to the United States. Almost simultaneously with consummation of the sale of Russian-America to the United States in 1867, an eastern businessman named H.M. Hutchinson bought the saleable holdings of the Russian-American Company in Russian-America for $65,000.

Under terms of the treaty of purchase, the Russian Orthdox Church retained ownership of its buildings and the land on which they stood, as well as the right to continue its activities in Alaska. But church officials feared that with

withdrawal of the company it would be impossible to support the Yukon parish. In the fall of 1867 church property from the Kolmakov post was moved to Ikogmiut mission. In 1868, the priest at Ikogmiut, Fr. Illarion, was recalled to Sitka with all moveable church property, leaving the mission in the care of a creole assistant.

The end of Russian sovereignty, however, did not eradicate Russian influences in the region. Remnants of Russian culture, especially the Orthodox Church, continued to exert strong influences on the names, language, settlements, religion, and customs of the people. The Russian cultural heritage was stamped indelibly on southwest Alaska in the 50 years of Russian exploration and occupation.

AN AMERICAN FRONTIER

The United States' acquisition of Russian America in 1867 provided an altogether new American frontier in the wake of westward expansion which had peaked in the mid 1800's with acquisition of Oregon Territory and California. While many Americans decried the purchase of Alaska as a waste of taxpayers' money, others applauded, especially those in the Pacific Coast region where fishing companies were already

expanding into Alaskan coastal waters. Americans in general optimistically thought that, where the Russians had failed, Yankee ingenuity could make the territory profitable.

Most of the scientific and practical information on Alaska that had been collected by the Russians was lost to the American successors. This lack of knowledge about Alaska, its resources, and its potential delayed widespread interest in the new territory until after gold was discoverd some thirty years later. These three decades provided an important period of adjustment for the new territory, especially for its indigenous people, during which they could adapt to American "frontierism" and the emerging industrial world of the 20th century. Had the gold rush followed immediately upon American purchase, the results might have been devastating. As it happened, the Alaskan frontier never experienced organized conflicts between immigrants and indigenes that marked earlier frontier expansion, but rather experienced only relatively minor personal incidents.

PRE-GOLD RUSH DECADES (1867-1897)

A sizeable contingent of Americans was already present in the west-central region of Russian America at the time of American purchase. In August of 1865, a party of Americans had landed

at Mikhailovski redoubt (now St. Michael) in Norton Sound to begin work on a telegraph line that was to extend across Bering Strait and connect Europe and North America by telegraph. Attempts to lay an Atlantic cable had failed, so this monumental undertaking proposed to link the continents with a cable overland from Vancouver, B.C., through Alaska and across the 56 miles of the Bering Strait. The company abandoned this project in 1867 when a cable was successfully laid across the Atlantic, but during the work, valuable scientific information was collected by a group of scientists attached to the project. Among these men were naturalist William H. Dall and artist Frederick Whymyer, both of whom became widely known for their work in Alaska. Heading the scientific corps was Naturalist Robert Kennicott, who died at Nulato in 1866 during this project.

The sale of Russian America to the United States brought no immediate changes in the region. Forty years later, Eskimos in the area of Bristol Bay had not heard of the United States Government and believed they were still under Russian rule.

Until the gold rush era, life continued pretty much as before, with some intensification of the fur trade and additional missionary activities. In 1869, there were not more than 300

whites in all of Alaska, including a few at St. Michael (as the Americans anglicized Mikhailovski redoubt); there were none north of Unalakleet. As late as 1887, Russian continued to be the dominant trading language in the region.

Hutchinson, Kohl and Company purchased the buildings, ships, and supplies of the Russian America Company for $65,000 and immediately shipped much of the saleable goods to California where it brought over $250,000 and inaugurated a new era of Yankee profiteering in Alaska. Hoping to take over and capitalize on the fur trade through the thriving port of San Francisco, the company hired many former Russian American Company employees and former Hudson Bay Company traders to act as their retailers. In return for merchandise from San Francisco, the traders sold their furs to the company at prices which probably were less than half their value on the San Francisco market. The company retained ownership of most of the post buildings and also provided a yearly barge service for shipping goods up the river.

In 1869 a 50 foot stern-wheeler, the Yukon, was shipped to St. Michael for use by the company on the Yukon River. Its maiden voyage was from St. Michael to Fort Yukon in July, 1869. This

was the first trip by steam vessel into Alaska's interior, and it became a landmark event among the Natives for reckoning other events in time.

During the early years of the American period a number of trading companies operated in the region, but only ony survived the competition. This was the Alaska Commercial Company, organized in 1870 (known all over the territory by its initials). By 1833 the ACC had squeezed out all rivals. The company took over or closed rival posts, entering a period of almost monopolistic trading that lasted into the 20th century.

Headquarters for ACC were at Unalaska. From there goods were shipped to the Yukon and Kuskokwim trading districts. By 1880 the Yukon district included posts at St. Michael, Anvik, Russian Mission (Ikogmiut), Andreevski, and Kotlik. Operations of the company were organized around a supply system that increasingly utilized riverboats and barges. Most traders owned small barges built of whipsawn lumber on which they annually drifted down the river and cautiously made their way up the coast to St. Michael with their cargoes of furs. After the ocean-going supply ship had arrived and they had selected their trade goods, they were towed back upriver, four or five to a steamer.

During the winter a trader would visit as many villages as possible in his area, setting up his tent and bartering for furs. The trader tried to have the kinds of goods most desired in his area, which gave him an advantage over competing traders, a strong bartering edge with the Natives, and also encouraged the villagers to go trapping for the trade items.

The early period of American occupancy in the region had a more intensive and competitive fur trade economy than any earlier or later period.

Just as St. Michael was the supply depot for Yukon River trading, a depot called "Warehouse" that ACC established near the mouth of the Kuskokwim River on the south shore of Kuskokwim Bay served the Kuskokwim River trade. During the early years ocean-going freighters anchored off Warehouse, and supplies were transferred onto smaller vessels for transport up the river. It was not until 1889 that a deep water channel into the Kuskokwim was discovered.

St. Michael became an even more important trading center and transportation interchange during the American period. Not only was it the trading center for Natives of Norton Sound and the lower Yukon, but travelers to the Bering Sea and the interior almost always stopped there.

In 1874 the U.S. Signal Service established a meteorological station at St. Michael. Men stationed there collected important scientific and ethnological specimens for the government. With the exception of the Signal Service officer, the only other official presence in the region before 1897 consisted of the U.S. Revenue Marine Service.

In spite of the increasing white population and travel through the region in these decades, the area was relatively little known beyond the coastal stations and established transportation routes.

Alaska was administered under the U.S. Army as a military district from 1867 to 1877 and under the U.S. Navy from 1879 to 1884, when a civil government was established by the Organic Act of 1884. The Act of July 27, 1868, extended U.S. Customs laws to Alaska; and a collector of customs was appointed to the district. To enforce customs laws regarding trade in liquor and firearms, the U.S. Revenue Marine Service began annual patrols of Bering Sea trading ships in 1880.

The principal duty of the cutters was to stop the sale of liquor and breech-loading firearms to Natives, but they performed many other functions as well, often far beyond their

responsibility. They assisted vessels in distress; searched for missing ships; transported shipwreck survivors, teachers, missionaries, and Natives whenever possible; helped in the 1880 and 1890 census; assisted government expeditions; and even transported reindeer from Siberia in the 1890's. The captains were expected to arrest lawbreakers, which meant transporting them to Unalaska or Sitka, or even San Francisco to be tried.

In this period, law in the region was actually an arbitrary combination of Native law and white law. Intertribal cases were usually left to Native solutions, even for murder. Native law rather than American law often prevailed even in interracial cases of murder, depending upon what the captain felt. More often there was simply no law enforcement authority present at all.

Even in enforcing customs laws, the revenue cutters were hampered because they did not arrive until after the first of July and by that time much contraband had already been sold to the coastal Eskimos, who simply waited until the cutter departed to trade it with other groups.

