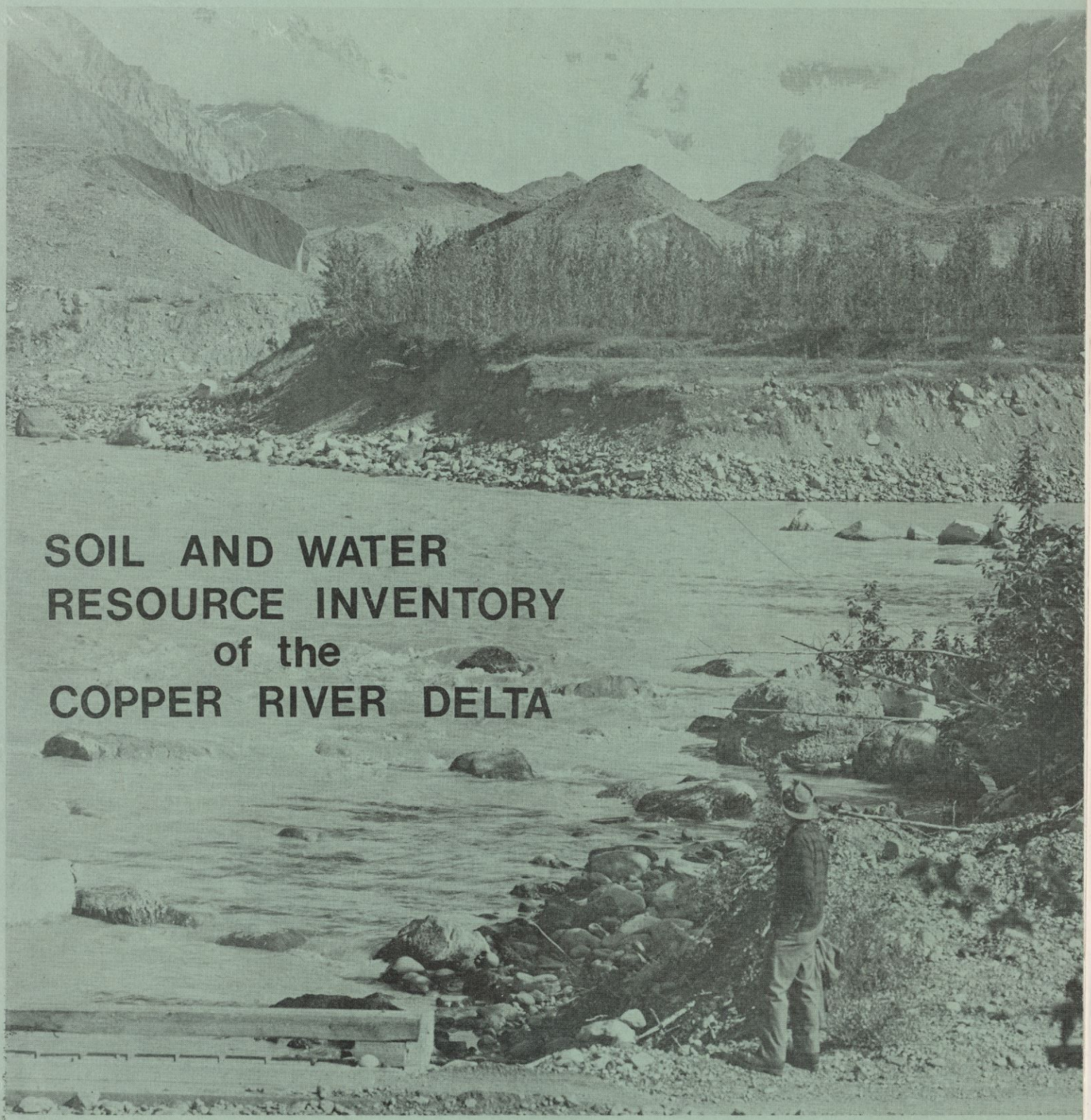

SOIL AND WATER RESOURCE INVENTORY of the COPPER RIVER DELTA

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CHARLES HARNISH - Hydrologist

CHUGACH NATIONAL FOREST
REGION 10 - ALASKA

SOIL AND WATER RESOURCE INVENTORY OF THE COPPER RIVER DELTA

1978

Chugach National Forest

U.S. Forest Service
Alaska Region
U.S. Department of Agriculture

by

Soil Scientist: Dean F. Davidson
Hydrologist: Charles E. Harnish

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STATEMENT FROM THE AUTHORS

This Resource Inventory is of a very general nature. Soils and water data were collected at specific sites and extrapolated throughout the entire survey area. Not all of the designated units in the survey area were visited due to the lack of time and manpower.

The survey area was divided into mapping units represented by geomorphic landforms. Each representative landform was visited in the field and the major soils described. This information was extrapolated to all other delineations of the same landform. The location of each representative soil was determined by the vegetation and topographic description as given in the general discussion for each landform.

This survey is intended to be used for general land use planning and management. IT IS NOT TO BE USED AS A PROJECT LEVEL INFORMATION SOURCE. It may however, be used to generally point out the areas where more detailed information will be needed for specific projects. At the time a project is identified, a more detailed survey may be initiated.

INTRODUCTION

LOCATION

The Copper River Soils and Water Resource Inventory survey area is located in South-Central Alaska adjacent to the coast line of the Gulf of Alaska. Its center is about 200 miles straight east of Anchorage, Alaska. The geographic area includes that land from the east shoreline of Prince William Sound eastward to the toe of the Bering Glacier, north into the Chugach Mountains and south to the Gulf of Alaska coastline. Kayak Island is also included (Figure 1). The area is approximately 796,000 acres in extent and ranges from sea level to about 6300 feet in elevation.

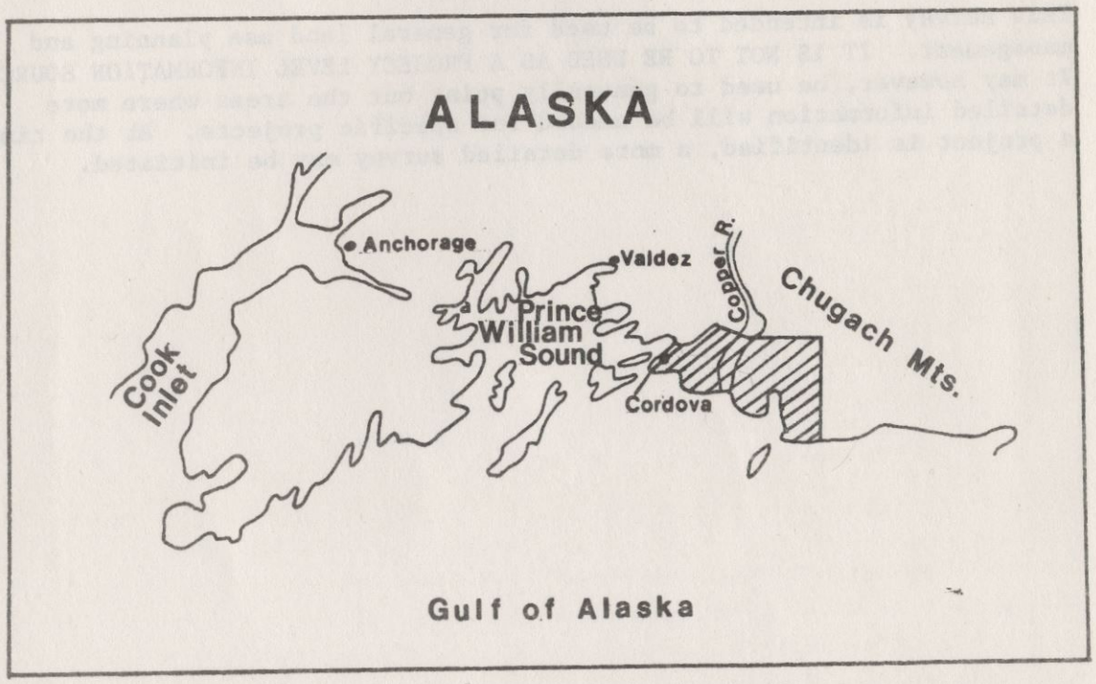


Figure 1. Index map showing the soil and water resource inventory survey area.

GEOGRAPHY AND GEOLOGY

The survey area may be divided into three major physiographic areas; the high rocky mountains with steep sideslopes, glacial moraines, and the low lying depositional flats. The mountains were apparently uplifted sometime during the mid to late Tertiary period (about 40 million years ago) of geologic time. Since this time these mountainous areas have been shaped by wind, water and glacial ice. A considerable amount of the topography has been influenced by glaciers that reached their maximum extent during the late Pleistocene age (less than 50 thousand

years ago). The carving action of the glaciers produced many of the alpine cirques, basins, rocky peaks, and the deep, steep sided U-shaped valleys. The high rocky peaks and sidewalls have a considerable amount of exposed bedrock consisting of siltstones, sandstones, conglomerates, graywackes and some volcanic rocks (Figure 2).

The glaciers left many depositional moraines as evidence of the extent of their forward progress. These moraines are characterized by rolling hills and valley trains of unassorted rock and soil material located along the valley sides and at the historical terminus of the glaciers. Many of the older moraines which are located away from the present glaciers are tree covered and contrast those moraines which are close to the glaciers and are without vegetation.

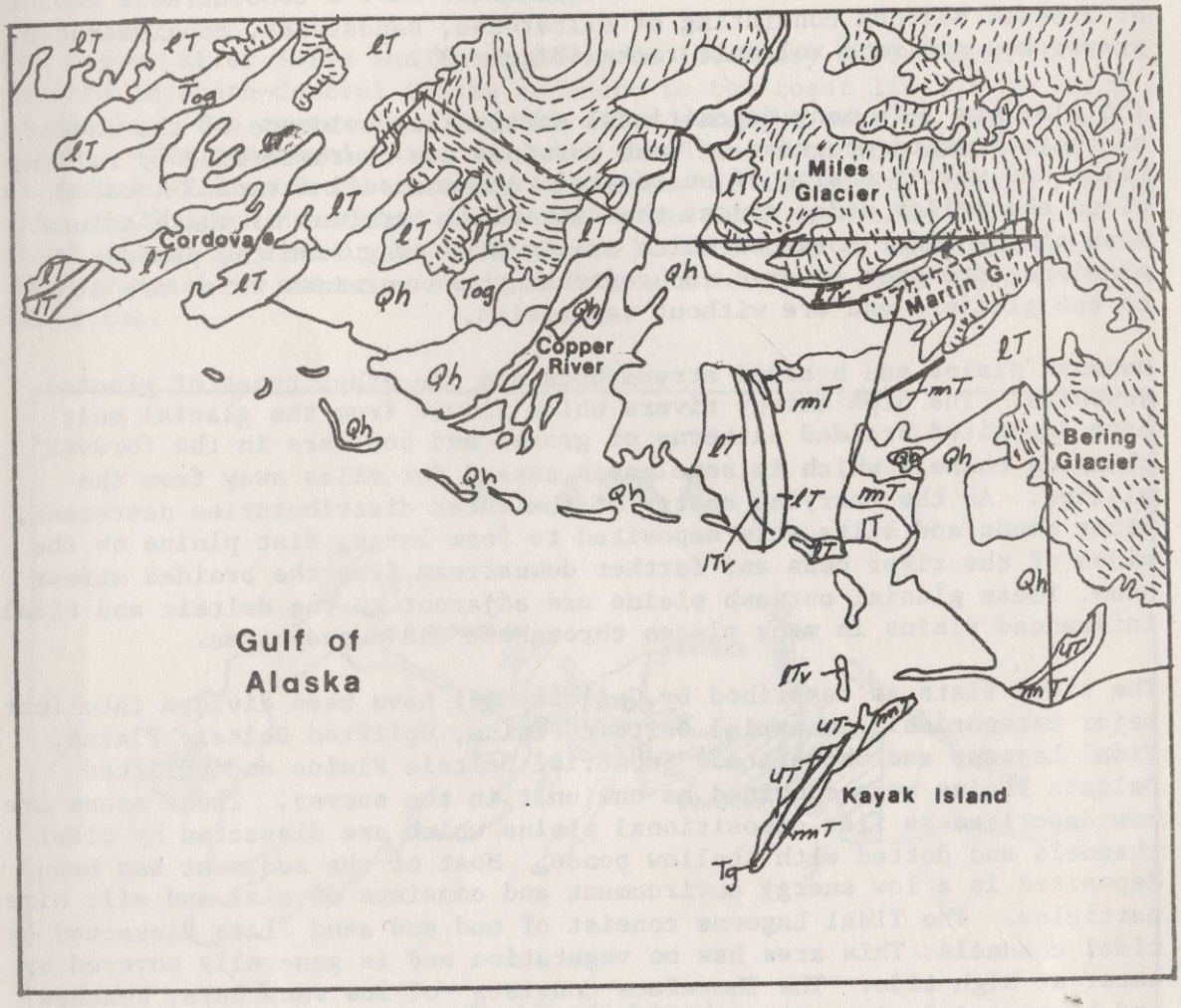
Outwash plains and braided stream beds are the other types of glacial deposits. The high energy rivers which flowed from the glacial melt have deposited braided patterns of gravel and boulders in the forever changing chanels which in some cases extend for miles away from the glacier. As the carrying energy of the water distributaries decreased, finer sands and silts were deposited to form large, flat plains on the sides of the river beds and farther downstream from the braided stream beds. These glacial outwash plains are adjacent to the deltaic and tidal influenced plains in many places throughout the survey area.

The tidal flats as described by Galloway (6) have been divided into four major categories: Subaerial Deltaic Plains, Uplifted Deltaic Plains, Tidal Lagoons and Shoreface. Subaerial Deltaic Plains and Uplifted Deltaic Plains were combined as one unit in the survey. These areas are now described as flat depositional plains which are dissected by tidal channels and dotted with shallow ponds. Most of the sediment has been deposited in a low energy environment and consists of clay and silt size particles. The Tidal Lagoons consist of mud and sand flats dissected by tidal channels. This area has no vegetation and is generally covered by water at high tide. The Shoreface consists of low sand bars, beaches and barrier islands. They are generally located in front of the Deltaic plains and Tidal Lagoons where the high energy environment of the ocean waves meets the low energy environment of the flats.

SOILS

Topography, climate, parent material, vegetation and organisms have all contributed to the variety of soils mapped in the Copper River Soil and Water Resource Inventory. The discussion below will explain some of the major effects which these factors had on the soil development.