While trade and law in the region were subject to the vagaries of personal ethics, missionaries strove to bring white man's morality and other aspects of his culture to the Natives. Not only were Natives expected to adopt Christianity, but much associated secular culture as well, including the English language.

After the sale of Russian America to the United States the Orthodox Church temporarily withdrew its priests from the region. Nevertheless, many Natives, though never visited by a priest, continued to identify with the Russian Orthodox Church. Even after visits of priests had become infrequent in the interior and representatives of other churches began making converts, many villages continued as adherents to the Orthodox faith. By the 1880's and 1890's the Orthodox Church had become identified with the aboriginal culture in the minds of many Natives. It had a more tolerant attitude toward their cultural practices than other denominations, avoided excessive zeal in proselytizing, and trained a cadre of Native clergy and lay leaders.

After the late 1880's missionaries of other churches began to have more influence in the region. Orthodox clergy met with suspicion and accusations of continuing ties with the Russian government from other missionaries, the press, and quasi-government officials.

In 1885 an ardent Presbyterian missionary, Sheldon Jackson, was appointed Commissioner of Education in Alaska. The Organic Act of 1884 had provided $25,000 for education in the entire district of Alaska. With this money, Jackson, who believed that education and religion were inseparable, solicited mission-oriented churches to establish schools in Alaska with funding assistance from the Bureau of Education. Such schools came to be known as "contract schools" and, with the exception of a "reindeer school" established near Unalakleet in 1898, all the schools in the region were organized and taught by religious sects until well after 1907 when Jackson was asked to resign his position.

Jackson solicited the Moravian Church to establish a mission and school in Southwest Alaska. In 1884 missionaries went to the Kuskokwim, chose the village of Mumtrekhlagamiut, and named their mission Bethel because the biblical text for the day (Genesis 35:1) was, "God said unto Jacob, arise, go up to Bethel, and dwell there."

In 1891 another mission was established some 80 miles above Bethel at Ogavik.

John H. Kilbuck, a Delaware Indian born on a Kansas reservation, worked at Bethel mission until 1899. In 1890 he traveled extensively on the river conducting the 11th Federal census. Kilbuck appointed many church "helpers," or lay readers among the Natives of outlying villages, where small chapels were then built to assist in the missionary effort. This and his own travels greatly extended the influence of the church on the Kuskokwim. The Kilbuck Mountains southeast of Bethel were named in his honor.

During the 1880's and 1890's, several other denominations established missions and churches at likely spots along the rivers. The Protestant Episcopal Church sent Octavius Parker, who established a mission at Anvik in 1887. Catholic priests Aloysius Robaut and Carmelo Giordano established the mission of Holy Cross near the village of Koserefsky in 1888. That same year a school was begun there, staffed by nuns of the order of Sisters of St. Ann. The Catholic influence expanded in 1891 when a mission house was built at Ohagamiut; a church in 1896. In 1892 a chapel and priests' residence were built at Shageluk on the Innoko River.

Not until 1894, when Dr. Mary Glenton came to the mission at Anvik, was medical assistance available in the region. She found the general health of the Natives very poor. Pneumonia

was the most common cause of death, and other respiratory diseases were widespread. Syphilis, skin diseases, rheumatism and eye problems were prevalent. In spite of the fact that crippled and abnormally formed babies were quickly disposed by infanticide, somatic disorders such as humpback, malformed lower jaws, and hip diseases were common. Infant mortality and accidental deaths contributed to the generally high mortality rate.

Another mission known locally as the "Swedish Covenant," was established at Unalakleet in 1887, the same year the Episcopalians established themselves on the Yukon River at Anvik.

By 1890-1891, there were 96 pupils attending their mission school, and by 1893-1894 they had also established a mission at Golovin.

The depletion of walrus by whalers in the 1860's and 1870's precipitated a plan for importing domesticated reindeer from Siberia to save the "starving Eskimos" of the Bering Sea coast. Though the Eskimos had little aptitude for the reindeer herding industry and were reluctant to be committed to a life completely restricted to one activity and a single food

resource, Sheldon Jackson embraced the idea enthusiastically and succeeded in establishing small herds of reindeer on Seward Peninsula between 1892 and 1894. Laplanders were recruited from Europe to teach reindeer herding to Eskimos, and superintendents who were also expected to double as teachers were hired for the project.

Ironically, the Eskimos got almost none of the reindeer. At the reindeer stations, rations did not include meat for Eskimo herders and apprentices, though they did for the Lapps. Any Eskimo who killed a reindeer was reprimanded and made to pay a fine in furs.

Jackson had hoped to eventually supply reindeer to every mission station in the tundra region. He gave outright 100 deer to a mission at Wales in 1894, and in 1896 sent another 100 on loan to Golovin Bay, 50 each for the Swedish Covenant mission and the Episcopalian mission at Anvik.

Throughout the decades from 1867-1897 furs continued to be the primary resource exploited in the region, though bowhead whaling continued in the Bering Sea until the end of the nineteenth century when the price of baleen declined. In the 1870's and 1880's the advent of steam whaling vessels enabled

many ships to overwinter in the Arctic. This necessitated coal stockpiles at coastal stations like Port Clarence and required yearly visits from tender ships which brought mail and provisions north, and took back whalebone, oil and ivory.

Crew members of whalers were often knowledgeble in other matters, and in 1880 a whaler discovered a large deposit of galena ore on the Fish River, which empties into Golovin Bay.

By 1889, prospectors were entering the region, after gold was discovered in paying concentrations on the Stewart and Forty-mile Rivers east of the Alaska border in the Yukon Territory.

On the eve of the gold rush many influences had combined to produced a unique amalgamation of Native and white cultures without appreciably changing the established order of the region.

Although the fur trade emphasized the dispersion of the people in trapping endeavors every season of the year except summer, but the summer fishing activity remained relatively unaffected by the fur trade economy. This allowed the Natives to escape total dependency on an economy based on trapping, but increased their dependence on commodities. This in turn tended

to centralize the Native population around trading stations and major waterways, further reducing their mobility and reinforcing their dependence on the trapping-trading economy.

Missions also contributed to centralization of the population in the region once they established schools and began offering medical services and supplying food during lean times. Although the missions focused on changing the religion of the Natives, they also had an effect on nearly every other aspect of Native life. Around the missions the Native semisubterranaean house was beginning to give way to above-ground log dwellings. Traders, medical treatment, and wage labor were also beginning to erode other traditional cultural practices.

Epidemics of introduced diseases, came more often as contact with outsiders increased. Increased contact also brought alcoholism and other social ills. Even in the 1890's health care remained poor, with over half of all babies dying within a year of birth.

Up to this time the white immigrants did not create their own settlements for the most part, but took up residence at Native villages. In a pioneering country with few white females, intermarriage with Native women was common, and children of these unions were readily accepted in the amalgam culture.

Native and non-Native material culture were also interwoven. Although guns had replaced aboriginal weapons for land hunting, sea mammal hunting and much trapping were still done with Native implements. Metal trade utensils were preferred by Natives for cooking, but traditional wooden dishes for serving and eating. Though matches were in universal use by 1898, seal oil lamps were still widely used. The most practical items of clothing from both cultures were worn by both Natives and whites.

By the end of the American fur trade period aboriginal culture of the region no longer existed in its traditional configuration, but had become a unique combination of Native and Anglo-American cultures that would never again recur. The Anglo-American culture of the region had also taken on an identity that was emerging as something distinctively Alaskan and had incorporated or adopted many aspects of traditional local lifeways. Although many more Anglo-Americans would soon swarm through the region, this emerging Alaskan identity would cushion a lot of the subsequent impact.

GOLD RUSH EPOCH (1897-1920)

The gold rush epoch, which lasted generally from 1897 to about 1920 in Southwest Alaska, was a period of rapid and intensive

changes. Most of this change resulted directly or indirectly from the gold rush and the great influx of white Americans. Concommitant innovation and development in transportation and communication, and trade and commerce created greater changes in the established order of the region, its land, and its population than occurred in any period before or since. Human use and occupation, which had formerly been a commingling of traders, missions, and Native interests based on mutual dependence and benefits, gave way to a new order based on exploiting mineral resources not formerly used by the Natives. White-dominated settlements sprang up at or near mining districts, and these became the seats of government authority and services. The fur trade economy was replaced by mining-oriented trade and commerce in which Natives had no role except peripherally in providing useful services or commodities. The land and its resources were exploited now in ways that relegated the Natives increasingly dependent roles as outsiders in their own land.

Stampedes. In the summer of 1897 two riverboats, NAT&T's Portus B. Weare and ACC's Alice, returned from the upper Yukon to St. Michael loaded with gold. These shipments started the world-famous rush to the Klondike. Several thousand of the stampeders heading for the gold fields in the Yukon Territory

chose the long route, to St. Michael by ship and then up the Yukon on one of the large riverboats that were rapidly being built and put in service. Almost overnight St. Michael became a metropolis with hotels, restaurants, storehouses, bakeries, laundries and mercantiles springing up, and with several large riverboats like the Leah and the Charles H. Hamilton taking shape on the ways.

When fall came in 1897, hundreds of the goldrushers were stranded in St. Michael, unable to get passage upriver. Eight or ten ships had already arrived from west coast ports with carpenters and lumber to build riverboats, and thirteen more were expected. Since southwestern Alaska was not gold country, the frenzied swarm of humans did not spread across the countryside, but stayed close to St. Michael and the Yukon River. The U.S. revenue cutter Bear was the only rudiment of authority present in the entire region.

In October 1897 a military post, Fort St. Michael, was hastily established and garrisoned with troops under command of Captain E.S. Walker. But St. Michael, appropriately nicknamed "Fort Get There," was only a way station on the road to riches for the expectant stampeders. By the end of 1898 all the richest ground in the Klondike gold fields had been staked;

St. Michael was full of disgruntled and penniless stampeders. In the spring of 1898 there crowded into St. Michael some 78 military men and 32 transportation companies with a fleet of 60 steamboats, eight tugs and towboats, and 20 barges.

New gold discoveries in other regions soon brought a resurgence of activity.

Before the gold rush at Nome had peaked, a new strike was made in the interior on tributaries of the Tanana River and by late 1902 hundreds of people were rushing to those diggings. The Yukon River continued to be a major access route to the interior and the successive gold strikes concentrated prospecting along the full length of the river. By this time, expectant prospectors were confident that almost any tributary of the region might yield hidden bonanzas. Those who had failed to find their fortunes at the earlier strikes began to prospect every tributary and minor creek that could be conveniently reached.

On the Kuskokwim River, prospecting had been disappointing. It was not until 1906 that the first real finds of gold were made when prospectors entered the headwaters of the Innoko drainage from the Kuskokwim. That summer a party led by

Thomas Ganes struck pay dirt on what was later named Ganes Creek. News of the discovery soon spread to other areas of Alaska, and miners quickly arrived and staked the entire creek valley. Early in 1908 a strike about 10 miles west on Ophir Creek produced the new town of "Ophir" at the mouth of that tributary.

More than 700 miles by river from the mouth of the Innoko and more 150 miles by winter trail from Kaltag (the nearest Yukon River supply post), the mining area was so inaccessible that the claims had to be rich to meet operating expenses. The most direct route to the Innoko district was via the Kuskokwim River. In 1907 at least seven vessels made one or two trips up the Kuskokwim carrying miners from Nome. They transferred to one of two small sternwheelers operating on the river and ascended to a point on the Takotna River that was within 12 miles of the Innoko headwaters. The town of McGrath was established as a trading post at the junction of the Kuskokwim and Takotna Rivers to serve the gold diggings.

In spite of its isolation, the Innoko district produced a significant amount of gold and attracted considerable attention. Up to and including 1910, production was $750,000 in

gold, and for the next few years averaged about $250,000. In 1908, Ophir had a population of 150 whites and was already the hub of mining activity on nearby creeks.

During the summer of 1907 and 1908 prospectors were also checking other tributaries. The Holitna was investigated without success, but some gold-bearing placers were found in 1907 on Bear Creek, a tributary of the Tuluksak. In 1908, gold was found on the Iditarod River.

A tent and cabin town called "Iditarod" was started nearby at the head of riverboat navigation (for more information about Iditarod, see BLM Anchorage District Office files on the Iditarod National Historic Trail,_____). Another settlement called "Dikeman" also appeared at the limit of ascent for the large riverboats about 80 miles downstream. It became an important transhipment point, and in 1910 had a population of around 100.

Iditarod, however, remained the commercial center for the district, and in 1910 had a floating population of around 2,000, a telephone system, tramway system, two newpapers, four

hotels, three lumber companies, a fire hall, nine saloons, and many other businesses. Though more than 2,500 people were in the district that summer, only about 1,000 were engaged directly in mining with the majority operating businesses and providing services. The mining camp of "Flat" on Otter Creek had only about 400 people, and the camps of "Boulder," "Discovery Otter" and nearby claims had about 300 residents.

Although the Iditarod district was just as inaccessible as the Innoko district, production returns soon outstripped those of the Innoko district. From a total production of $500,000 in 1910 they increased to $2,500,000 in 1911 and $3,500,000 in 1912.

After miners began entering the district via the Kuskokwim in 1909-1910, strikes were made on Crooked Creek, the Yunilnuk or George River, and on New York Creek a few miles upstream from Napamiute. In 1910 gold was discovered in streams draining into Goodnews Bay. As more miners entered Southwest Alaska and prospected other localities, traces of placer gold were soon found on most streams draining the west slope of the Kuskokwim Mountains, including the Kancktok, Eek, Kwethluk, Kisaralik and Aniak Rivers. By 1912, gold was also discovered north of the Innoko district on several small streams in the

Cripple Creek Mountains. This indicated a mineralized belt extending from Goodnews Bay northeastward across the entire region a distance of over 300 miles. In ensuing years, additional discoveries were made across this zone, not only of gold and cinnabar, but also of silver, platinum, copper, nickel and other minerals.

Exploration. The effects of the gold rush were immediate and pronounced with respect to exploration, transportation, communication, and trade and commerce. When the gold rush attracted national attention, the federal government sponsored major explorations in Alaska in 1898 and 1899. The U.S. Geological Survey made its first geological reconnaissance in southwest Alaska in 1898, when Josiah E. Spurr with topographer William S. Post investigated the Kuskokwim, Kanektok and Togiak River drainages.

The following year, Lt. Joseph S. Herron led a U.S. Army exploration party through the region seeking the most direct and practical overland route to the interior gold fields. Others, both government sponsored and independent, followed them in investigating and mapping the region, so that by 1920 most features had been investigated and mapped fairly accurately.

Government. The territory of Alaska was given a criminal code in 1899; in 1900 a civil code was adopted and the territory was divided into three judicial districts. St. Michael (later Nome) was made the seat of one district and a federal judge was appointed to establish a court and administer the codes.

Transportation and Communication. At the peak of the gold rush, transportation and communication grew faster than at any time before or since. River navigation on the Yukon and Kuskokwim increased dramatically. In the summer of 1898 nearly 200 riverboats passed by Holy Cross on the Yukon; in 1906 more than 30,000 tons of freight were moved on the Yukon alone. The largest boats, which could cost as much as $95,000, operated on the larger rivers, while smaller, shallow-draft vessels were used on the upper reaches and side streams.