The high rocky peaks have no significant soil development. Although there is parent material exposed to form soil, either the slopes are too steep or the wind too severe to allow for the accumulation of fine material and soil development.



lTv	-	Lavas and pyroclastic rocks, some chert, limestone and shale.
lT	-	Marine and continental clastic rocks.
mT	-	Siltstone, organic shale, sandstone, and marine volcanic rocks.
uT	-	Siltstone, sandstone, and conglomeratic sandy mudstone.
Qh	-	Alluvial, glacial, lacustrine, swamp, landslide and beach deposits.
Tg	-	Granodiorite intrusion.
lT	-	Claystone, siltstone, sandstone, coalyshale and shale.
lTv	-	Andesitic, rhyolite and trachyte lava flows.
Tog	-	Quartz diorite, granodiorite, and quartz monzonite.

Figure 2. Geological Rock Type of the Copper River Survey Area (9).

The mid-elevation alpine areas have a climate which is not as severe as the rocky peaks and do not have slopes that are as steep, hence, there are more fines accumulated, especially in basins, and a minor amount of soil development. Presumably, a significantly cold and windy climate reduces the amount of biological activity and influences the growth and type of vegetation on top of the soil. Usually, the vegetation is limited to grasses, forbs and a few poor growth trees. The soils are generally dark brown or black in the surface horizons because of decayed organic material and become lighter with depth. Most of these soils are limited in depth because of the poor developmental conditions.

On the steep sideslopes at lower elevations, soil material accumulates from material which rolls down the slopes due to gravity or that deposited by wind. The warmer climate and the deeper soil permit extensive vegetative growth. Relatively warm water from precipitation combined with the organic acids from the decaying plant material contribute greatly to the dissolution, transportation and deposition of elements within the soil profile. This provides for a more developed soil profile with generally black surface horizons from accumulated organic material and dark red subsoil horizons grading to browner and yellower colors with depth from the accumulation of iron and aluminum.

Soils that form on the flats appear to develop under two major environments; those on sands and gravels where water passes quickly through the profile, and those on depositional flats which are continuously wet. It appears that it is difficult for vegetation to get a start on the coarse textured soils, possibly because the soil is being continually moved by wind and water or the soil is not wet for long enough periods of time for seeds to establish themselves. Once a vegetative cover is established, however, an organic mat is developed from the litter which increases the water holding capacity and nutrient content of the soil surface. Once a sprouting media has been developed, the site becomes an excellent growing site.

The soils on the flats that are continually wet are much the opposite of those previously described. The texture is very fine and they have either layers of low permeability which impede water movement or a high water table. These soils are generally dark gray and black in color from the abundant undecayed plant material in their profile. Usually low growing vegetation is compatible in these wet areas. If the total depth of organic material is greater than about four to five feet, they are called muskegs. Muskegs are found in a large range of topographical locations. These soils consist of a floating mass of intertwined roots and plants on the flats with a stagnant water table and on the hillsides with a lateral flow of water.

DRAINAGE

Drainage appears to play an important role in the development of soil profiles as well as to govern the vegetative productivity potential of the site. Drainage as a natural condition of the soil, refers to the frequency and duration of periods when the soil is free of saturation

(8). The categories range from excessively drained soils as represented by gravel, to very poorly drained as represented by fine silts and clays with a high water table or ponded water.

To see how drainage affects the development of a soil profile a discussion of two extreme physiographic sites follows:

1. Well Drained Sites. With time, parent material is acted upon by the chemical, physical, and biological forces of nature. On well drained sites plant invasion begins with lichens and moss, then if climatically suited, alder, willow, salmonberry, etc., followed by conifers, the climax species. During this period, soil profile development takes place with alteration of the mineral components of the original parent material. Organic acids enter the soil from organic surface materials. There is a constant movement of water through the soil and underlying material, both from lateral groundwater movement downslope and downward percolation from rainfall. This water removes ions such as Ca and Fe or deposits them at different levels within the soil profile and underlying parent material.

By these processes layers of different color, acidity, texture, thickness, etc., are created to form the soil profile with its descriptive horizons. Changes are very rapid during the first few hundred years after which they continue at a slower rate.

2. Poorly Drained Sites. Water movement through the soil parent material is restricted and the soil is saturated with water at all times. The drainage may be restricted by compact glacial till, silt, local rock features or a well developed water impeding layer in the soil profile.

Plants that colonize the drier sites are unable to live in this type of wet environment. Because the soil environment is anaerobic (lacking in oxygen) only a few species of plants can grow successfully. The most common are various sedge and sphagnum species.

As these species grow and die, their vegetative remains decompose very slowly (much more slowly than on the drier sites) because of anaerobic conditions and low soil temperatures. They are essentially pickled.

The organic materials accumulate with each succeeding generation of plants growing on the remains of the preceeding ones forming organic peats and mucks (11).

LANDTYPE ASSOCIATIONS DESCRIPTIONS

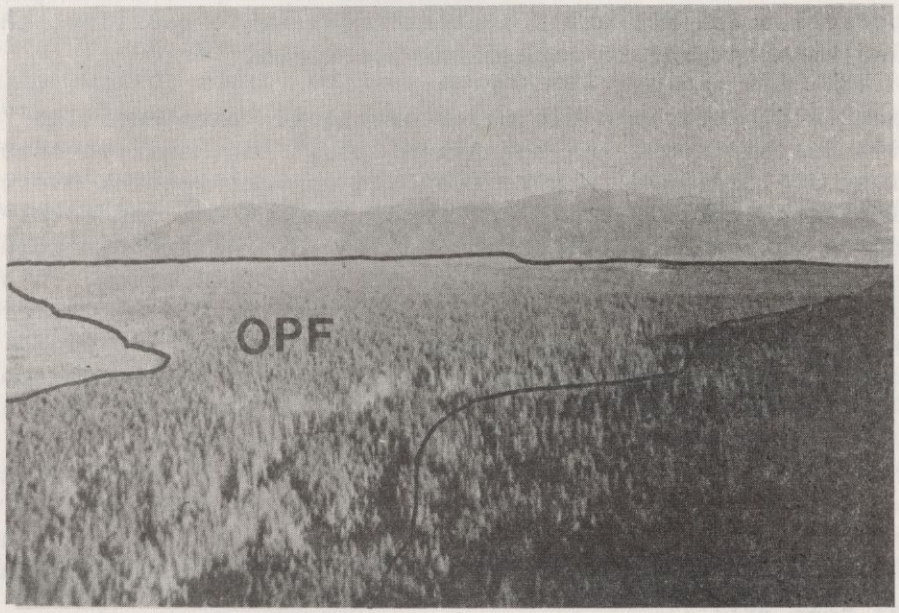
The relationship of one landform to another and the properties that make up the landform are important in land management. A broad level of stratification of these landforms is the landtype association. This level of stratification usually includes many individual landforms with similar topographic and geologic properties shaped by similar geomorphic processes. Since these landforms have been developed by similar geomorphic processes and reflect a similar topographic position, they will react relatively similar to management practices.

This report is divided into two major sections: that entitled "Landtype Association Descriptions" and the Appendices. The Landtype Association Descriptions are designed to give the land manager a quick overview of the physical description, soil, and vegetation of the landform. A subheading on Management Limitations points out the areas within each mapping unit where management problems are likely to occur. A subheading titled "Notes" is included for the users to record any discrepancies in the report and additions or comments they may wish to record. This report should be a working tool and can only be as such with continuous updating by those who use it.

The Appendices include the raw soils data, the soils interpretations for various activities, and the legends to explain the implications of each interpretation. This is included as a record of the actual data for those land managers and soil scientists who wish to use it. (This, we hope, they will do.)

MAP SYMBOL OPF

GLACIAL OUTWASH PLAINS - FORESTED



ACREAGE: 34,000 acres

LOCATION: At the toe of the Sheridan, Saddlebag, Fickett, Johnson, Martin River, and Bering Glaciers.

DESCRIPTION: This association is characterized by alluvial sands and gravels deposited in a relatively smooth plain downstream from active glaciers or historical glacial sites. These plains are stable enough so that active stream cutting and alluvial deposition has ceased in most places. The soil has excellent properties in most places to make this landform one of the better growing sites for trees in the survey area. The slope gradient is generally less than seven percent. The outwash plains are located at elevations of less than 300 feet.

SOILS: About 70 percent of the soils are found on outwash gravel plains and have a spruce-hemlock tree cover. They are greater than 100 centimeters deep and somewhat excessively drained. The surface soil has a dark brown color, a fine sandy loam texture, and about five percent gravel. The subsoil has a dark reddish-brown color, a loamy sand to

sand texture, and about 60 percent gravel. About 30 percent of the soils are located on outwash plains with a spruce tree cover. They are greater than 100 centimeters deep and well drained. The surface soil has a dark brown color and a fine sandy loam texture. The subsoil has a dark reddish-brown to dusky red color and a sandy loam to loamy sand texture.

VEGETATION: The vegetation appears to be defined by two major overstory categories: a Western Hemlock-Sitka Spruce stand and a relatively pure Sitka Spruce stand. Understory species of the hemlock-spruce stand are huckleberry, fern, and Devils' Club, and the ground is covered completely by moss and dwarf dogwood. The understory of the spruce stand consists of a relatively dense cover of salmonberry, ferns, and Devils' Club. The ground is covered completely by moss and some dwarf cranberry.

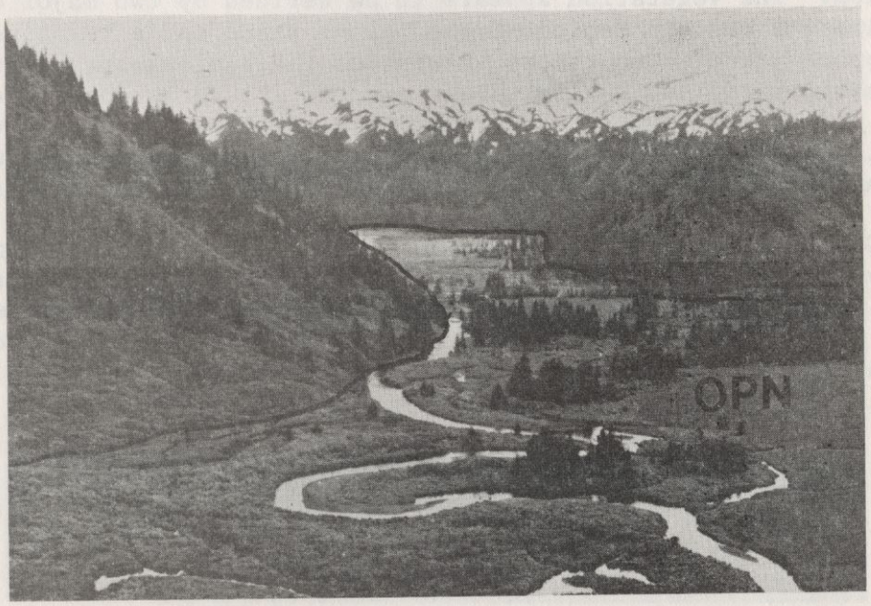
LIMITING FACTORS: The major limiting factor in this mapping unit is the poor revegetation potential of the soil due to the high coarse fragment content, the low water holding capacity, and the somewhat excessively drained soils. This may be overcome by site preparation and good forest management procedures. This mapping unit is presently the best potential commercial timber unit in the survey.

NOTES:

LTA BD 82, 83, 84
LTs

MAP SYMBOL OPN

GLACIAL OUTWASH PLAINS - NONFORESTED



ACREAGE: 124,300 acres

LOCATION: Along much of the Cordova to Copper River stretch of the Copper River highway, east of the Copper River, in front of the Bering Glacier and the north end of Kayak Island.

DESCRIPTION: This association is characterized by fine texture alluvial sediments in a relatively smooth plain downstream from active or historical glacial sites. The landform is generally found adjacent to and further downstream from the Glacial Outwash Plains - Forested. The soil has poor drainage which limits trees except for stream levees and some localized areas of better drainage. The slope gradient is less than six percent. The plains are located at elevations of less than 200 feet.

SOILS: About 50 percent of the soils are located in low-lying lagoonal areas. They are greater than 100 centimeters deep and very poorly drained. The surface soil has a very dark grayish-brown color and a silt loam texture. The subsoil has a dark gray color and a sandy-loam to loamy-sand texture. About 30 percent of the soils are located on

river levees. They are greater than 100 centimeters deep and poorly drained. The surface soil has a dark brown color and a sandy loam texture. The subsoil has a very dark gray color and a sandy loam to loamy sand texture. About 15 percent of the soils are located outwash sands and gravels. They are greater than 100 centimeters deep and moderately well drained. The surface soil has a dark brown color and a loamy fine-sand texture. The subsoil has a salt and pepper very dark grayish-brown color and sandy texture. It contains about 65 percent gravel and cobbles. About five percent of the soils are located in low lying wet areas. They are greater than 100 centimeters deep and have poor drainage. The surface soil has a dark reddish-brown color and about 80 percent fiber when rubbed. The subsoil has a dark reddish-brown to brown color and about 25 percent fiber when rubbed.

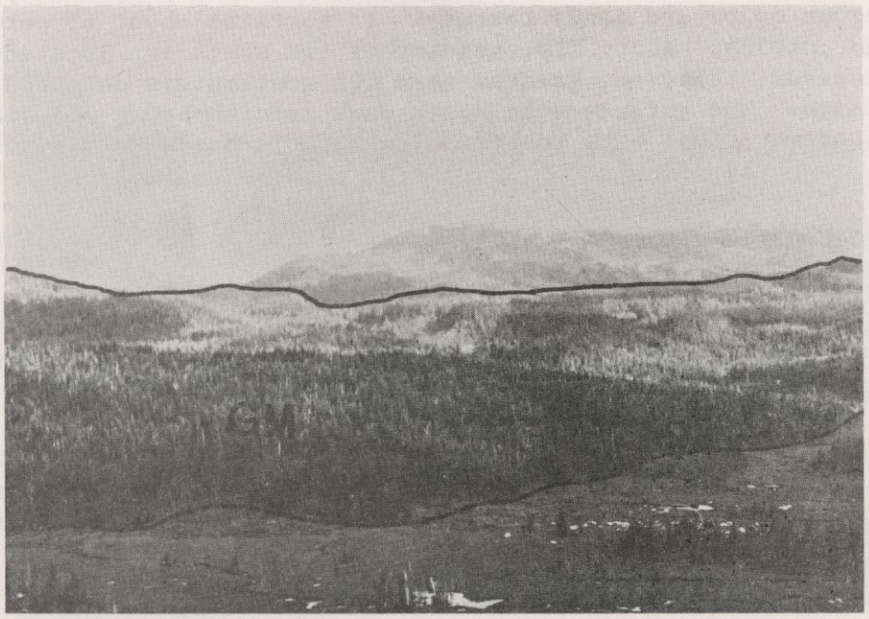
VEGETATION: The vegetation in this mapping unit is indicative of the soil-water drainage. The higher, relatively better drained sites consist mostly of elderberry, alder, willow, Devils' Club, and grasses. Spruce trees are common along the drainage levees. The low-lying areas of relatively poor drainage are vegetated with species such as sweetgale, vetch, marestail, rushes, and sedges.

LIMITING FACTORS: The major limiting factors in this mapping unit are the poor drainage, the high water table, and the organic soils in selected locations. All three of these limitations will restrict the construction of camp and picnic sites, trails, and roads. These limitations also make the site unsuitable for commercial timber.

NOTES:

MAP SYMBOL GM

UNDIFFERENTIATED GLACIAL MORAINES



ACREAGE: 36,500 acres

LOCATION: In front and on the sides of the Bering, Martin, Johnson, Fichett, Sheridan, and Scott Glaciers.

DESCRIPTION: This association is characterized by hummocky topography deposited around the toe, along the sides, and beneath the glacier as it melted or receeded. It is common to see an abundance of small hills, basins, and irregularly shaped lakes in this topography. The slope varies from about seven percent on the ground moraines to 45 percent and steeper on the terminal and lateral moraines. The moraines are located between 200 and 1000 feet in elevation.

SOILS: About 35 percent of the soils are located on glacial outwash plains. They are greater than 100 centimeters deep and well drained. The surface soil has a dark reddish-brown color and a silt loam texture. The subsoil has a dark reddish-brown color and a loam texture with about 70 percent gravel and cobbles. About 30 percent of the soils are located on tree covered glacial moraines, hillsides, and flats. They are greater than 100 centimeters deep and well drained. The surface

soil has a dark brown color, a loam texture, and about 35 percent gravel. The subsoil has a dark reddish-brown color, sandy loam to sand texture, and about 80 percent gravel. About 15 percent of the soils are located in open moss-sedge muskeg areas. They are greater than 100 centimeters deep and poorly drained. The surface soils have a yellowish-red color and about 75 percent fiber when rubbed. The subsoil has a dark reddish-brown color and about 70 percent fiber when rubbed. About 15 percent of the soils are located in muskegs on hillsides with slopes less than 21 percent. They are greater than 100 centimeters deep and poorly drained. The surface soil has a dark reddish-brown color and about 70 percent fiber when rubbed. The subsoil has a dusky red color and about 20 percent fiber when rubbed.

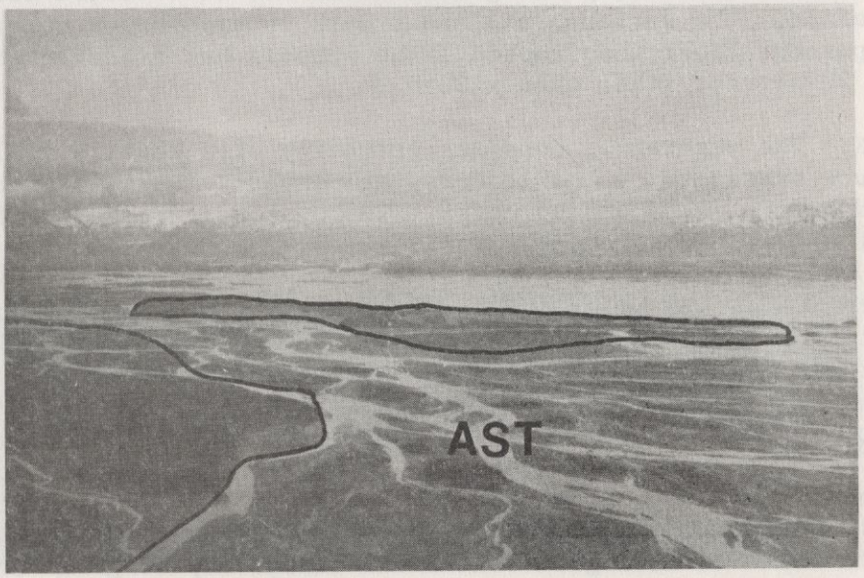
VEGETATION: The vegetation consists primarily of a Western Hemlock-Sitka Spruce overstory; a huckleberry, salmonberry, Devil's Club understory; and a fern, moss ground cover. The open wet areas generally consist of sedges, sphagnum moss, and some willow.

LIMITING FACTORS: The major limiting factors in this mapping unit are the thixotropic (cohesionless) soils on outwash plains, steep slopes, organic soils and poor drainage in muskegs, and the high coarse fragment content on morainal flats. Camp and picnic sites should not be constructed on thixotropic soils, organic soils, and slopes over 15 percent gradient. Trails or paths and roads should be restricted on slopes over 45 percent gradient and those areas of high coarse fragment content; they should be avoided on thixotropic soils located on outwash plains and organic soils in muskegs. Commercial timber may be grown on many hillsides and flats if it is managed properly. Vegetative competition appears to be the limiting factor. Commercial timber cannot be grown on organic soils.

NOTES:

MAP SYMBOL AST

ALLUVIUM AND STREAM TERRACE DEPOSITS



ACREAGE: 99,900 acres

LOCATION: Copper, Scott, Sheridan, Martin, Bering, and Campbell Rivers.

DESCRIPTION: This landtype association is characterized by shifting river channels which dissect gravel and sand bars, river banks, and recent river terraces. These deposits are usually located in or adjacent to the channels of most of the major rivers. Most of the deposits do not as yet have a stabilizing vegetative cover, hence they are continually changing due to erosion and deposition from the rivers. They have slopes that range from zero to six percent. They generally occur at elevations lower than 400 feet.

SOILS: About 90 percent of the soil is located in glacial outwash sands and gravels. They are greater than 100 centimeters deep and somewhat excessively drained. The surface soil has a dark brown color and a loamy fine sand texture. The subsoil has a very dark grayish-brown color, a loamy sand texture, and about 65 percent gravel and cobbles. About 10 percent of the soils are located on old stabilized sand bars. They are greater than 100 centimeters deep and somewhat excessively

drained. The surface soil has a very dark grayish-brown color and sandy loam texture. The subsoil has a very dark grayish-brown color and loamy sand texture.

VEGETATION: Much of this mapping unit is recently deposited and does not have any vegetative cover. The vegetation on the remaining areas consists of cottonwood and some small spruce in the overstory; alder, willow and Devil's Club in the understory. A partial moss ground cover can be found in the lower, relatively poorly drained, wet areas.

LIMITING FACTORS: The major limiting factors in this mapping unit are the high sand content and wind erosion, flooding, and the high coarse fragment content. Localized flooding during snowmelt runoff and after heavy precipitation will produce localized flooding which will restrict locations of camp, picnic, path or trail, and road sites. Many of the soils in this mapping unit are not stable enough for commercial timber production; however, the good drainage and coarse textured soils do provide some interesting possibilities.

NOTES:

Close to ocean (affected by tides)

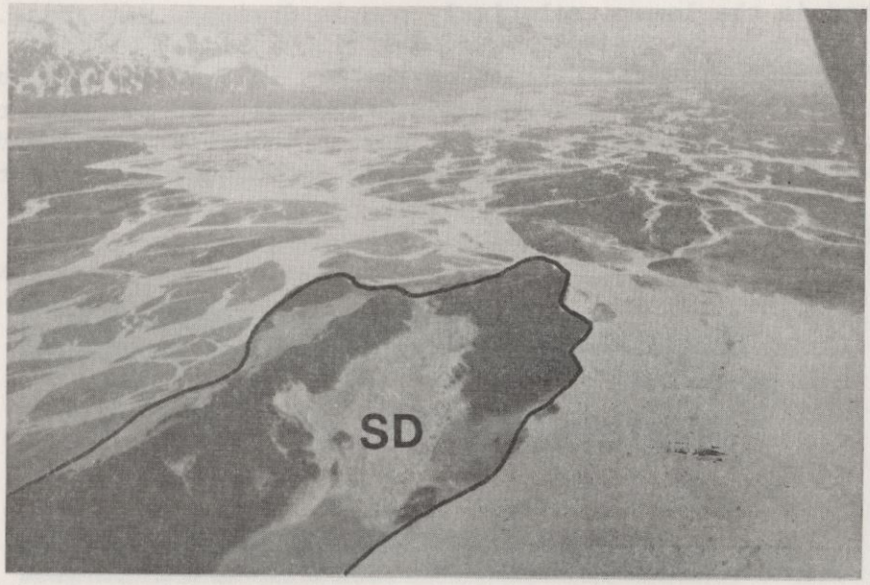
- the 70's come into play

LTA 70 77,79,71,78

LT3

MAP SYMBOL SD

SAND DUNES AND AEOLIAN DEPOSITS



ACREAGE: 16,500 acres

LOCATION: Copper River

DESCRIPTION: This association is characterized by sand dunes and other wind deposited landforms located on islands and along the sides of the Copper River. Most of the landforms consist of either dunes, with up to 100 feet in relief orflat sandy islands. The slopes range from less than six percent to over 45 percent. The landforms are located at elevations less than 100 feet.

SOILS: About 50 percent of the soils are located on low-lying flat plains. They are greater than 100 centimeters deep and poorly drained. The surface soils have a dark brown color and a sandy loam texture. The subsoil has a very dark gray color and a sandy loam to loamy sand texture. About 40 percent of the soils are located on sand bars and dunes. They are greater than 100 centimeters deep and somewhat excessively drained. The surface soil and subsoil have a very dark grayish-brown color and sand texture. About 10 percent of the soils are located

beneath the surface of shallow ponds. They are greater than 100 centimeters deep and very poorly drained. The surface soil and subsoil have a very dark gray color and sand texture.

VEGETATION: The dominant vegetation found on the sand flats consists of a dense alder overstory and some scattered marestail and moss. The alder overstory tends to be thinner on the sand dunes. The site is shared by Devils' Club, ferns, some scattered grass and moss.

LIMITING FACTORS: The major limiting factors in this mapping unit are the high sand content and wind erosion, and a high water table and poor drainage in the low-lying sand plains. Camp, picnic, path or trail, and road locations should be restricted from all low-lying areas due to blowing sand, poor drainage, and a high water table. Revegetation is very low due to the blowing sand and poor drainage. As of this survey, this site will not grow commercial timber.

NOTES:

MAP SYMBOL UTN

UPLIFTED TIDAL MARSHES

ACREAGE: 87,900 acres

LOCATION: Eyak, Alaganik, Pete Dahl, Martin River, and Controller Bay Sloughs.

DESCRIPTION: The uplifted tidal marshes are characterized by a reticulate pattern of tidal influenced sloughs and poorly drained freshwater ponds. The landform extends as far inland as is influenced by the saltwater at high tide. This landform was below mean tide level before the 1964 earthquake and then uplifted to its present position. Although the slough channel banks are constantly eroding, the channels appear to be relatively stable in their present location. The slopes are generally less than six percent. It occurs at elevations from sea level up to about 15 feet.

SOILS: About 80 percent of the soils are located in lagoonal areas. They are greater than 100 centimeters deep and somewhat poorly drained. The surface soil has a very dark gray color and a fine sandy loam texture. The subsoil has a very dark gray color and a silt loam texture.

About 10 percent of the soils are located in abandoned stream channels. They are greater than 100 centimeters deep and poorly drained. The surface soil has a very dark gray color and a fine sandy loam texture. The subsoil has a dark brown to very dark gray color, a sandy loam to silty clay loam texture, and about 65 percent fine gravel. About 10 percent of the soils are located in low-lying lagoonal areas. They are greater than 100 centimeters deep and somewhat poorly drained. The surface soil has a very dark grayish-brown color and a silt loam texture. The subsoil has a dark gray color and a sandy loam to loamy sand texture.

VEGETATION: The dominant vegetation over the majority of the mapping unit is sedge, grass, vetch, sweetgale, and some scattered willow and alder. The willow and alder brush generally increases on river levees of one or two feet of relief and other areas of better drainage.

LIMITING FACTORS: The major limiting factors in this mapping unit are the high erosion hazard, poor drainage, and high water table. Camp and picnic sites, paths or trails, and road locations should all be restricted from low-lying areas due to the high potential erodibility of the fine textured soils, the high water table and the poor drainage. This mapping unit does not have any potential value for commercial timber.

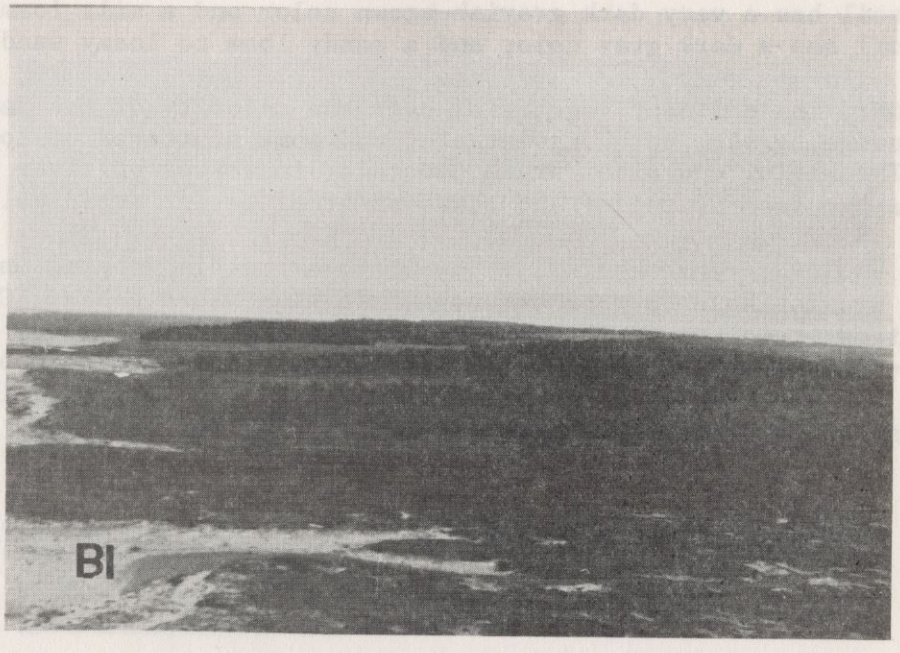
NOTES:

LTA 70

LT's 79

MAP SYMBOL BI

BARRIER ISLANDS AND SPITS



ACREAGE: 12,600 acres

LOCATION: Okalee and Softuk Spits, Egg, Knak, Strawberry, Grass, Kokinhenick, and Copper Barrier Islands and Bars.

DESCRIPTION: The spits are characterized by long protective arms which extend from the mainland. Barrier islands are small, low relief, off-shore islands of depositional origin. Both the barrier iIslands and spits consist mostly of wave deposited beach sands around the periphery and protected lagoonal silts inland. These landforms provide protection for the waters on the landward side; hence, an environment suitable for deposition of sediment. The slopes are generally less than six percent. It occurs at elevations of less than 25 feet.