The transportation companies employed many workers directly in their operations. Around 1899 ACC established a boat yard and machine shop near Andreafsky, with a large hotel to house steamer crews during the winter. The riverboats also used hundreds of cords of wood annually and employed many people in supplying that wood. Much of the wood was cut by Natives

along the rivers, although disillusioned prospectors and miners also took up wood cutting. By 1899 there were wood yards every 15 miles or so along the Yukon above Holy Cross. Many areas along the river were completely cleared of trees by the woodcutting, and some remain treeless even today.

After the gold rush peaked, many steamboats lay idle on the boatways at St. Michael, or were converted to barges, or simply abandoned along the river. Some were transferred outside Alaska or converted to other uses. With the decline of mining around the time of World War I, river transportation all but ended in the region.

Overland travel also burgeoned during the gold rush. In winter the wet, boggy terrain, dotted with lakes and criss-crossed by streams, was no longer a barrier to long-distance overland travel. Remote areas could be reached more directly and quickly than in summertime. Winter travel over trails, especially by dogsled, became nearly as important as river transportation. Mail, light freight, and passengers were taken in via these trails and mail, passengers and considerable gold were taken out over them.

To facilitate overland travel in the region the Alaska Road Commission sent W.L. Goodwin in 1911 to mark and clear 958 miles of trail along the route he had surveyed through the region in 1908. The route more or less transected the region, extending from Rainy Pass to Kaltag and from Kaltag over the old Russian portage route to Unalakleet. From Unalakleet the trail ran north along the coast, across Norton Sound and west along the coast to Nome.

This route, with its side trails, eventually became known as the Iditarod Trail because most of the hundreds of people who walked or mushed over the trail from 1911 to 1925 were traveling to or from the Iditarod district. (See Iditarod Trail research in Anchorage District files _____.) As new settlements sprang up during the gold rush, post offices were established. By 1910 there were many of these, and the Iditarod Trail had been planned, to shorten the mail route via Fairbanks and Valdez. In the summer, mail delivery to the interior by boat was fairly frequent, sometimes as often as twice a week during the peak years of river traffic. In February 1924, the first airmail delivery in Alaska was made by Carl Ben Eilson who flew in an open-cockpit DeHaviland biplane from Fairbanks to McGrath in less than 3 hours, a 272 mile run by dogsled normally taking 18 days. In the 1930's landing strips

were built at many locations in the region. Air transportation effectually ended the region's isolation from the outside world, which had returned with the decline of gold mining activity.

Communication from the region to the outside world was greatly improved by the construction by the U.S. Signal Corps to connect the U.S. Army Headquarters at St. Michael with all other Army posts in Alaska and eventually with the rest of the nation. The first sea cable in Alaska was laid across Norton Sound to connect Ft. St. Michael with Ft. Davis near Nome. From St. Michael the line continued north to Unalakleet and then over the portage route to Kaltag and up the Yukon to Ft. Gibbon. By 1903 the telegraph line had been compeleted to Eagle, where messages were passed on via the Canadian telegraph line to Seattle and the rest of the U.S. In 1903 the Norton Sound cable was replaced by the first long-distance wireless telegraph in the U.S., and by 1904 an all-American line was compeleted utilizing submarine cables from Valdez to Seattle.

Known as the Washington-Alaska Military Cable and Telegraph System (WAMCATS), the line was maintained by personnel stationed every 40 miles along its route. Although it had been

constructed by the military, use of the telegraph was also used by civilians. By 1910 wireless systems began to replace the cable system in Alaska, and the overland facilities were soon abandoned.

Towns. Some of the gold rush stampeders settled more or less permanently in the region and a few became independent traders or went to work for one of the established trading companies. New trading posts were soon established along the coast and rivers, at mining camps, and at existing settlements, often in competition with established traders.

At St Michael, the frenzied commercial activity slackened after the Klondike rush subsided. By 1908 the population had dwindled to 550. By the 1920's the town was nearly moribund, surviving primarily as a local trading center for nearby Native villages.

Unalakleet was relatively unaffected by the gold rush activity, remaining a village with a trading post and mission, supported somewhat by Eaton Station (a reindeer station). It was an important station for the WAMCATS operations from 1900 to 1910 and also an important stop on the winter mail trail prior to the 1930's.

As dredging, hydraulicking and other mechanized mining methods were introduced, the gold claims were consolidated by large companies, and since fewer workers were needed, the population declined in the mining districts. World War I further reduced the population when gold prices fell and many miners joined the armed forces. By 1917, the population of Iditarod was 50. Gold mining continued as an important activity, however, and during the depression years of the 1930's, increased somewhat when gold prices rose. The most productive districts continued to be the ones where gold had been mined earlier, even though the richest deposits had been depleted.

After the completion of the Alaska Railroad in 1923, the railroad took over the operation of the few remaining riverboats and shipped freight from Nenana downriver to Yukon River settlements after that time. In the 1930's, as air transportation increased, mail and light freight were transported more and more by air, so that only the heavy freight continued to be brought downriver by boat.

The towns of Otter, Iditarod, Dikeman, Dishkaket, Innoko City and Dementi had all become ghost towns by 1920. Flat was the only mining settlement to survive the decline of mining in the Innoko and Iditarod districts after 1920, but with cessation of gold mining in World War II it too was largely abandoned.

Akiak emerged as an important transshipment point on the Kuskokwim. It was also the center of the reindeer herding industry on the Kuskokwim and supply depot for the NYAC gold mining district on the upper Tuluksak River. By 1918 it had a school, hospital and post office.

Commerce. Though minerals were the major resource exploited during the gold rush period, other resources also gained importance. Trapping, previously the main support of all Natives in the region, became less important to them, but an important source of grubstake money to many miners.

The gold rush period caused greatly increased pressure on populations of game and fish in the region. Dried salmon was especially in demand as dogsled transportation increased, to provide winter supplies of dogfood. The introduction of the fish wheel on rivers in the region by about 1910 and outboard motors by about 1918 made it possible to catch and transport more fish than formerly with less work and in less time.

In the early 1900's more than two million salmon were taken annually on the Yukon alone; more than a million chums were taken in many years. Commercial fishing for export from the region began on the lower reaches of the Yukon and Kuskokwim

as early as 1913. In 1919 the salmon run on the Yukon was extremely poor -- many blamed the floating cannery which had set up in the Apoon mouth of the Yukon that year. From 1918 to 1921, an average of 166,000 chums were taken annually on the Yukon for commercial use, but controversy over the canneries resulted in the closure of the Yukon to commercial fishing until 1932 and closure of Kuskokwim Bay from 1926 to 1929. However, from the 1930's until the 1950's commercial fishing on the Yukon and Kuskokwim was not significant because of the comparative isolation of the region and the abundance of salmon elsewhere in Alaska. The full scale establishment of commercial fisheries on the rivers of Southwest Alaska did not come until after statehood, when other sources of salmon in Alaska were declining.

Local use of timber for construction and fuel increased greatly in the region during the gold rush years. Often the wood had to be rafted downriver to supply missions and settlements on the treeless lower reaches of the rivers.

In the 1920's when fur prices were at a record high, many fur farms were started along the Yukon and Kuskokwim rivers. Some continued through the 1930's, but virtually all were abandoned

after the onset of World War II, where the wartime economy, other employment opportunities, and the advent of artificial fur combined to force shutdown.

Several important developments continued in southwest Alaska more or less independently of the gold rush and the changes it brought about. The religious missions, reindeer industry, and schools were strongly interrelated at the end of the nineteenth century, but as involvement of the federal government changed in the region, these activities soon diverged.

Missions. Missions in Southwest Alaska also benefitted little from the activity of the gold rush decades. Most, in fact, viewed the miners and traders as a bad influence on the Natives and a threat to the missions' work.

During the early part of the twentieth century the position of the missions among the Natives was solidified because they offered access to food and other goods, as well as education, medical care, communications, and other new and valuable assets of the outside world.