SOILS: About 90 percent of the soils are located in beach sands and dunes. They are greater than 100 centimeters deep and well drained. The surface soil has a very dark grayish-brown color and a sand texture. The subsoil has a very dark grayish-brown color and sand texture. About 10 percent of the soils are located in lagoonal areas

inland from the beaches. They are greater than 100 centimeters deep and somewhat poorly drained. The surface soil has a dark grayish-brown color and a silt loam texture. The subsoil has a brown to dark gray color and a silt loam to fine sandy loam texture.

VEGETATION: The dominant vegetation in the sandy beach area consists of an alder, willow, elderberry, forbs overstory and a grass-moss ground cover. The lower-lying, wet, protected lagoonal areas generally have sedge, grass, and moss vegetation.

LIMITING FACTORS: The major limiting factors in this mapping unit are the access to the islands and blowing sand on the beach areas, poor drainage, a high water table, and some flooding in the lagoonal areas. Camp, picnic, and road locations should be restricted from the beach and lagoonal areas which have a high water table and are susceptible to wave and wind erosion. Some of the spits have select locations with excellent drainage and produce good commercial timber. The lagoonal areas which have poor drainage will not produce commercial timber.

NOTES:

MAP SYMBOL M

MUSKEG

ACREAGE: 15,900 acres

LOCATION: Bering Lake and the Martin River.

DESCRIPTION: This landform is characterized by low-lying, broad floodplains covered with a thick organic mat. These areas are in the major river floodplains and usually have silt or gravel at a depth greater than five feet. The water table is commonly at or near the surface. The slopes are less than six percent. The landform is located at elevations under 100 feet.

SOILS: The soils in this mapping unit are all organic. About 70 percent of the soils are located in a muskeg dominated by sedge and bog buckbean vegetation. They are greater than 100 centimeters deep and very poorly drained. The surface soil has a very dusky red color and about 80 percent fiber when rubbed. The subsoil has a brown to yellowish-brown color and about 80 percent fiber when rubbed. About 30 percent of the soils are located in muskegs with some spruce tree vegetation. They are greater than 100 centimeters deep and poorly drained. The surface soil

has a dusky red color and about 15 percent fiber rubbed. The subsoil has a dusky red color and no fiber when rubbed.

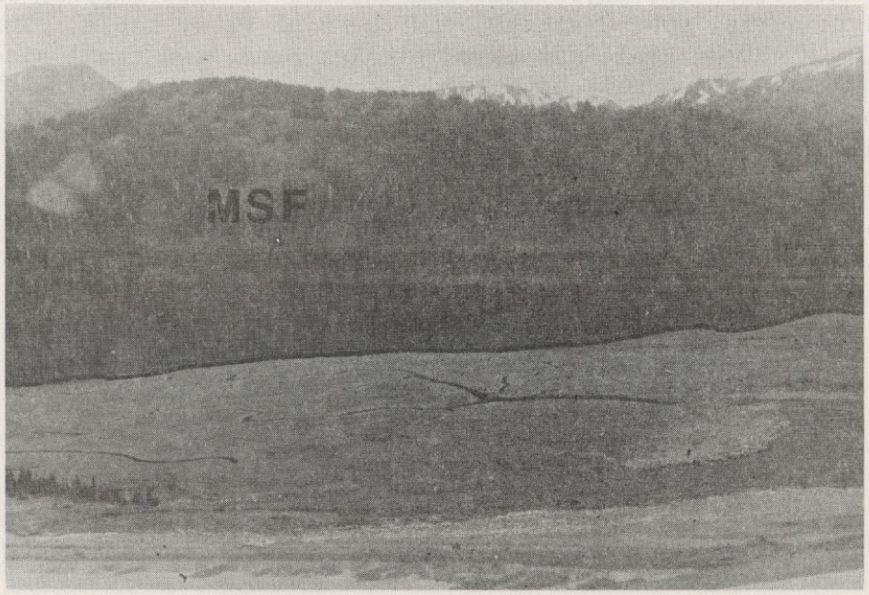
VEGETATION: The dominant vegetation in the muskegs are sphagnum moss, sedges, myrica gale, nagoon berry, other forbs, and some scattered conifers.

LIMITING FACTORS: The major limiting factors in this mapping unit are the organic soils, poor drainage, and the high water table. This mapping unit is not suitable for camp, picnic, path, and trail sites. Extensive preparation will be needed for road construction. This area is not a potential timber site because of the poor drainage and high water table.

NOTES:

MAP SYMBOL MSF

MOUNTAIN SIDESLOPES - FORESTED



ACREAGE: 105,800 acres

LOCATION: Forested sideslopes on most inland mountain ranges.

DESCRIPTION: This association is characterized by mountain sideslopes that have a forest canopy. Most of these slopes were shaped originally by glaciers and subsequently by water and frost wedging. Depositional U-shaped valleys are located downslope from this land form. Rocky ridges and open alpine uplands are located upslope. These slopes are commonly dissected by large talus slopes. Slopes range from 21 to 65 percent. Elevations range from 200 to 3000 feet. About five percent of this association consists of exposed bedrock.

SOILS: About 60 percent of the soils are located on sideslopes from 21 to 66 percent. They are greater than 100 centimeters deep and well drained. The surface soil has a dark reddish-brown color and a fine sandy clay loam texture. The subsoil has a dark reddish-brown to strong brown color, a silt loam texture and about 30 percent gravel and cobbles. About 15 percent of the soils are located on a slope gradient greater

than 45 percent. They are less than 50 centimeters to bedrock and moderately well drained. The surface soil has a dusky red color, a silt loam texture, and about 15 percent gravel. The subsoil has a dark reddish-brown color, a loam to sandy loam texture, and about 70 percent gravel. About 10 percent of the soils are located on outwash plains with a dense spruce-hemlock tree cover. They range from 50 to 100 centimeters deep and are somewhat excessively drained. The surface soil has a dark brown color, a fine sandy loam texture and about five percent gravel. The subsoil has a dark reddish-brown to very dark grayish-brown color, a loamy sand to sand texture, and about 60 percent gravel. About 10 percent of the soils are located in muskegs on gentle slopes. They are greater than 100 centimeters deep, organic, and poorly drained. The surface soil has a dark reddish-brown color and about 80 percent fiber when rubbed. The subsoil has a dark reddish-brown color and about 10 percent fiber when rubbed. About five percent of the ground surface consists of exposed bedrock.

VEGETATION: The vegetation on the majority of the sideslopes consists of a dominantly Western Hemlock-Sitka Spruce overstory, a variety of Vaccinium species, Devils' Club, fern and twisted stalk understory, and a moss ground cover. Some open wet areas on gentle slopes consist of a sedge-sphagnum moss vegetation.

LIMITING FACTORS: The major limiting factors in this mapping unit are the steep slopes, bedrock outcrop, and shallow, organic, and poorly drained soils in select locations. Slopes over 25 percent and poorly drained organic soils should be avoided for construction of camp and picnic sites. Road and path construction should be restricted on slopes over 45 percent and avoided on slopes over 65 percent due to increased landslide and surface erosion hazard. They should also be restricted on organic soils (muskegs). The avalanche hazard will increase on open slopes over 30 percent. Good commercial timber may be produced on many sites in this mapping unit if it is properly managed. It appears that vegetative competition is presently a major limiting factor.

NOTES:

MAP SYMBOL MUN

MOUNTAIN UPLANDS - NONFORESTED

ACREAGE: 78,200 acres

LOCATION: Generally all inland mountain ranges including the Ragged Mountains and the Don Miller Hills.

DESCRIPTION: This association is characterized by rolling to steep, high elevation landforms that have little tree cover. Most of the surface has been shaped by glacial scouring and frost action resulting in somewhat smooth rock surfaces and depositional material in low-lying areas. Ponds and small lakes are common. Mountain Uplands - Nonforested is generally located above Mountain Sideslopes - Forested. Slopes range from 6 to 65 percent. Elevations range from 500 to 3000 feet. About 20 percent of the surface area in this association is exposed bedrock.

SOILS: About 50 percent of the soils are located on alpine mountain sideslopes with grass and scattered tree cover. They are less than 50 centimeters deep and well drained. The surface soil has a dark reddish-brown color and a silt loam texture. The subsoil has a dark reddish-gray color and a loam texture. About 20 percent of the soils are

located on alpine mountain sideslopes vegetated with grass and brush. They range from 50 to 100 centimeters deep and are well drained. The surface soil has a dark brown color, a loam texture, and about 10 percent gravel and cobbles. The subsoil has a dark brown to brown color, a loam texture, and about 40 percent gravel and cobbles. About 10 percent of the soils are located on alpine mountain sideslopes. They are less than 50 centimeters deep and well drained. The surface soil has a dark reddish-brown color, a loam texture, and about five percent gravel. The subsoil has a dark reddish-brown color, a loam texture, and about 25 percent gravel. About 20 percent of the ground surface consists of exposed bedrock.

VEGETATION: The vegetation on some of the sideslopes consist of a poor stand of Mountain Hemlock with a lupine, heather, moss ground cover. Other sideslopes have an alder-willow brush overstory and some grass and moss ground cover. The majority of the mapping unit consists of a sedge, grass, and moss ground cover with no shrubs or trees.

LIMITING FACTORS: The major limiting factors in the mapping unit are the shallow soils, exposed bedrock, steep slopes, and a cold climate. Camp and picnic sites should not be located on slopes over 15 percent gradient. Roads, paths, and trails should be restricted on slopes over 45 percent and avoided on slopes over 65 percent due to high erosion hazard and landslide potential. All steep slopes have a high avalanche potential; people and structures should be restricted from these areas. This mapping unit will never produce commercial timber because of the cold climate.

NOTES:

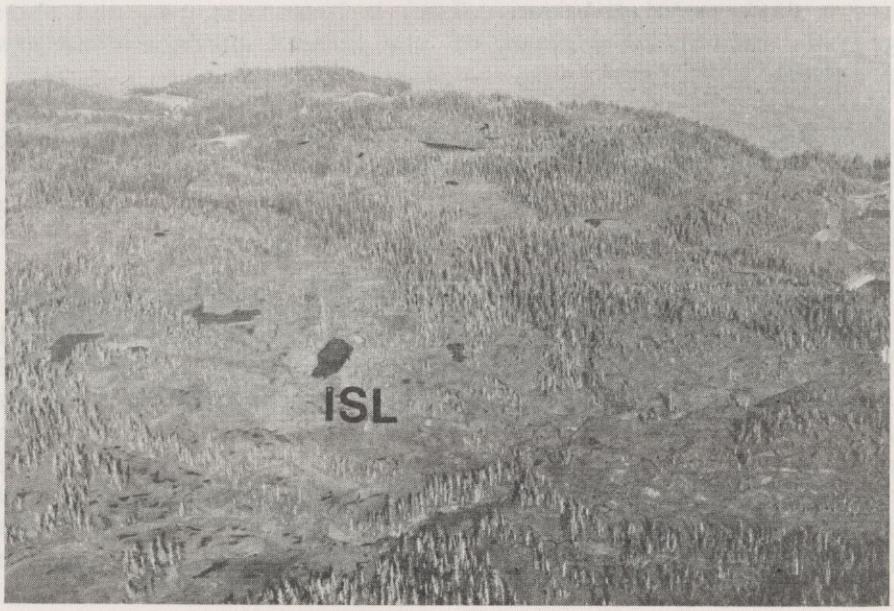
LTA 9D

91,92,93,94

LT's

MAP SYMBOL ISL

ICE SCOURED LANDS



ACREAGE: 12,900 acres

LOCATION: Heney Mountains, McKinley Lake, and north of the Cordova Airport.

DESCRIPTION: This association is characterized by many small hills and basins dissected in places by steep sided stream channels. Most of the topography is controlled by bedrock which has been rounded by over riding ice from glaciers. Shallow soils generally cover the small bedrock hills; ponds are commonly found in the small basins. Slopes range from 21 to greater than 66 percent. Elevations range from zero to 800 feet. There are some selected locations of exposed bedrock.

SOILS: About 50 percent of the soils are located on spruce-hemlock covered hillsides with slopes less than 45 percent gradient. They are less than 50 centimeters deep and well drained. The soil has a dark grayish-brown color and a fine sandy-loam texture. About 20 percent of the soils are located on steep hillsides with a low density tree cover. They are less than 50 centimeters deep and moderately well drained. The surface soil has a dark reddish-brown color, a silt loam texture, and

about 25 percent gravel. The subsoil has a dark reddish-gray color, a loam texture, and about 25 percent gravel. About 20 percent of the soils are located in muskegs on hillsides of slopes less than 21 percent. They are greater than 100 centimeters deep and somewhat poorly drained. The surface soil has a dusky red color and about 15 percent fiber when rubbed. The subsoil has a dusky red color and about 10 percent fiber when rubbed. About 10 percent of the soils are located on hillsides of over 45 percent gradient. They are less than 50 centimeters deep and well drained. The surface soil has a dusky red color, a silt loam texture, and about 15 percent gravel. The subsoil has a dark reddish-brown color, a loam to sandy loam texture, and about 70 percent gravel.

VEGETATION: The vegetation on most of the steep slopes consists of Sitka Spruce-Western Hemlock in the overstory, some Vaccinium species and Devil's Club in the understory, and a moss ground cover. Small hilly areas are usually characterized by Mountain Hemlock, Vaccinium species, crow berry, moss, grass, and some sedge. Low-lying wet areas consist mainly of sedges, sphagnum moss, and bog orchit.

LIMITING FACTORS: The major limiting factors in this mapping unit are shallow soils, organic soils, steep slopes, and a cold climate. Camp and picnic sites should not be located on slopes over 15 percent. Roads, paths, and trails should be restricted on slopes over 45 percent and avoided on slopes over 65 percent due to the high erosion hazard and shallow soils. All the above activities should be restricted from areas containing organic soils. This mapping unit is not suitable for commercial timber production because of shallow soils, poor drainage, and cold climate.

NOTES:

MAP SYMBOL IR

GLACIAL ICE AND ROCK

ACREAGE: 171,400 acres

LOCATION: Bering, Martin, Johnson, Slide, Fickett, Saddlebag, Sheridan, Scott, and Sheppard Glaciers and all of the exposed, rocky mountains in between.

DESCRIPTION: The glacial ice and rock association is characterized by rocky mountain peaks and glaciers. The rocky peaks are usually steep, sharp, and many sided. The glaciers are smooth in many places and strongly crevassed in others. A vegetative cover is only found in select places. Slopes range from zero to over 100 percent. This landform occurs at elevations from 500 to 6500 feet.

SOILS: There are no significant soils in this mapping unit.

VEGETATION: The little vegetation that is found in this mapping unit consists of moss, lichens, grasses, and some legumes.

LIMITING FACTORS: This mapping unit has severe limitations for all management activities except for some types of recreation.

NOTES:

CLIMATOLOGICAL AND HYDROLOGICAL DATA

Climatology

The basic factors affecting Cordova's climate are similar to those encountered at practically all points along the coastal area of southeastern Alaska. The climate is basically maritime in nature, with the the nearby ocean areas exerting a modifying influence to hold daily and seasonal temperature ranges confined within rather narrow limits. The nearness to ocean areas, plus the exposure of the area to the frequent lows which develop in or move out of the Gulf of Alaska, provides abundant precipitation to the area. High, rugged nearby mountains, with relatively steep slopes extending in many places to the shoreline, influence the local climate in several ways. The relatively steep slopes tend to intensify precipitation from onshore movement of moisture laden air, and the rugged, uneven terrain tends to create considerable variation in rainfall amounts and pronounced temperature differences within relatively short distances. Downslope drainage effects upon temperature distribution are considerable the year around since much of the higher mountain areas remain permanently glaciated all year. Also, the semicircle of the high mountain ridges around Cordova provide considerable sheltering effect, particularly to the north and west.

The National Oceanic and Atmospheric Administration Station at the Cordova airport (mile 13) indicates the average precipitation on the delta is approximately 89 inches per year. The precipitation is fairly uniform throughout the year except for September and October which is double the other months (Appendix E, Table 1 and Table 2).

The maximum month of precipitation on record occurred in November of 1976, when 30.6 inches of precipitation was recorded. The minimum month occurred in April of 1948 when 0.08 inches of precipitation was recorded.

Cordova holds the record for the highest precipitation in 24 hours. That was 7.9 inches and occurred in September of 1951.

Precipitation increases rapidly with elevation. Heavy snow and rain falls on the upper slopes of the mountains. Permanent ice and snow fields, as well as glaciers, are common in the mountains.

The average annual snowfall of 127 inches occurs mainly during the period from November through March.

Cordova's rather persistent cloudiness is clearly shown by the average sky cover of nearly eight tenths from sunrise to sunset. The mean annual number of clear days is 52, while 262 days, on the average, are cloudy.

Temperatures are greatly modified by the relatively warm waters of the Pacific Ocean (Appendix E, Table 3 and 4). During the winter months onshore winds frequently bring rain and above-freezing temperatures,

rapidly melting the accumulated snow and turning roads and runways into a glazed condition with the return of freezing temperatures to seriously affect transportation of all kinds. High temperatures at Cordova have failed to climb above the middle eighties. Although a record low of -33 degrees has been recorded, temperatures reaching extreme cold levels are usually of brief duration. The growing season averages about 107 days, extending from May 29 to September 13.

Compared with most Alaskan stations, wind characteristics of Cordova are quite favorable. The surrounding mountains tend to keep velocities at relatively low levels most of the time, and the average wind speed for the year is 4.8 miles per hour. During cold, clear weather the wind is usually calm or light and generally too variable to have pronounced effects upon local conditions. The high ridge of the Chugach Range, running WNW to ESE, combined with shoreline effects, contributes to the prevailing easterly wind direction at the station.

An interesting, though somewhat unpleasant, wind condition arises occasionally when the pressure pattern causes cold air from the interior to flow across the coastal ranges to the Pacific. At these times the winds can be quite severe, especially at the mouth of the Copper River.

Hydrology

The runoff characteristics of the Copper River Delta area are a product of the geology, climate, and soils found in the area. The mountains generally rise rather abruptly out of the sea and are covered extensively by ice fields and glaciers. Glacial outwash plains adjacent to the mountain ranges and in the intermountain valleys contain thick sequences of unconsolidated gravel, sand, silt, and clay; some of these plains are so flat that muskeg bogs are common. Well consolidated and relatively impermeable igneous and sedimentary rocks make up the major part of the mountain ranges as well as the bedrock underlying the valley and plain deposits. Large and extensive stream systems, fed by precipitation and glacial meltwater, disgorge from the glaciated valleys and provide recharge to the permeable deposits in the outwash plains. Thus these deposits contain extensive zones of water-saturated sediments.

Glaciation has removed the weathered mantle and left a bedrock surface except in the floors of the narrow valleys and the deltas of the major streams emerging from the steep mountains. The chances for development of large groundwater supplies are meager. The steep relief and slight soil cover account for a high ratio of stream runoff to precipitation.

An extended record of runoff measured at Power Creek (Appendix E, Table 5) near Cordova indicates an average runoff of 162 inches per year, that is, if the runoff for a given length of time (one year) was uniformly spread back on the land area it would measure 162 inches deep. Comparing this with the precipitation recorded at lower elevation confirms the statement that precipitation increases rapidly with elevation because runoff greatly exceeds measured precipitation.

Runoff records procured from a glacier free watershed (Dick Creek, Table 6), indicates an average runoff of 187 inches. This watershed is closer to the coastal influence and therefore gets a higher average precipitation input than Power Creek. The channel is more stable than the glacial streams, but it still carries a large bed load.

Runoff is dependent upon rain or snow recharge. As mentioned earlier groundwater as a source of runoff is negligible. Because of low water storage, streamflow is directly related to input from storms in drainage without glaciers. In watersheds with glaciers, the melting ice will sustain flow during storm free periods in the summer season.

High flows begin in early May and will continue into July depending upon snow pack and rain. There is a runoff period in August. Another high flow period occurs in September when fall storms begin. The runoff will drop sharply during the winter months when glaciers and lakes refreeze and precipitation comes in the form of snow.

The glacial outwash channels are very unstable. Because of the aggradation effect of the deposited sediment carried by the stream, the rivers are always overflowing their banks and creating new channels.

The quality of surface water is generally in one of two categories. It is either good and meets public health standards for potable water, or it is highly silty glacial water. This silty water results from a rock flour that is so fine that clarification of the water for domestic use is very costly. Glacial streams carry as much as 100,000 tons/day of sediment. The Copper River carries over a million tons/day of sediment.

Two major river systems, the Copper River and the Bering River, flow through the unit. These rivers carry large sediment loads from these glacial sources to the ocean.

Groundwater is usually of poor quality. The iron content is high and the water is moderately hard. Organic matter is also usually present.

There are 228,000 acres of water in the unit which is approximately 25% of the area. Most of this acreage is in small ponds and lakes.

GLOSSARY

Alluvium	General term applied to all material deposited by streams and rivers.
Cirque	A deep, steep-walled recess in a mountain, caused by glacial erosion.
Clay	A mineral soil separate consisting of particles less than 0.002 millimeters in equivalent diameter.
Cobbles	Rock material ranging in size from three to ten inches in diameter (7.5 cm - 25 cm).
Deep	A soil depth which is greater than 100 cm (40 inches).
Drainage	See "Drainage" on page 39.
Frost wedging	The mechanical disintegration of earth material brought about by the contraction and expansion of thawing and freezing water.
Geomorphology	That branch of both physiography and geology that deals with the form of the earth, the general configuration of its surface, and the changes that take place in the evolution of landforms.
Gravel	Rock material ranging in size from two millimeters to three inches in equivalent diameter.
Graywacke	A type of dark colored sandstone marked by quartz and feldspars set in a finer matrix. Known as garbage rock.
Ground	The mineral soil surface.
Lateral moraine	An elongated body of drift, commonly thin, lying on the surface of a glacier in a valley, at or near the lateral margin of the glacier.
Moraine	An accumulation of drift, with an initial topographic expression of its own, built within a glaciated region chiefly by direct action of glacial ice.
Pedon	The smallest sampling area of soil which can be described and sampled to represent the nature and arrangement of its horizons and variability and the other properties that are preserved in the samples.
Rubbed fiber	That percentage of distinguishable organic fiber after the sample is rubbed between the fingers until decomposed organic fiber is destroyed.

Sand	A soil particle between 0.05 and 2.0 millimeters in diameter.
Sandstone	A cemented or compacted detridal sediment composed predominantly of sand size quartz particles.
Silt	A soil separate consisting of particles between 0.05 and 0.002 millimeters in equivalent diameter.
Siltstone	A fine grained consolidated clastic rock consisting of silt size particles.
Solum	The upper part of the soil profile, above the parent material in which the processes of soil formation are active.
Terminal moraine	A moraine across the front end of a glacier at its farthest advance marking the terminus of the glacier.
Thixotropy	The property of a material to change state from a gel to a liquid upon disturbance.
Unassorted	A non-stratified mixture of fine and course material.
U-shaped valley	The characteristic cross sectional appearance of a valley after it has been carved by a glacier.
Volcanic	Soil and rock material derived from volcanic origin.

BIBLIOGRAPHY

(1) Forest Service Handbook on Soils, Section 2509.15 figure 6.5, Ch. 6.

(2) Soil Survey Manual, U.S.D.A. Handbook No. 18, 1951, p.17-172

(3) Definitions and abreviations for Soils Descriptions, Form PF-123 U.S.D.A. - SCS, Berkley, Calif. 1966

(4) Davidson, Dean F. and John Osborne, 1976. The Soil and Water Resource Inventory of the West Half of the Challis National Forest, Challis, Idaho.

(5) Soil Taxonomy. A Basic System of Soil Classification for Making and Interpreting Soil Surveys. Soil Survey Staff, U.S.D.A.-SCS. Agricultural Handbook No. 436. 1976

(6) Galloway, William E. 1975. Sediments and Stratigraphic Frame-work of the Copper River Fan-Delta, Alaska. Bureau of Economic Geology, U. of Texas.

(7) Stewart, Thomas G. 1976. Geomorphic Land Units of the Copper River Coastal Lowlands, Chugach National Forest. (Unpublished)

(8) Resource Conservation Glossary, Soil Conservation Society of America, 1976.

(9) Climatological Data for the State of Alaska, NUAA

(10) Procedural Guide for the Soil Resource Inventory Portion of the Land Systems Inventory (Draft) April, 1976. Forest Service, Intermountain-Region.

(11) Sheehy, T.J. 1975. Reconnaissance Ecosystem - Soil Inventory and Management Report for the Upper Prince William Sound. Planning Unit-B. Chugach National Forest.

APPENDIX A

SOIL HYDROLOGIC CHARACTERISTICS

Map Symbol Identification map symbol representing each landtype association, (Mapping Unit).

Soil Number The number assigned to each soil family mapped in this survey.

Soil % On Landtype Association The surface area each soil represents within that landtype association (Mapping Unit).

Infiltration - Infiltration is the rate at which water enters the soil. The infiltration rate of a soil is controlled by the structure, porosity, organic matter content, and texture of the surface layers. Five qualitative classes are used and they have the following quantitative ranges expressed in inches of water per hour.

Class	Rate (Inches/Hr.)
1 - Very Slow	Less than 0.2
2 - Slow	0.2 - 0.6
3 - Moderate	0.6 - 2.0
4 - Rapid	2.0 - 6.0
5 - Very Rapid	More than 6.0

Permeability Permeability or percolation is the rate at which water moves through the soil. The permeability of a soil is determined by structure and texture of the soil profile below the surface layers. The same five classes are used for permeability as were used for infiltration.

Available Water-holding Capacity This column gives the water-retention capacity of the soil profile and is expressed in centimeters of water down to a 100 cm depth. Available water, as used in this report is the water in the soil profile that is available to plant roots. The figures in this column are net figures as the hydroscopic and gravitational water have been subtracted. These figures are based on the mineral portion of the soil profile. The retention figures were calculated by using average water-holding capacities of specified soil textures (1). Contrasting textures in a soil profile were calculated separately and totaled to arrive at the retention capacity of the profile and reductions were made when significant amounts of gravel occurred in the profile.

Drainage This column gives an interpretation of general relative soil drainage based on field observations and inferences related to runoff, soil permeability, and internal soil drainage. These drainage classes are based on those morphological characteristics that are affected by different degrees of aeration within the soil profile (3). The drainage classes are as follows:

Very Poorly Drained - The water table remains at or near the surface a greater part of the time. Soils of this class usually occupy level or depressed areas and are frequently ponded.

Poorly Drained - The soil remains wet much of the time with the water table seasonally near the surface for prolonged intervals. This drainage condition is due to a high water table, a slowly permeable layer within the soil profile, or seepage.

Somewhat Poorly Drained - Soil is wet for significant periods, but not all of the time, usually because of a slowly permeable layer or a high water table.

Moderately Well Drained - Profile is wet for a small but significant part of the time, usually because of a slowly permeable layer within or immediately beneath the solum, a relatively high water table, surface additions of water from runoff of higher areas, or a combination of the above.

Well Drained - Water is removed from the soil readily but not rapidly.

Somewhat Excessively Drained - Water is removed rapidly from the soil.

Excessively Drained - Water is removed very rapidly from soils.

Ground Cover The following information pertains to the protective cover of each representative soil in that mapping unit. They include the following:

Bare Soil - That soil suface which is not protected from raindrop splash by coarse fragments and vegetative cover.

Tree Canopy Cover - An estimate of the soil surface protected by tree branches, leaves, etc., over 15 feet above the soil surface.

Brush Canopy Cover - An estimate of the soil surface protected by branches, leaves, etc.,, up to 15 feet above the soil surface.

Organic Mat Cover - An estimate of the soil surface protected by a vegetative layer lying directly on the soil surface.