At Anvik and Koserefsky and Holy Cross most villagers moved onto mission land by about the turn of the century. Unfortunately, the fact that the missions owned the land discouraged

development of a sense of responsibility and active participation in village affairs among the Natives. Federal assistance to church schools was discontinued in 1895 and thereafter the missions concentrated on their boarding schools, often letting that the day schools for local children lapse. This undercut the development of local support for the missions.

Over the years, outside support for the missions gradually dwindled, especially during the depression years of the 1930's. Without this source of financing, they eventually became unable to continue. The decline and finally the collapse of the missions made it clear that unless local leadership and support were developed among the Natives, a dependency developed upon unending support from outside sources.

Schools. As the white population in the region increased, non-sectarian schools were demanded. Public schools were established at many villages. Later the federal government also began to accept some responsibility for providing medical care in the region. Though Congress in 1900 had authorized Alaskan communities to incorporate and maintain municipal schools, most of Southwest Alaska had no communities large enough to incorporate. The Nelson Act of 1905 permitted

school districts to be organized outside incorporated towns and provided for their maintenance from the "Alaska Fund." State-supported schools were thereafter provided for white children or children of mixed blood who were suitably acculturated. The federally funded Bureau of Education thus provide schools for Alaskan Natives only, after 1930. In 1931 this function was assumed by the Bureau of Indian Affairs.

Reindeer. During the height of the reindeer experiment, sizeable herds were kept at Holy Cross, Shageluk, Bethel, Akiak and Nulato. For the most part the enterprise remained in the hands of whites -- whether the operation was overseen by the missions, the schools, or in individual ownership. The herds were declining by the mid 1930's, although there was still a total of about 176,000 reindeer in Southwest Alaska in 1936. Controversy had emerged regarding the non-Native ownership in light of the original intent of the government-financed program. Finally Congress passed the Reindeer Act of 1937, which restricted ownership of reindeer to Natives. However, few Native herders were ever sufficiently trained and prepared to accept the exacting demands the herding put on them in exchange for for potential future rewards.

Medicine. After the gold rush period the Bureau of Education began to provide medical care in the region.

Severe epidemics continued in the region during the gold rush decades, often spread by steamboats from village to village. The few attempts to impose quarantines were unsuccessful.

Although chronic diseases such as tuberculosis, syphilis, and eye diseases continued to be prevalent through the early part of the century, after about 1915 when mission and federal medical care was increasingly available in the region, diseases no longer took the high toll that they once had. In 1926, a medical clinic boat was put in service on the Yukon and its tributaries to make periodic visits to all villages along the river.

PRESENT SITUATION

Almost none of this 72 million acre region has been systematically examined for cultural resources. Little detail is available on contemporary sociocultural values, and the documentation of sociocultural values has been limited to compiling broad, composite descriptions of Native groups or the populace of the region with little detail on how these values

attach to specific sites, areas, or practices. Though approximately 12 million acres are projected to remain in the public land domain, the unavailibility of complete information on cultural resources, and the vague land boundaries have precluded even a standard Class I level inventory of cultural resources on those lands.

The physical remains that have been identified are usually easily visible, or stand out in the history of the region. They cluster predominantly along the major water courses and around existing settlements because these have been the most accessible and therefore the most examined localities of the region. Present inventories are therefore probably not representative of the amount or range of cultural resources and sociocultural values existing in the region.

Current uses of cultural resources in the region include: scientific use for study of the past, sociocultural use for sustaining a sense of continuity with the past, and management use for determining effective management programs.

In spite of almost nonexistent management, the importance of cultural values to the residents of the region is clearly indicated in a number of ways. The sociocultural importance

of historic Native sites and cemeteries is demonstrated by the legislative authority granted for transfer to Alaskan Natives of lands on which these sites are located. Other socio-cultural values are manifest in the tremendous number of applications for Native allotments based upon subsistence aspects of their traditional economy. With more than 62 percent (1970 census) of the population being Native and around 88 percent (1974 estimate) of the Native people still speaking their Native language, Native sociocultural concerns should understandably be of primary importance in the region.

Other very definite sociocultural values are associated with the overall kind and quality of life available in the small villages and towns in the region. To many whites, bush life hearkens back to the simple, less restricted days of frontier America and individual self reliance. For Native residents it is the essence of their traditional lifeway. These basic values are important to individuals for the sense of human dignity, self-worth and well-being they provide.

The use of cultural resources in the region for scientific study of prehistoric and historic cultures is presently an important and ongoing use of these resources. Archeologists pursuing long-term research programs are working in

several parts of the region to shed light on the peopling of this continent and the origin and ancestry of indigenous cultures. Ethno-archeology studies are attempting to fill gaps in the knowledge of cultural change that has occurred since white man's coming. Ethonographic studies have become an urgent attempt to document traditional cultural practices, even languages, before they pass out of evidence.

Historical research to document the not-so-remote past is being carried out with equal urgency. Oral history continues to be a major source of detailed historical information. Historical archeology is also becoming an important source of documentary information on the early historic period, often the only means of verifying the scant historical record. To preserve material elements of the historic past, archival materials and historical artifacts are being actively sought in the region.

The loss of cultural resources from natural deterioration such as decay and erosion; from environmental forces such as floods, earthquakes, subsidence and wildfire; and from human-caused factors such as land development, fire, collecting and neglect is rapidly reducing the quantity and quality of cultural resources in the region.

INVENTORY STATUS OF CULTURAL RESOURCES

Although there has been little systematic, large-scale inventory of cultural resources in southwestern Alaska, over a period of nearly 150 years there has been a great deal of information recorded about the Native population and settlements, as well as about the outposts of the Russian and American immigrants. Although these early records were not products of trained anthroplogists, archeologists and historians, many of them represent observations of trained scientists and social observors. Much of the information they contain is relevant and accurate and of great use in compiling inventories of past settlements and other features in the region. Trained cultural scientists did not begin inventories in the region until well into the twentieth century. In their work they have made increasing use of these historical records (see Selected References).

Two prolific anthroplogical researchers, Wendell H. Oswalt and James W. VanStone, have contributed greatly to the inventorying that has been done in the region.

Herbert W. Krieger of the Smithsonian Institution undertook the first archeological work in the region in the summer of 1927. Inspired by Hrdlicka's reports he excavated at the lower Yukon sites of Anvik and Bonasila, and at Holikachuk and

Shageluk on the Innoko. In the summer of 1935, Frederica deLaguna conducted an archeological reconnaissance on the Yukon as far downstream as Holy Cross and along the lower Innoko as well. She made archeological tests at several sites and also utilized historical sources to identify many occupation sites.

In 1948, Helge Larsen of the Danish National Museum conducted an archeological reconnaissance on the coast of southestern Alaska in the Goodnews Bay area. At about this same time archeologist James Giddings began field work in the Norton Sound area where he found deep middens that preserved an unwritten record of thousands of years of human occupation. One of these, the Iyatayet site, was designated a National Historic Landmark in 1961.

Archeologist Robert E. Ackerman of Washington State University has identified well over 300 archeological sites in an area extending from Goodnews Bay to the Holitna River. In 1975-1976, archeological excavations were made at a midden site on the Manokinak River in the Clarence Rhode National Wildlife Refuge by archeologist Robert Shaw. This recent work has shown that occupation sites of considerable age exist not only along the coast, but in the delta and tundra regions as well.

In 1954 and 1963 Oswalt and VanStone conducted excavations at the historic site of Crow Village on the middle Kuskokwim River, the first large scale excavation at a late period site in the region, in order to help reconstruct recent cultural history. During the 1966 and 1967 field seasons Oswalt carried out comprehensive excavations at the site of Kolmakovski redoubt.

Survey and excavation work has been carried out in the Lake Minchumina area by archeologist Charles E. Holmes since 1972.

In 1972, the site where Kolmakovski redoubt stood joined the Iyatayet Site on the National Register of Historic Places. In 1977, the sites of Mikhailovski redoubt and of the later U.S. Army post of Fort St. Michael were added to the register.