TABLE I

SOIL HYDROLOGIC CHARACTERISTICS

Map Symbol	Soil No.	Soil % on Landtype Ass.	Infiltration	Permeability	Available Water Holding Capacity (100 cm profile)	Drainage	GROUND COVER			
							Bare Soil	Tree Canopy Cover	Brush Canopy Cover	Organic Mat Cover
OPF	S-11	70%	Rapid	Rapid	3.2 cm	Somewhat excessively drained.	-	85%	20%	100%
	S-12	30%	Rapid	Rapid	6.1 cm	Well Drained	-	40%	85%	100%
OPN	S-3	50%	Rapid	Slow	13.0	Very poorly drained	-	-	10%	100%
	S-9	30%	Rapid	Rapid	8.3 cm	Poorly drained.	-	1%	80%	5%
	S-2	15%	Rapid	Very Rapid	3.1 cm	Moderately well drained.	90%	20%	40%	10%
	S-22	5%	Rapid	Very Slow	-	Poorly drained.	-	10%	10%	100%
GM	S-15	35%	Rapid	Moderate	10.6 cm	Well drained.	-	60%	30%	100%
	S-21	15%	Rapid	Slow	-	Poorly drained.	-	-	-	100%
	S-23	15%	Rapid	Slow	-	Poorly drained.	-	-	10%	100%
	S-13	35%	Rapid	Moderate	3.6 cm	Somewhat excessively drained.	-	80%	30%	100%

TABLE I

SOIL HYDROLOGIC CHARACTERISTICS

Map Symbol	Soil No.	Soil % on Landtype Ass.	Infiltration	Permeability	Available Water Holding Capacity (100 cm profile)	Drainage	GROUND COVER			
							Bare Soil	Tree Canopy Cover	Brush Canopy Cover	Organic Mat Cover
AST	S-2	90%	Rapid	Very Rapid	3.1 cm	Excessively drained.	50%	15%	35%	20%
	S-1	10%	Rapid	Rapid	7.3 cm	Somewhat excessively drained.	50%	40%	50%	-
SO	S-9	50%	Rapid	Rapid	8.3 cm	Poorly drained.	20%	-	80%	5%
	S-8	40%	Rapid	Rapid	5.0 cm	Somewhat excessively drained.	40%	2%	40%	-
	S-4	10%	Rapid	Rapid	3.0 cm	Very poorly drained.	10%	-	20%	90%
UTM	S-5	80%	Moderate	Moderate	9.2 cm	Somewhat poorly drained.	10%	-	5%	90%
	S-6	10%	Moderate	Slow	13.2 cm	Poorly drained.	-	-	5%	100%
	S-3	10%	Moderate	Moderate	13.0 cm	Somewhat poorly drained.	10%	-	30%	90%
BI	S-8	90%	Rapid	Rapid	5.0 cm	Well drained.	20%	5%	35%	80%
	S-10	10%	Moderate	Moderate	17.0 cm	Somewhat poorly drained.	-	-	-	100%
M	S-26	70%	Rapid	Moderate	-	Very poorly drained.	-	-	-	80%
	S-25	30%	Rapid	Moderate	-	Poorly drained.	-	15%	20%	100%

TABLE I

SOIL HYDROLOGIC CHARACTERISTICS

Map Symbol	Soil No.	Soil % on Landtype Ass.	Infiltration	Permeability	Available Water Holding Capacity (100 cm profile)	Drainage	GROUND COVER			
							Bare Soil	Tree Canopy Cover	Brush Canopy Cover	Organic Mat Cover
MSF	S-16	60%	Rapid	Moderate	18.7 cm	Well drained.	-	60%	50%	100%
	S-17	15%	Rapid	Moderate	3.7 cm	Moderately well drained.	10%	60%	30%	90%
	S-11	10%	Rapid	Rapid	3.2 cm	Somewhat excessively drained.	-	70%	75%	100%
	S-22	10%	Rapid	Rapid	-	Poorly drained.	-	5%	10%	100%
	Bedrock	5%								
MUN	S-20	50%	Moderate	Slow	3.1 cm	Well drained.	-	-	20%	100%
	S-19	20%	Moderate	Moderate	9.8 cm	Well drained.	-	-	5%	100%
	S-18	10%	Moderate	Moderate	7.0 cm	Well drained	5%	50%	30%	90%
	Bedrock	20%	-	-	-	-	-	-	-	20%
ISL	S-7	50%	Rapid	Moderate	3.8 cm	Well drained.	-	50%	50%	100%
	S-20	20%	Moderate	Moderate	3.0 cm	Moderately well drained.	20%	30%	20%	80%
	S-24	20%	Rapid	Moderate	-	Somewhat poorly drained.	-	-	-	100%
	S-17	10%	Moderate	Slow	3.7 cm	Well drained	-	80%	40%	100%
IR	Ice & Bedrock	-	-	-	-	-	-	-	-	20%

APPENDIX B

ENGINEERING INFORMATION

Map Symbol Identification map symbol representing each landtype association (Mapping Unit).

Soil No. The number assigned to each soil family mapped in this survey.

Dominant Depth to Bedrock The general depth range of each soil (less than 50 centimeters, 50-100 centimeters, greater than 100 centimeters).

Slope Range The overall range of slopes observed in the field for each landtype association (Mapping Unit).

Inherent Surface Erosion Hazard Rated for bare soil conditions according to five qualitative classes. These classes are based on the ability of the soils to take in water, resistance of the soil surface to dispersion under the impact of rainfall and surface water movement, effect of coarse fragments that reduce surface detachment, and effect of topography. Climate was considered a constant (4).

5 Very High Unprotected bare soil will erode sufficiently to severely and permanently damage the productive capacity of the soil or will yield excessively high volumes of sediment.

4 High Unprotected bare soil will erode sufficiently to severely damage productive capacity or will yield high volumes of sediment.

3 Moderate Sufficiently resistant to erosion to permit limited and temporary exposure of bare soil during development or use.

2 Low Sufficiently resistant to erosion to permit exposure of bare soil under minimal precautionary restrictions.

1 Very Low No appreciable hazard of erosion.

Avalanche Hazard This column gives five classes of the degree of avalanche hazard based on distance between observed or suspected avalanche paths. The classes are:

5 Very High 0 to 1000 feet.

4 High 1000 to 2000 feet.

3 Moderate 2000 to 3000 feet.

2 Low 3000 to 5000 feet.

1 Very Low Greater than 5000 feet.

Erosion Hazard, Cut and Fill Slopes Based on a standard road with a 12 foot driving surface, a 3 foot berm, and a 3 foot ditch on the dominant slope gradient for the designated area and uncompacted fills with ratios and heights inferred from 18 foot wide roads and dominant slope gradient with balanced cut and fill slope gradient with balanced cut and fill design, bare vegetative cover, bermed and with an insloped bed. Classes are:

5 Very High Unprotected cuts and fills will yield excessively high volumes of sediment.

4 High Unprotected cuts and fills will yield excessively high volumes of sediment during periods of flashy or long duration runoff.

3 Moderate Sufficiently resistant to erosion to permit temporary exposure of bare soil after construction.

2 Low Sufficiently resistant to erosion to permit exposure of bare soil under minimal precautionary restrictions.

1 Very Low No appreciable hazard erosion.

Slump Hazard, Cut and Fill Slopes This column gives five hazard classes for mass failures of road cuts. The chief variable is the height and angle of cut. Slopes with the highest cut slope failure hazards generally have an accumulation of fine textured homogenous material, lack of cohesive materials, steep slopes, and a subsurface moisture source. Five qualitative classes were used, based on the relative volumes of materials which could be expected from mass failures of the cut slope. These classes are stated in terms of sediment production and maintenance problems. Classes are:

5 Very High Cut slopes will yield excessively high volumes of material from mass failures and the road will require continuous removal of material to keep sediment from reaching streams and in some instances to maintain trafficability. Under normal conditions roads will not be economically feasible on these slopes.

4 High Cut slopes will yield high volumes of material from mass failures which will require almost constant removal of material from the roadbed to keep sediment from reaching streams.

3 Moderate Cut slopes will yield such volumes of materials from mass failures that the road will only require seasonal removal of material.

2 Low Cut slopes will yield only such volumes of material that only occasional removal of material will be required.

1 Very Low No appreciable hazard of mass failure of the cut slopes.

Road Trafficability This column gives four qualitative classes of trafficability on non-surfaced, low standard roads. The criteria reflects how well a soil will perform after it has been removed from its original location and is placed in a road embankment. It also reflects the ease of removal. Criteria considered are soil texture, coarse fragments, drainage, slope, and soil susceptibility to frost action. The classes that are used are: good, fair, poor, and very poor (10).

4 Good Soils have fragmental and loamy-skeletal textures with or without well fractured, hard bedrock. Soils may be well drained or better and/or on slopes of 0 to 15 percent. Road surfaces are resistant to erosion and rutting. Intermittent maintenance will be needed.

3 Fair Soils have a coarse-loamy, coarse-silty, and loamy-skeletal texture. Soils may be moderately well drained and/or on 15 to 25 percent slopes. Road surfaces need only seasonal maintenance to insure trafficability. Few traction or rutting problems.

2 Poor Soils have a fine-loamy, fine-silty, sandy, and clayey-skeletal textures with or without well fractured, soft bedrock. Soils may be somewhat poorly drained and/or on slopes of 26 to 45 percent. Maintenance is needed several times during the season to reduce ruts and holes. Some traction problems exist when fine soil surfaces are wet or when sandy soils are present.

1 Very Poor Soils have fine and very fine textures or are high in organic matter, and with or without well-fractured soft bedrock. Soils may be poorly or very poorly drained and/or on slopes greater than 45 percent. Roads need constant maintenance during wet weather. Rutting and traction problems are severe.

Road Construction Hazards This column is included to summarize the major factors related to road construction.

> Greater Than

< Less Than

TABLE II

ENGINEERING INFORMATION

Map Symbol	Soil No.	Dominant Depth to Bedrock Inches & cm	Slope Range	Inherent Surface Erosion Hazard	Avalanche Potential	Erosion Hazard Cut & Fill Slopes	Slump Hazard Cut & Fill Slopes	Road Traffic-ability	Road Construction Hazards
OPF	S-11	> 100 cm (40")	< 5%	Moderate	-	Moderate	Very Low	Good	-
	S-12	> 100 cm (40")	< 5%	Moderate	-	Moderate	Very Low	Poor	High sand content
OPN	S-3	> 100 cm (40")	< 5%	Very Low	-	Low	Very Low	Very Poor	Poor drainage, high water table.
	S-9	> 100 cm (40")	< 5%	Moderate	-	Moderate	Very Low	Very Poor	Poor drainage, high sand content, high water table.
	S-2	> 100 cm (40")	< 5%	Low	-	Very Low	Very Low	Fair	-
	S-22	> 100 cm (40")	< 5%	-	-	-	-	Very Poor	Organic Soil.
GM	S-15	> 100 cm (40")	6 - 21%	Moderate	-	Low	Low	Poor	Soil has thixotropic characteristics.
	S-21	> 100 cm	< 5%	-	-	-	-	Very Poor	Organic Soil

> Greater Than

< Less Than

TABLE II

ENGINEERING INFORMATION

Map Symbol	Soil No.	Dominant Depth to Bedrock Inches & cm	Slope Range	Inherent Surface Erosion Hazard	Avalanche Potential	Erosion Hazard Cut & Fill Slopes	Slump Hazard Cut & Fill Slopes	Road Traffic-ability	Road Construction Hazards
GM	S-23	> 100 cm (40")	6 - 21%	-	-	-	-	Very Poor	Organic Soil
	S-13	> 100 cm (40")	< 21%	Low	-	Low	Low	Good	-
AST	S-2	> 100 cm (40")	< 5%	Low	-	Low	Very Low	Fair	Wind erosion on aeolian soils.
	S-1	> 100 cm (40")	< 5%	Moderate	-	Moderate	Very Low	Poor	Wind erosion, high sand content.
SD	S-9	> 100 cm (40")	< 5%	Moderate	-	Moderate	Very Low	Poor	High sand content, wind erosion.
	S-8	> 100 cm (40")	21-45%	Moderate	Very Low	Moderate	Low	Poor	High sand content, wind erosion.
	S-4	> 100 cm (40")	< 5%	Moderate	-	Moderate	Very Low	Poor	High sand content, wind erosion.

> Greater Than

< Less Than

TABLE II

ENGINEERING INFORMATION

Map Symbol	Soil No.	Dominant Depth to Bedrock Inches & cm	Slope Range	Inherent Surface Erosion Hazard	Avalanche Potential	Erosion Hazard Cut & Fill Slopes	Slump Hazard Cut & Fill Slopes	Road Traffic-ability	Road Construction Hazards
UTM	S-5	> 100 cm (40")	< 5%	Moderate	-	High	Very Low	Poor	Fine texture soils erosion hazard.
	S-6	> 100 cm (40")	< 5%	Moderate	-	High	Very Low	Fair	High water table. erosion hazard.
	S-3	> 100 cm (40")	< 5%	Moderate	-	Moderate	Very Low	Fair	High water table.
BI	S-8	> 100 cm (40")	< 5%	Moderate	-	High	Very Low	Poor	High sand content, wind and wave erosion
	S-10	> 100 cm (40")	< 5%	Moderate	-	Moderate	Very Low	Poor	High water table.
M	S-26	> 100 cm (40")	< 5%	-	-	-	-	Very Poor	High water table, organic soils
	S-25	> 100 cm (40")	< 5%	-	-	-	-	Very Poor	High water table, organic soils

> Greater Than

< Less Than

TABLE II

ENGINEERING INFORMATION

Map Symbol	Soil No.	Dominant Depth to Bedrock Inches & cm	Slope Range	Inherent Surface Erosion Hazard	Avalanche Potential	Erosion Hazard Cut & Fill Slopes	Slump Hazard Cut & Fill Slopes	Road Traffic-ability	Road Construction Hazards
MSF	S-16	> 100 cm (40")	21-66%	Moderate	Low	High	Moderate	Poor	Slump and erosion hazard potential on slopes over 45%
	S-17	< 50 cm (20")	> 66%	Very High	Low	Very High	High	Fair	Slopes over 65%, very high erosion and slump hazards, shallow soils. Avoid.
	S-11	50-100 cm (20"-40")	< 5%	Low	-	Moderate	Very Low	Fair	-
	S-22	> 100 cm (40")	< 5%	-	-	-	-	Very Poor	Organic soils, high water table.
MUN	S-20	< 50 cm (20")	21-66%	Moderate to high	High	High	Low	Fair	Shallow soils, slopes over 45%, erosion hazard.
	S-19	50-100 cm (20"-40")	21-66%	Moderate to high	High	High	Low	Good	Slopes over 45%, erosion hazard.
	S-18	< 50 cm (20")	21-66%	Moderate to high	Moderate	High	Low	Fair	Shallow soils, slopes over 45%, erosion hazard.

> Greater Than

< Less Than

TABLE II

ENGINEERING INFORMATION

Map Symbol	Soil No.	Dominant Depth to Bedrock Inches & cm	Slope Range	Inherent Surface Erosion Hazard	Avalanche Potential	Erosion Hazard Cut & Fill Slopes	Slump Hazard Cut & Fill Slopes	Road Traffic-ability	Road Construction Hazards
ISL	S-7	< 50 cm (20")	21-45%	Moderate	-	High	Low	Fair	Shallow soils, erosion hazard.
	S-20	< 50 cm (20")	21-66%	Moderate to high	Low	High	Low	Fair	Shallow soils, slopes over 45%, erosion hazard.
	S-24	< 100 cm (40")	6-21%	-	-	-	-	Very Low	Organic soils.
	S-17	< 50 cm (20")	21-66%+	Moderate to high	Low	High	Low	Good	Shallow soils, slopes over 45%, erosion hazard.
IR	Ice	& Bedrock	6-66%	-	Very High	_	_	Very poor	Bedrock, variably fractured slopes over 45%.