In 1971 the Alaska Native Claims Settlement Act section 14 (h)(1) authorized Alaskan Natives to receive title to Native cemeteries and historic sites important to their heritage. To date more than 6,000 such sites have been identified in the southwest region under that program.

In 1974, the BLM began a cultural resource inventory which was later resumed by the State of Alaska Division of Parks, to become the Alaska Heritage Resource Survey. This comprehen-

sive statewide register presently lists around 2,000 properties in the southwest region, though many have not been evaluated by field examination as yet.

In 1972, the Alaska Division of Parks, Office of History and Archeology made a case study of the abandoned gold rush town of Iditarod, describing its history and its potential for preservation and interpretation. In 1974, they also sponsored an inventory of historic roadhouses based upon historical records. Many historic roadhouses on the Iditarod Trail were enumerated, as well as some along the rivers of the region.

The historic buildings of the Orthodox Church and of other religious denominations in the region are presently being evaluated for the National Register of Historic Places.

In 1978 the Iditarod Trail became one of the first trails designated as a National Historic Trail.

In 1977 a precursory cultural reconnaissance after the 345,000 acre Bear Breek Fire was made by BLM. This revealed that two of the old roadhouses on the Iditarod Trail were burned in the conflagration. Three prehistoric chipping sites were also found in a previously uninvestigated area on the South Fork of the Kuskokwim River. Though badly impacted by the fire and

subsequent erosion, these prehistoric sites may contain valuable information on early occupation in a part of the region where virtually nothing is known at this time.

In 1977, an examination of a proposed roadway near the village of Shageluk by a BLM archeologist revealed a potentially important housepit site which may date from the Russian period. In the course of a preliminary examination along the Kisaralik River in 1978, two cultural sites were identified, both of potential significance. In 1979, an effort was made with Wendell Oswalt to identify the site of the Vinasale odinochka below present day McGrath. It is possible that riverbank erosion has washed away the site of that Russian outpost. In 1980, a BLM archeologist also made a brief examination of features at the site of Sterling Landing on the Kuskokwim below McGrath where a public easement site is being developed.

Several places are known where vintage aircraft crashed in Southwest Alaska, but these have not yet been evaluated in the field.

Although villages in the region obtain approximately 75 percent of their food locally from the land, there has been little inventory of this local use of the land and its resources.

There is little detailed information on subsistence use of the land and resources in southwestern Alaska although the Park Service and the State of Aalska have done a few studies in connection with land-use plans. Little information about subsistence activities occurring on public lands is included in these reports.

Unfortunately, on most of the public land in the Planning Area, the only indication of the occurence of subsistence activities at present is the existence of Native allotments. Since Native allotments are generally chosen within 50 miles of villages for ease of access, an erroneous impression is given that all subsistence activity is occurring within about 50 miles of established villages.

From the foregoing descripton of past inventory in the region it can be seen that although much has been done in some localities and along certain themes, there are still significant gaps in existing knowledge about cultural resources in Southwest Alaska. The following discussion of known and potential cultural resources in each planning block will show how these gaps relate to land under BLM management.

Goodnews Planning Block (1)

Because of a relative concentration of archeological fieldwork here in the past, a number of occupation sites which may range from 7,000 years ago up to recent historic in age have been identified in the area of Goodnews Bay and the lower Goodnews River. About 30 sites are presently listed on the Alaska Heritage Resource Survey for this locality. This ratio indicates that little of the area has been examined yet for evidence of prehistoric and historic occupation.

To date the earliest stratified prehistoric occupation sites investigated, near Mumtrak Mountain, appear to date from only about 4,000 years ago. These and later prehistoric sites in the locality relate to the origin of southern Eskimo culture and establishment of permanent maritime villages, some of which continued to be occupied through the 1800's. The earlier prehistory of this locality has yet to be discovered. No inventory has yet been made of historic resources relating to the gold mining period.

Many Native historic places and/or cemetery sites have been identified in the Goodnews Bay-Goodnews River area, attesting to strong sociocultural values relating to Native heritage. Similarly, a multitude of Native allotments have been filed in the area. This demonstrates the continuing importance of traditional Native subsistence activities for local residents.

NYAC Planning Block (2)

No cultural sites are presently listed on the Alaska Heritage Resource Survey in this planning block, possibly because no cultural inventories have been conducted in this 430,000-acre tract of land. In 1980, archeologist Robert Ackerman identified many prehistoric sites to the south and a few northwest of this area, indicating a high potential for finding sites of similar age within the planning block itself.

Encompassing the major part of the Kilbuck Mountain Range, this block of land contains some features that have high cultural potential. In the summit of Rockpile Pass is a large pile of stones erected in the remote past. Possibly connected somehow with caribou hunting, it is reputed among local miners to be a burial site stemming from long ago use of the pass as a battleground. Nearby, at the head of Ophir Creek is a small hot spring. Such features in Alaska almost without exception attracted aboriginal use and often figured prominently in local legends and myths of the Native people.

Several Native historic places have been identfied within this planning block. Several Native allotments in the area have also been filed on, indicating the continuing importance of traditional subsistence activities to local Native residents.

Anvik River Planning Block (3)

Although it is over 4.1 million acres in size, probably less than 1 percent of this area has been examined for cultural resources of any age or thematic association. However, virtually all of the land has potential for yielding important evidence of past human use and occupation.

Known cultural sites cluster on the coast and along major rivers, indicating both that these were the major focus for settlements and that little fieldwork has been done in the upland areas. Past archeological work has concentrated on large coastal sites which contain evidence of many successive occupants from as early as 6,000 to 7,000 years ago. Relatively little archeological fieldwork has been done in interior areas except along major waterways. Occupation sites on the rivers may span several millenia, but there is potential for earlier sites to be found. Skeletons of huge Pleistocene animals such as mastodons and mammoths are not uncommon in this area, where they are often exposed by streambank erosion. None of these finds are known to have yet been examined for possible associated evidence of man.

Historic period sites of Native occupation, Russian fur trade posts, early church missions, and American period settlements are also present on the waterways. The banks of the Unala-

kleet, Anvik, Yukon, and Innoko Rivers account for most of the known cultural sites in the planning block. However, even many of these have been identifed from historical sources and have not been evaluated in the field.

Resources relating to every period of Alaskan history are probably present within this planning block, from earliest evidence of man to the gold rush. Since this area was the cradle of southern Eskimo origin and the northernmost area of Russian settlement in North America, this planning block contains evidence of many unique cultural developments. It was also the interior area of Alaska first exploited by American fur traders, having some of the first posts occupied after the American purchase of Alaska in 1867. Some of the earliest reindeer herding was undertaken in this part of Southwest Alaska and historical resources relating to the gold rush period undoubtedly occur in the Marshall district and along the Yukon and Innoko Rivers. Travel routes here also reflect a continuum of use from prehistoric times to recent historic. The Yukon River and the Anvik-Golsovia, Kaltag-Unalakleet and Yukon-Kuskokwim portages stand out in all periods of Alaskan transportation history. Historic aircraft wrecks occur in the planning block; on the North River the wreckage of a Douglas A-20B is listed on the Alaska Heritage Resource Survey.

Many Native historic sites and/or cemetery selections dot the planning block, as do parcels filed on under the Native Allotment Act. Native residents still practice many traditional subsistence activities and maintain other aspects of their tradtional lifeway. Roughly 88 percent still speak the Yupik language and certain landmarks still have meaning in Eskimo oral history.

Sleetmute Planning Block (4)

This land area, approximately 3.7 million acres in size, is bounded on the south by a concentration of cultural sites along the Kuskokwim River. The planning block contains several historic gold mining areas. Many trails of the gold mining era also criss-cross the area, some are dotted by shelter cabins and roadhouses.

Placer mining in this area has unearthed many bones of extinct bison and mammoth, indicating that the area could have supported early hunters as well. To date none of these finds are known to have been examined for the possibility of associated cultural material.

Little is known of prehistoric occupation in this area since almost no survey has been done exept along the Kuskokwim River. Historic aboriginal occupation sites are also nearly

unknown except along the Kuskokwim River. Some Anglo-American historic sites of the gold mining period have been identified in the planning block on the Iditarod Trail. Other areas of the block have not been inventoried for historic sites although Russian outposts existed nearby on the Kuskokwim and by the 1910's gold mining was occurring on Willow Creek, Julian Creek, Crooked Creek, Moore Creek and others.

A few Native historic place selections and Native allotments in the planning block indicate that subsistence activities extend into the upland areas, probably mainly in the form of hunting and trapping.

Lime Village Planning Block (5)

The complete lack of cultural inventory in this 2.8 million acre planning block is reflected in the fact that only two sites are presently listed here on the Alaska Heritage Resource Survey. Only one of the two sites, the Salmon River Roadhouse site on the Iditarod Trail, has been examined in the field, but this was after it was largely destroyed by the Bear Creek Fire in 1977. A precursory air reconnaissance of the fire area that same year revealed 9 cabins and roadhouses, of which 4 were burned and 1 narrowly escaped burning. Three prehistoric sites were also found within the single section (1 square mile) that was examined, and were heavily impacted by burning and subsequent erosion.

Native historic places and allotments radiate from Lime Village and Kuskokwim River settlements into the planning block, indicating Native use of the land and its resources in the past and in the present. General trapping and hunting trails crisscross the area and line cabins dot these trails. Boat access along rivers and streams is also important for local subsistence activities, and fly-in hunting camps are also present in some localities.

Minchumina Planning Block (6)

No sites are listed on the Alaska Heritage Resource Survey in this 927,000 acre planning block, reflecting the fact that no cultural inventory has been conducted there. The absence of Native historic places and allotments attests to its remoteness. In spite of this, recent archeological work in the Lake Minchumina area indicates that it has the potential to contain archeological sites of some importance.

Summary

Thus it is apparent that relatively little inventory has been done in the areas of any of the planning blocks and that cultural resources of different periods or themes are not equally represented in the existing inventory. Great gaps

exist in land areas that have been examined and in time periods that have been investigated. Current inventory efforts will not be able to close these gaps in the foreseeable future, and the decline in cultural resources continues to result in the loss of many significant features of our cultural and historical heritage.

Condition and Integrity of Cultural Resources

Few cultural resources in the Planning Area have yet had the benefit of any form of physical or administrative protection. Within the planning blocks even fewer sites have had attention.

The greatest single program that has resulted in administrative protection of cultural sites in the Planning Area has been the identification and selection of Native historic sites and cemeteries under provisions in section 14 (h)(1) of the Alaska Native Claims Settlement Act. At present time these properties are withdrawn from all forms of use or appropriation, with the exception of prior valid existing rights. Administrative planning was also undertaken in 1979 to protect significant historic resources along the Iditarod Trail and will culminate in a management plan in 1982. No other cultural resources in the region, including properties listed on the National Register of Historic Places, have been protected by administrative action .

Physical protection for cultural resources in the Planning Area is virtually nonexistent. In 1929 the last remaining log structure at Kolmakovski redoubt was disassembled and taken to the University of Alaska museum in Fairbanks for preservation. No stabilization has been undertaken on structures or sites on public land to date. In 1977 and 1978 clearings around several of the old structures on the Iditarod Trail were renewed to conduct investigations and help protect them from wildfires. Signs were also posted at some of these sites most likely to remain under BLM-administration.

In 1979, the pilothouse of the historic sternwheeler Lavelle Young was protected from imminent loss by being removed to Fairbanks for restoration there by the municipality. During 1979 and 1980 additional fieldwork for protection planning was carried out for roadhouses and other features associated with the Iditarod Trail.

Many agents of deterioration are contributing to a general decline of cultural resources on public lands throughout the Planning Area. Natural factors such as decomposition, erosion, flooding and lightning-caused fires annually reduce the number of existing sites and structures. Human-caused agents of deterioration like land development, man-caused fires, mining, demolition and collecting undoubtedly account for

additional losses. At present the natural agents of deterioration are still accounting for the greatest loss of cultural resources in the Planning Area.

Fire accounts for the greatest loss of historic structures, ruins and objects. In 1977 the Bear Creek Fire which burned accross a 30-mile section of the Iditarod Trail destroyed one standing building in current use and also several ruined structures. Also, fallen trees have rendered this section of the trail unusable since the fire. That fire was probably lightning-caused, but other recent fires have been man-caused. In 1974 a fire aboard the old sternwheeler Quickstep, which was dry-docked at old McGrath, reduced it to ashes. At about this same time, one of the remaining log structures at old McGrath was also destroyed by fire. In 1976 it was evident that people had recently been building fires in Blazo cans upstairs in the old Northern Commercial Company building at Iditarod. The most significant building remaining at the old town, it is questionable how long it will survive before joining the Quickstep.

In 1978, a fire at the abandoned town of Ophir destroyed several standing structures and other ruined features. In 1979, a controlled fire at the village of Holikachuk got out of hand and burned several old structures. Since most of these were not examined by cultural resource staff, it is impossible to fully assess the extent of the losses.

Riverbank erosion and flooding, usually caused by ice jams, take an undetermined yearly toll along the rivers. The Vinasale odinochka site was reportedly cut away by the Kuskokwim long ago, and the site of Joaquin and the Big Creek Roadhouse is rapidly disappearing into the Takotna River from erosion. On the Unalakleet River, the Whaleback cabin was being badly undercut by bank erosion when in the spring of 1980 an ice jam and flood took it away. On the South Fork of the Kuskokwim a standing log cabin at the Rohn River Roadhouse site is yearly innundated by glaciering ice and cannot long survive.

Decompositon of historic wooden structures has reduced most of these in the Planning Area to ruined piles of mouldering logs. Though the rot proceeds relatively slowly at first, once the roof fails it progresses rapidly in the log walls until little remains except an outline where the building once stood. Many of the old structures along the Iditarod Trail and at contemporary mining camps are at the critical stage now where the roofs are gone or disintegrating. Rot in the structural walls will progress rapidly now that they are exposed to moisture penetration.

It is not uncommon to find that logs from old buildings have been used for firewood by travelers. Buildings at the site of the abandoned settlement of Tolstoi suffered even greater depradation. Around 1974 or 1975, a trapper cut out many of the soundest wall logs and used them for firewood and constructing a small cache next to one of the cabins he was using. In 1976, before the fire at Ophir, it was obvious that building material was being stripped from many of the old buildings, or whole buildings being dismantled. Some of the buildings at Iditarod have similarly suffered removal of roofing and siding material in the last few years.

Development projects are probably having less effect on cultural resources than other human-caused factors because archeological examinations are usually performed now prior to construction projects on state and federal land. Prior to this procedural precaution, some cultural sites were undoubtedly destroyed, as at the old village site of Mumtrak on Goodnews Bay. In most cases, however, such losses are never discovered after the fact.

Procedural requirements for archeological examinations in advance of state and federal projects, or for projects on land under their ownership, will undoubtedly mitigate the loss of

cultural resources to some extent in the future. Land use planning also promises to help integrate sociocultural concerns into the land use decision-making process. Recently, special planning efforts in fire management, coastal zone management, and other management concerns have been undertaken in the southwest region.

Planning can integrate cultural resource concerns and sociocultural values into land management programs to achieve maximum benefits in land use with minimum loss of our heritage values. But the planning must recognize that our unique cultural and historical resources are a limited, fragile and non-renewable resource if there is to be anything left by which future generations can better understand and appreciate their heritage.