APPENDIX C

SOIL SUITABILITY AND LIMITATIONS

Map Symbol Identification map symbol representing each landtype association (Mapping Unit).

Soil No. The number assigned to each soil family mapped in this survey.

Soil % on Landtype Association The surface area each soil represents within that landtype association (Mapping Unit).

Camp & Picnic Site Suitability This column gives three qualitative classes for the soil suitability for picnic and camp areas. Criteria used to arrive at the classes are soil surface texture, flooding potential, soil permeability, slope, wetness, and coarse fragments on the surface. The classes are:

1 Slight There are no major soil limitations which would require extensive site preparation other than the normal construction procedures for a normal campground or picnic area.

2 Moderate There are one or two major soil limitations which would make extensive site preparation necessary and increase the cost of construction for suitable campground or picnic areas.

3 Severe The soil limitations are significant enough so a suitable campground or picnic area cannot be constructed economically regardless of the site preparations utilized.

Path and Trail Suitability This column gives three qualitative classes for the soil suitability in its natural state for path and/or trail construction. Criteria used to arrive at the classes are surface soil texture, soil drainage, flooding potential, slope, and coarse fragments on the soil surface. The classes are:

1 Slight The soil is suitable in its natural state.

2 Moderate There are some major limitations which would make the soil unsuitable but they may be overcome by some site preparation.

3 Severe The limitations are significant enough to make the soil unsuitable although most of the limitations could be overcome by extensive site preparation and costly construction techniques.

Revegetation Potential, Cut and Fill Slopes This column gives five qualitative classes of the potential for natural revegetation of cut and fill slopes to establish a protective cover. Criteria used to arrive at the classes are soil texture, water holding capacity, depth of soil, and climatic limitations. This rating does not consider the possibility of specialized revegetation practices such as hydro-seeding or use of mats. The classes are:

5 Very High Excellent response to revegetation can be expected the first year with normally accepted practices.

4 High Good response to revegetation can be expected the first year with normally accepted practices.

3 Moderate Fair response to revegetation can be expected the first year with normal practices. More than one year may be necessary to establish a protective vegetated cover. Limitations are soil properties and/or somewhat adverse climatic conditions.

2 Low Poor response can be expected the first year by using normal revegetation practices. Limitations are coarse textures, high erosion rate, low fertility level, or adverse climatic conditions.

1 Very Low Little or no response can be expected the first year by using normal revegetation practices. Limitations are very coarse textured soils, a very high erosion rate, low fertility level, or adverse climatic conditions.

Reforestation Potential Five qualitative classes were considered for limitations for natural reforestation. Criteria considered in the developement of these classes were vegetative competition, climate, water holding capacity of the soil, evapotranspiration, soil depth, and soil drainage. The class rating and major limitations are listed in the column. The degree of stocked tree stands are defined as well (greater than 70% stocked), adequate (40 - 70% stocked), poor (10 - 40% stocked), and non-stock (less than 10% stocked). The classes are:

5 Very High Excellent response to natural reforestation can be expected within the first five years after the timber sale without site preparation. Artificial regeneration should not be necessary for a well stocked tree stand.

4 High Good response to natural reforestation to produce an adequately stocked stand can be expected within the first five years after the timber sale without site preparation. Artificial regeneration or site preparation will be necessary to produce a well stocked tree stand.

3 Moderate Fair response to natural reforestation can be expected within the first five years after the timber sale without site preparation. Artificial regeneration and site preparation will be necessary to produce an adequately stocked tree stand.

2 Low Poor natural reforestation can be expected after the timber sale. Artificial regeneration and extensive site preparation will be necessary to produce an adequately stocked tree stand.

1 Very Low Little or no natural reforestation can be expected after the timber sale. An adequate stock stand will be difficult to obtain even after site preparation and artificial regeneration.

Soil Limitation This column is included to summarize the major limiting factors for soil suitability for camp and picnic sites, paths and trails, revegetation, and reforestation.

TABLE III

SOIL SUITABILITY & LIMITATIONS

Map Symbol	Soil No.	Soil % on Landtype Ass.	Camp & Picnic Site Suitability	Path & Trail Suitability	Revegetation Pot. C & F Slopes	Reforestation Potential	Soil Limitations
OPF	S-11	70%	Good	Good	Low	Moderate	High coarse fragment content in subsoil.
	S-12	30%	Good	Good	Moderate	Moderate	-
OPN	S-3	50%	Poor	Poor	Moderate		High water table & poor drainage, flooding.
	S-9	30%	Poor	Poor	Low	Very Low	Poor drainage, flooding.
	S-2	15%	Moderate	Moderate	-	Low	Flooding, high coarse content.
	S-22	5%	Poor	Poor	-	Very Low	High water table, flooding, poor drainage, organic soils.
GM	S-15	35%	Moderate	Moderate	Moderate	Moderate	Slopes over 15%, vegetative competition.
	S-21	15%	Poor	Poor	-	_	Organic soils, poor drainage.
	S-23	15%	Poor	Poor	-	-	Organic soils, poor drainage.
	S-13	35%	Moderate	Moderate	Low	Moderate	Slope, High coarse fragment content.

TABLE III

SOIL SUITABILITY & LIMITATIONS

Map Symbol	Soil No.	Soil % on Landtype Ass.	Camp & Picnic Site Suitability	Path & Trail Suitability	Revegetation Pot. C & F Slopes	Reforestation Potential	Soil Limitations
AST	S-2	90%	Moderate	Moderate	Low	Low	Sandy soils, high coarse fragment content, flooding, high water table in places.
	S-1	10%	Moderate	Moderate	Moderate	Moderate	Sandy soils, flooding, (localized).
SD	S-9	50%	Poor	Poor	Low	-	High water table, poor drainage.
	S-8	40%	Poor	Poor	Low	Low	Sandy soils, slope.
	S-4	10%	Poor	Poor	Very Low	-	Poor drainage, sandy soils, highwater table.
UTM	S-5	80%	Poor	Moderate	Moderate	-	Poor drainage.
	S-6	10%	Poor	Poor	Low	-	Poor drainage, high water table.
	S-3	10%	Poor	Moderate	Low	-	Poor drainage, high water table.

TABLE III

SOIL SUITABILITY & LIMITATIONS

Map Symbol	Soil No.	Soil % on Landtype Ass.	Camp & Picnic Site Suitability	Path & Trail Suitability	Revegetation Pot. C & F Slopes	Reforestation Potential	Soil Limitations
BI	S-8	90%	Moderate	Poor	Low	Moderate	Sandy, subject to blowing sand.
	S-10	10%	Poor	Poor	Moderate	-	Poor drainage, flooding.
M	S-26	70%	Poor	Poor	-	-	Organic soils, poor drainage.
	S-25	30%	Poor	Poor	-	Very Low	Organic soils, poor drainage.
MSF	S-16	60%	Poor	Poor	High	Moderate	Slope (greater than 15%), vegetative competition.
	S-17	15%	-	Poor	High	Moderate	Very steep slopes (greater than 66%), vegetative competition
	S-11	10%	Good	Good	Moderate	Moderate	-
	S-22	10%	Poor	Poor	-	Very Low	Organic soil, poor drainage.
	Bedrock	5%	-	-	-	-	-

TABLE III

SOIL SUITABILITY & LIMITATIONS

Map Symbol	Soil No.	Soil % on Landtype Ass.	Camp & Picnic Site Suitability	Path & Trail Suitability	Revegetation Pot. C & F Slopes	Reforestation Potential	Soil Limitations
MUN	S-20	50%	Poor	Moderate	Low	-	Slopes over 15%, cold climate, shallow soils.
	S-19	20%	Poor	Moderate	Moderate	-	Slopes over 15%, cold climate.
	S-18	10%	Poor	Moderate	Moderate	Very Low	Slopes over 15%, cold climate, shallow soils.
	Bedrock	20%	-	-	-	-	-
ISL	S-7	50%	Poor	Moderate	Moderate	Low	Slopes over 15%, shallow soils, cold climate.
	S-20	20%	Poor	Moderate	Moderate	Low	Slopes over 15%, shallow soils, cold climate.
	S-24	20%	Poor	Poor	-	-	Organic soils, poor drainage.
	S-17	10%	Poor	Poor	Moderate	Low	Slopes over 45%, cold climate, vegetative competition.
IR	-	100%	-	-	-	-	-

APPENDIX D

Soil Profile Characteristics

This appendix gives the technical information observed in the field for soil classification and interpretation.

Soil No. The number assigned to each soil family mapped in this survey.

Soil Classification The name given to each soil pedon description according to the soil taxonomy (5).

LIST OF SOIL CLASSIFICATIONS IN SURVEY AREA

Mineral Soils

Soil Number			
1	Typic	Cryorthents,	sandy, mixed
2	Typic	Cryorthents,	sandy-skeletal, mixed
3	Typic	Cryaquents,	coarse-loamy, mixed, non-acid
4	Typic	Cryaquents,	sandy, mixed
5	Typic	Cryaquents,	fine-silty, mixed, non-acid
6	Typic	Cryaquents,	loamy-skeletal, mixed, acid
7	Lithic	Cryorthents,	coarse-loamy, mixed, acid
8	Typic	Cryopsammets,	mixed
9	Typic	Cryochrepts,	sandy, mixed
10	Dystric	Cryochrepts,	coarse-silty, mixed
11	Typic	Cryorthods,	sandy-skeletal, mixed
12	Typic	Cryorthods,	sandy, mixed
13	Typic	Cryorthods,	loamy-skeletal, mixed
15	Typic	Cryorthods,	thixotropic-skeletal, mixed
16	Typic	Cryorthods,	coarse-loamy, mixed
17	Lithic	Cryorthods,	loamy-skeletal, mixed
18	Lithic	Cryorthods,	coarse-loamy, mixed
19	Typic	Cryumbrepts,	loamy-skeletal, mixed
20	Lithic	Cryumbrepts,	coarse-loamy, mixed

Organic Soils

21	Typic	Cryofibrists
22	Typic	Cryohemists
23	Terric	Borohemists, dysic
24	Lithic	Borohemists, dysic
25	Typic	Cryosaprists
26	Sphagnic	Cryofibrists, dysic

Soil Number 1
Typic Cryorthents, sandy, mixed

These soils are mapped in the Alluvial and Stream Terrace Deposits Landtype Association. They are found on sand bars.

A1	0 - 15 cm (0 - 6")	Very dark grayish-brown (10YR3/2) sandy loam when moist; massive; soft, very friable, non-sticky, non-plastic consistency; moderately alkaline; clear, wavy boundary.
C1	15 - 100 cm (6 - 40")	Very dark grayish-brown (10YR3/2) loamy sand when moist; massive; loose, very friable, non-sticky, non-plastic consistency; moderately alkaline.

DC - SPD/MWD
MC - SM
RC - S

Soil Number 2
Typic Cryorthents, sandy-skeletal, mixed

These soils are mapped in the Alluvial and Stream Terrace Deposits Landtype Association and the Outwash Plains - Non-Forested Landtype Association. They are found in glacial river outwash sands and gravels.

O1	8 - 0 cm (3 - 0")	Undecomposed leaves, ferns and roots mixed with live moss.
A1	0 - 12 cm (0 - 5")	Dark brown (7.5YR3/2) loamy fine sand when moist; single grain; very friable, non-sticky, non-plastic consistency; neutral; clear, wavy boundary.
C1	12 - 26 cm (5 - 10")	Very dark grayish-brown (10YR3/2) medium sand when moist; single grain; loose consistency; 5 percent fine gravel; neutral; clear, wavy boundary.
IIC2	26 - 100 cm (10 - 40")	Salt and Pepper Type Sand; single grain; loose; mildly alkaline; about 60 percent gravel and 5 percent cobbles by volume.

These soils are tentatively classified with the Chenega Soil Series.

DC - MWD
MC - SM
RC - S

Soil Number 3
Typic Cryaquents, coarse-loamy, mixed, non-acid

These soils are mapped in the Uplifted Tidal Marshes Landtype Association and Outwash Plain - Non-Forested Landtype Association. They are found in low-lying lagoons and on slough levees.

O11	19 - 12 cm (8 - 5")	Living moss and sledge.
O22	12 - 0 cm (5 - 0")	Dark brown (7.5YR3/2) partially decomposed moss and sedge roots; strongly acid; gradual, smooth boundary.
C1	0 - 21 cm (0 - 8")	Dark greenish gray (5BG4/1) silt loam when moist; massive; friable, slightly sticky, non-plastic consistency; strongly acid; gradual, wavy boundary; contains about 30 percent sedge roots.
C2	21 - 45 cm (8 - 18")	Dark greenish gray (5BG4/1) fine sandy loam when moist; massive; friable, slightly sticky, non-plastic consistency; medium acid; gradual, wavy boundary; contains about 15 percent sedge roots.
C3	(45 - 75 cm) (18 - 30")	Dark gray (5Y4/1) fine sandy loam when moist; massive; friable, slightly sticky, non-plastic consistency; medium acid.
IIC4	75 - 100 cm (30 - 40")	Gray (5Y4/1) gravel

These soils are tentatively classified with the Moose River Soil Series.

DC MWD / WD
MC M
RC VS

Soil Number 4
Typic Cryaquents, sandy, mixed

These soils are mapped in the Sand Dunes and Aeolian Deposits Landtype Association. They are found in frequently ponded, low-lying areas between sand dunes.

C1	0 - 10 cm (0 - 4")	Very dark gray (10YR3/1) sand when moist; single grain; loose consistency; neutral; gradual, wavy boundary.
C2	10 - 18 cm (4 - 7")	Very dark gray (10YR3/1) sand when moist; single grain; loose consistency; neutral; gradual, wavy boundary.
C3	18 - 100 cm (7 - 40")	Very dark gray (10YR3/1) salt and pepper sand when moist; single grain; loose consistency; neutral.

These soils are tentatively classified with the Stave Series.

DC MWD
MC M
RC VS

Soil Number 5
Typic Cryaquents, fine-silty, mixed, non-acid

These soils are mapped in the Uplifted Tidal Marshes Landtype Association. They are found in low-lying lagoons.

O1	10 - 0 cm (4 - 0")	Living moss and sedge roots.
A11	0 - 10 cm (0 - 4")	Dark gray (10YR4/1) fine sandy loam when moist; single grain; friable, non-sticky, non-plastic consistency; very strongly acid; clear, wavy boundary.
A12	10 - 21 cm (4 - 8")	Dark gray (10YR4/1) fine sandy loam when moist; few, fine, faint mottles of dark yellowish-brown (10YR4/4) color when moist; friable, non-sticky, non-plastic consistency; very strongly acid; clear, wavy boundary.
B21g	21 - 62 cm (8 - 24")	Dark gray (10YR4/1) silt loam when moist; few, fine, faint mottles of dark yellowish-brown color when moist; massive; firm, non-sticky, non-plastic consistency; strongly acid; gradual, wavy boundary.
B22g	62 - 100 cm (24 - 40")	Dark gray (N4/) silt loam when moist; dark brown (7.5YR4/4) mottles when moist; massive; firm, non-sticky, non-plastic consistency; strongly acid.