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CULTURAL RESOURCE MANAGEMENT OPPORTUNITIES

The presence of cultural resources representing all periods of Alaskan history, and the potential for increasing our knowledge about that history in virtually uninvestigated areas provide many management opportunities in this Planning Area. Because the cultural resources are remote and inaccessible for the most part, there is little opportunity at present to undertake interpretive or other visitor use development on public land. However, a major opportunity does exist to increase the cultural information upon which land management decisions are based. This area offers many opportunities to manage the land for maximum benefit from its cultural and sociocultural resources.

- Opportunity for cultural inventories of any level to add significantly to existing information on the cultural and sociocultural resources is almost unlimited in the Planning Area.

- Opportunity exists to protect and preserve the limited, fragile and non-renewable cultural resources in the Planning Area by physical and administrative means for both the known and presently unknown cultural properties.

- Opportunity is available to provide recognition for cultural resources by listing them in the Alaska Heritage Resource Survey, or by giving special designation as unique and outstanding resources to all eligible properties.

- Opportunity is present in many forms to increase public understanding and appreciation of the region's history and cultural heritage.

- Opportunity exists for adding significantly to scientific knowledge about the culture history of the region and of Alaska in general where many gaps in current knowledge are now present.

- Many opportunities are available to consolidate or coordinate management of cultural and sociocultural resources that transcend agency boundaries.

Opportunity is manifest in the entire Planning Area to better inform the public about several regulations pertaining to cultural resources and about BLM's cultural resource management program.

GOODNEWS PLANNING BLOCK

There is excellent opportunity here to find cultural resources ranging from earliest penetration of man into Alaska to recent history. Although the Ahklun Mountains are a strategic interface of mountains with the coast, much of the public land here has not been examined for cultural resources. Neither has the history of the locality yet been compiled from available sources. There is special opportunity here to document and evaluate cultural resources which relate to southern Eskimo culture history and to later mining history in the area. Cultural sites on public land offer excellent opportunities to protect and preserve significant elements of local cultural heritage for the understanding and enjoyment of future generations.

There is also opportunity to collect data on traditional use of the land and its resources in the planning block, a primary consideration in making federal land use decisions. Because

it is also an important coastal zone in the Planning Area, it offers unique opportunities to coordinate with maritime management agencies in matters related to sociocultural values.

NYAC PLANNING BLOCK

Because none of this planning block has been inventoried for cultural and sociocultural resources there is opportunity to contribute greatly to existing information through any level of cultural inventory. There is special opportunity to document and evaluate cultural resources relating to the mining history of the area, and to historic and prehistoric Native use of this interesting locality. Cultural sites on public land in the planning block also provide an opportunity to protect and preserve unusual elements of local heritage, like at Rockpile Pass, for the benefit of present and future generations.

Sociocultural values related to traditional cultural practices also provide management opportunities. The past inventory of sociocultural resources, such as Native historic sites and cemeteries, and the traditional uses of the land and resources there indicated by Native allotments show there is opportunity to further identify traditional uses of land and resources. This information is badly needed for making federal land use decisions.

ANVIK RIVER PLANNING BLOCK

Because of its strategic location between traditional southern Eskimo and interior Athapaskan territories, this planning block presents important opportunities for management of scientific values of cultural and sociocultural resources. These opportunities can be best realized through the identification and protection of cultural sites, since almost no inventory has been done on public lands there. The Anvik and Unalakleet Rivers, both long used as travel and trade routes, have along their courses numerous cultural sites that offer opportunities to further ongoing archeological research in culture history, including the origins of Eskimo and Athapaskan cultures.

There are also opportunities for identifying and protecting cultural resources relating to Russian Alaska, since the planning block is central to the only area of Interior Alaska to which the Russians carried the fur trade. Both the Anvik and Unalakleet portage routes were much used, offering opportunities to add considerably to documentation of this period of Alaska history. The Anvik River especially offers opportunity to inventory an undocumented area of known cultural significance that has had use in all periods of the past.

Opportunities also exist to identify and protect cultural resources of the American period, since the Unalakleet continued to be an important route for the WAMCATS and the Seward-Nome Trail. There is opportunity to identify and mark sites relating to these historical developments and to stabilize structures or ruins that have interpretive value. Because the route is still used for the commemorative dogsled race annually, there is opportunity to reconstruct shelter cabins where these have decayed beyond repair. There is also opportunity for cooperative agreements for management of the historic trail route as well as for public information and interpretation through cooperation with land owners.

Other opportunities relate to inventory and evaluation of sociocultural resources in the planning block. These is great opportunity for identifying traditional use of the land and its resources and other sociocultural values. These inventories are needed to incorporate vital information into agency land use planning to ensure that sociocultural values receive primary consideration in land use decisions.

SLEETMUTE PLANNING BLOCK

There is unlimited opportunity to identify cultural resources in this planning block ranging from earlies prehistoric to recent historic in age. Prehistoric archeological sites in

this strategic upland area between the Yukon and Kuskokwim drainages are currently almost entirely undocumented. This provides a major opportunity to protect important archeological resources through physical and administrative measures.

There is ample opportunity to contribute to what is known about local history in the Russian and American periods through inventory and documentation. This would include documenting changes brought about in Native use and occupation of the area in those periods. There is still a major opportunity to identify and evaluate relics, sites and features associated with the historic period, especially in developments in mining and overland transportation, and to protect important resources of this period on public land. There is also opportunity to interpret historic sites on the Iditarod Trail by marking with signs, and to stablize historic structures and ruins for interpretation.

Many opportunities also exist for identifying in greater detail the traditional uses fo the land and resources in the planning block. Although sociocultural resources are represented in Native historic places selections and Native allotments in the planning block, much more information is needed for effective land use decisions.

Unlimited opportunities also exist to identify cultural resources of all periods of Alaska history in this planning block. Prehistoric archeological sites in its important foothill area are virtually unknown at present, yet the area has high potential to yield evidence from the earliest hunters down to recent Athapaskan occupation. Thus there is great opportunity to contribute to regional and statewide research objectives through directed archeological fieldwork and protection of archeological resources in the planning block.

There is also opportunity to fill gaps in the local history of the area during the Russian and American periods. Russian materials were traded into this locality after about 1831 and there are also cultural resources of the American gold mining era in the planning block and on the Iditarod Trail. However, little inventory has been conducted, so there is still opportunity to identify and evaluate relics, sites and features of the historic period. The Iditarod Trail offers other opportunities to interpret historic sites by marking with signs and to stabilize or reconstruct historic structures for public interpretation and use. There is also opportunity to coordinate with other land managing entities the administration of features such as the Iditarod Trail through cooperative agreements for protection and management of its historic values.

Many opportunities also exist to add to inventories of traditional uses of land and resources in the planning block. There is equal opportunity to add information on sociocultural values that are vital to effective land use planning.

MINCHUMINA PLANNING BLOCK

There is great opportunity to identify cultural resources of nearly all time periods in this planning block, since no cultural inventory has been done there at present. It has high potential to yield prehistoric archeological sites of major importance in regional and statewide research objectives through directed archeological fieldwork. Until such time as the full potential is known, there is opportunity to protect cultural resources from degradation by natural and human agents.

Opportunity also exists to inventory and protect cultural resources of the historic period in this planning block, since it is located on an important access route connecting the Tanana and Kuskokwim drainages. Because the Minchumina Lake area was occupied and used during the historic period, there is also opportunity to find evidence of historic use extending into the area of the planning block.

There is also an opportunity to increase the level of information on sociocultural aspects of local land use, since existing information indicates the area is important for a variety of traditional economic pursuits, such as hunting and trapping.

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Opportunities also exist to identify and protect cultural resources of the American period, since the Unalakleet continued to be an important route for the WAMCATS and the Seward-Nome Trail. There is opportunity to identify and mark sites relating to these historical developments and to stabilize structures or ruins that have interpretive value. Because the route is still used for the commemorative dogsled race annually, there is opportunity to reconstruct shelter cabins where these have decayed beyond repair. There is also opportunity for cooperative agreements for management of the historic trail route as well as for public information and interpretation through cooperation with land owners.

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