These soils are tentatively classified with the Eyak Soil Series.

DC SPD
MC M
RC S

Soil Number 6
Typic Cryaquents, loamy-skeletal, mixed, acid

These soils are mapped in the Uplifted Tidal Marshes Landtype Association. They are found in old, abandoned stream channels.

O1	3 - 0 cm (1 - 0")	Living moss and sedges.
A1	0 - 15 cm (0 - 6")	Very dark gray (5YR3/1) fine sandy loam when moist; many, medium, distinct, dark reddish-brown (5YR3/3) mottles when moist; weak, fine granular structure; firm, non-sticky, non-plastic consistency; extremely acid; clear, wavy boundary.
IIB21g	15 - 23 cm (6 - 9")	Dark brown (7.5 YR4/2) sandy loam when moist; few, medium, faint, dark reddish-brown (5YR3/3) mottles when moist; single grain; 60 percent fine gravel; very strongly acid; clear, wavy boundary.
IIIC1g	23 - 40 cm (9 - 16")	Very dark gray (5YR3/1) silty clay loam when moist; few, medium, fine dark reddish-brown (5YR3/3) mottles when moist; massive; firm, sticky, plastic consistency; very strongly acid; clear, wavy boundary.
VIC2g	40 - 80 cm (16 - 32")	Variable from yellowish-red to dark reddish-brown (5YR4/6-3/2) loam when moist; 50 to 80 percent gravel; very strongly acid; abrupt, smooth boundary.
VC3g	80 - 100 cm (32 - 40")	Dark gray (5YR4/1) silty clay loam when moist; massive; very firm, sticky, plastic consistency; 5 percent gravel; very strongly acid.

DC SAD
MC M
RC S

Soil Number 7
Lithic Cryorthents, coarse-loamy, mixed, acid

These soils are mapped in the Ice Scoured Lands Landtype Association. They are found on spruce-hemlock covered hillsides.

O11	20 - 14 cm (8 - 6")	Living moss.
O12	14 - 8cm (6 - 3")	Very dusky-red (2.5YR2/3) organic mat composed of 30 percent fiber when rubbed; extremely acid.
O2	8 - 0 cm (3 - 0")	Dark reddish-brown (5YR2/2) organic matter composed of 5 percent fiber when rubbed; extremely acid; clear, wavy boundary.
C1	0 - 27 cm (0 - 11")	Dark grayish-brown (10YR4/2) fine sandy loam when moist; weak, medium subangular blocky structure; friable, non-sticky, non-plastic consistency; very strongly acid; abrupt, irregular boundary.
R	27 cm + (11" +)	Weathered Argillite and slate.

DC MWD
MC M
RC S

Soil Number 8
Typic Cryopsamments, mixed

These soils are mapped in the Sand Dunes and Barrier Islands and Spits Landtype Associations. They are found on sand beaches, bars, and dunes.

A	0 - 13 cm (0 - 5")	Very dark grayish-brown (10YR3/2) sand when moist; single grain; loose consistency; mildly alkaline; clear, wavy boundary.
B	13 - 33 cm (5 - 13")	Very dark gray (10YR3/1) loamy sand when moist; single grain; soft, very friable, non-sticky, non-plastic consistency; moderately alkaline; clear, wavy boundary.
C	33 - 100 cm (13 - 40")	Dark brown (7.5YR3/2) sand when moist; single grain; loose consistency; moderately alkaline.

These soils are tentatively classified with the Kunayosh Series.

DC SPD
MC SM
RC M

Soil Number 9
Typic Cryochrepts, sandy, mixed

These soils are mapped in the Outwash Plains - Non-Forested and Sand Dunes Landtype Associations. They are found on river levees and sandy plains.

O1	3 - 0 cm (1 - 0")	Living moss and roots.
A2	0 - 8 cm (0 - 3")	Dark brown (7.5YR3/2) sandy loam when moist; few, fine, faint dark brown (7.5YR4/4) mottles when moist; weak, fine subangular block structure; soft, very friable, non-sticky, non-plastic consistency; medium acid; clear, wavy boundary.
B22	8 - 25 cm (3 - 10")	Very dark gray (5YR3/1) sandy loam when moist; few, fine, faint, dark brown (7.5YR4/4) mottles when moist; weak, fine subangular blocky structure; soft, very friable, non-sticky, non-plastic consistency; medium adic; clear, wavy boundary.
B23	25 - 53 cm (10 - 21")	Dark reddish-brown (5YR3/2) loamy sand when moist; common, medium, faint, dark brown (7.5YR4/4) mottles when moist; weak, medium subangular blocky structure; soft, very friable, non-sticky, non-plastic consistency; medium acid; clear, wavy boundary.
C1	53 - 100 cm (21 - 40")	Dark gray (5YR4/1) loamy sand when moist; many, large, distinct dark brown (7.5YR4/4) mottles when moist; single grain; loose consistency; slightly acid.

DC MWD
MC M
RC M

Soil Number 10
Dystric Cryochrepts, coarse-silty, mixed

These soils are mapped in the Barrier Island and Spits Landtype Association. They are found in the lagoonal areas inland from the beaches.

O1	6 - 0 cm (15 - 0")	Living moss and sedge roots.
A	0 - 11 cm (0 - 4")	Dark grayish-brown (10YR4/2) silt loam when moist; single grain; friable, non-sticky, non-plastic consistency; very strongly acid; gradual, smooth boundary; about 15 percent of the soil by volume is organic matter.
B	11 - 25 cm (4 - 10")	Dark brown (7.5YR4/2) silt loam when moist; massive; friable, slightly sticky, non-plastic consistency; very strongly acid; gradual, smooth boundary.
C	25 - 100 cm (10 - 40")	Dark gray (5YR4/1) fine sandy loam when moist; massive; friable, non-sticky, non-plastic consistency; neutral.

DC ≤PD
MC M
RC S

Soil Number 11
Typic Cryorthods, sandy-skeletal, mixed

These soils are mapped in the Mountain Sideslopes - Forested and Outwash Plains - Forested Landtype Associations. They are found on outwash gravel plains with a dense spruce-hemlock tree cover.

O1	4 - 0 cm (2 - 0")	Living moss and roots.
A2	0 - 2 cm (0 - 1")	Dark reddish-brown (5YR3/2) fine sandy loam when moist; moderate, medium subangular blocky structure; very friable, non-sticky, non-plastic consistency; extremely acid; abrupt, smooth boundary.
B21ir	2 - 6 cm (1 - 2")	Dusky red (2.5YR3/2) fine sandy loam when moist; weak, medium subangular blocky structure; friable, non-sticky, non-plastic consistency; very strongly acid; clear, smooth boundary.
B22	6 - 13 cm (2 - 5")	Dark reddish-brown (5YR3/3) fine sandy loam when moist; weak, medium subangular blocky structure; friable, slightly sticky, non-plastic consistency; strongly acid; clear, smooth boundary.
IIC1	13 - 48 cm (5 - 19")	Dark reddish-brown (5YR3/2) loamy sand when moist; loose consistency; 80 percent fine gravel; medium acid; gradual, wavy boundary.
IIC2	48 - 100 cm (19 - 40")	Dark reddish-brown (5YR3/3) loamy sand when moist; loose consistency; 40 percent fine gravel; medium acid; abrupt, smooth boundary.

These soils are tentatively classified with the Nikishka Soils Series.

DC MWD
MC M
RC M

Soil Number 12
Typic Cryorthods, sandy, mixed

These soils are mapped in the Outwash Plains - Forested Landtype Association. They are found on outwash plains with a medium density spruce tree cover.

O1	4 - 0 cm (2 - 0")	Living moss.
A2	0 - 5 cm (0 - 2")	Dark brown (7.5YR4/2) fine sandy loam when moist; weak, fine, subangular blocky structure; friable, non-sticky, non-plastic consistency; abrupt, smooth boundary.
B21ir	5 - 10 cm (2 - 4")	Dark reddish-brown (5YR3/4) fine sandy loam when moist; single grain; friable, non-sticky, non-plastic consistency; gradual, smooth boundary.
B22	10 - 21 cm (4 - 8")	Very dark grayish-brown (10YR3/2) loamy sand when moist; single grain; loose consistency; gradual, smooth boundary.
C1	21 cm + (8" +)	Very dark grayish-brown (10YR3/2) sand when moist; single grain; loose consistency.

These soils are tentatively classified with the Tawak Soil Series.

DC MWD
MC M
RC M

Soil Number 13
Typic Cryorthods, loamy-skeletal, mixed

These soils are mapped in the Undifferentiated Glacial Moraines Landtype Association. They are found on tree-covered hillsides and flats.

O1	8 - 0 cm (3 - 0")	Living moss and roots.
A2	0 - 12 cm (0 - 5")	Dark brown (7.5YR3/2) loam when moist; weak, medium subangular blocky structure; friable, non-sticky, non-plastic consistency; 35 percent gravel; very strongly acid; clear, wavy boundary.
B12ir	12 - 20 cm (5 - 8")	Dark reddish-brown (5YR2.5/2) sandy loam when moist; single grain; very friable, non-sticky, non-plastic consistency; 60 percent gravel; strongly acid; gradual, wavy boundary.
B21	20 - 35 cm (8 - 14")	Dark reddish-brown (5YR2.5/2) loamy sand when moist; single grain; very friable, non-sticky, non-plastic consistency; 80 percent gravel; strongly acid; gradual, wavy boundary.
B22	35 - 40 cm (14 - 16")	Dark brown (7.5YR3/2) sandy loam when moist; single grain; very friable, non-sticky, non-plastic consistency; 40 percent gravel; strongly acid; clear, wavy boundary; somewhat thixotropic.
C1	40 - 55 cm 16 - 22")	Dark reddish-brown (5YR2.5/2) sand when moist; single grain; loose consistency; 95 percent gravel; gradual, wavy boundary.
C2	55 - 100 cm (22 - 70")	Gravel.

DC WD
MC M
RC R

Soil Number 15
Typic Cryorthods, thixotropic-skeletal, mixed

These soils are mapped in the Undifferentiated Glacial Moraines Landtype Association. They are found on the glacial outwash plains covered by morainal drift.

O1	7 - 3 cm (3 - 1")	Living moss and roots.
O2	3 - 0 cm (1 - 0")	Dark reddish-brown (5YR2.5/2) decomposed organic material; abrupt, smooth boundary.
A1	0 - 4 cm (0 - 2")	Dark reddish-brown (5YR2.5/2) silt loam when moist; weak, fine granular structure; friable, non-sticky, non-plastic consistency; clear, wavy boundary.
A2	4 - 8 cm (2 - 3")	Dark brown (7.5 YR3/2) silt loam when moist; weak, fine subangular blocky structure; friable, non-sticky, non-plastic consistency; less than 5 percent gravel; clear, wavy boundary.
B21ir	8 - 12 cm (3 - 5")	Dark reddish-brown (5YR3/2) loam when moist; massive; friable, slightly sticky, non-plastic consistency; 15-20 percent fine gravel; clear, wavy boundary.
IIB22	12 - 42 cm (5 - 17")	Dark brown (7.5YR3/2) loam when moist; massive; friable, slightly sticky, non-plastic consistency; 35 percent gravel, 25 percent carbonate.
IIC1	42 - 100 cm (17 - 40")	Dark brown (7.5YR3/2) sandy loam when moist; single grain; 50 percent gravel and cobbles.

These soils are tentatively classified with the Kniklik Soil Series.

DC WD
MC M
RC R/M

Soil Number 16
Typic Cryorthods, coarse-loamy, mixed

These soils are mapped in the Mountain Sideslopes - Forested Landtype Association. They are found on moderate to gentle sideslopes.

O1	12 - 8 cm (5 - 3")	Living moss and roots.
O2	8 - 0 cm (3 - 0")	Dark reddish-brown (5YR3/2) decomposed organic material.
A2	0 - 6 cm (0 - 2")	Dark brown (7.5YR4/2) fine sandy loam when moist; weak, fine granular structure; friable, sticky, plastic consistency; clear, irregular boundary.
B21ir	6 - 10 cm (2 - 4")	Dark reddish-brown (5YR3/3) silt loam when moist; weak, medium subangular blocky structure; very friable, slightly sticky, slightly plastic consistency; clear, irregular boundary.
B22	10 - 94 cm (4 - 37")	Strong brown (7.5YR4/5) silt loam when moist; weak, fine subangular blocky structure; friable, sticky, slightly plastic consistency; 15 percent gravel; gradual, wavy boundary.
IIB23	94 cm + (37" +)	Strong brown (7.5YR4/5) silt loam when moist; weak, fine subangular blocky structure; friable, slightly sticky, slightly plastic consistency; 20 percent gravel, 20 percent cobble.

These soils are similar to the Naptowne Soils Series but the overlying loose cover is deeper than 30 inches.

DC SED /WD
MC M /sm
RC M/R

Soil Number 17
Lithic Cryorthods, loamy-skeletal, mixed

These soils are mapped in the Mountain Sideslopes - Forested and the Ice Scoured Lands Landtype Associations. They are found on hillsides that are usually over 45 percent gradient.

O1	5 - 0 cm (2 - 0")	Living moss.
A2	0 - 4 cm (0 - 2")	Very dusky red (2.5YR2/2) silt loam when moist; weak, fine granular structure; very friable, non-sticky, non-plastic consistency; 15 percent gravel; very strongly acid; clear, wavy boundary. Contains a variable amount of decomposed organic matter.
B21ir	4 - 10 cm (2 - 4")	Dark reddish-brown (5YR3/2) loam when moist; weak, fine granular structure; very friable, non-sticky, non-plastic consistency; 30 percent gravel; very strongly acid; clear, wavy boundary.
B22	10 - 23 cm (4 - 9")	Dark brown (7.5YR3/4) loam when moist; weak, fine subangular blocky structure; very friable, non-sticky, non-plastic consistency; 40 percent gravel; very strongly acid; gradual, wavy boundary.
B3	23 - 34 cm (9 - 13")	Very dark grayish-brown (10YR3/2) sandy loam when moist; weak, fine subangular blocky structure; very friable, non-sticky, non-plastic consistency; 80 percent gravel; very strongly acid; abrupt, irregular boundary.
R	34 cm + (13" +)	Sandstone.

DC SED
MC M
RC S

Soil Number 18
Lithic Cryorthods, coarse-loamy, mixed

These soils are mapped in the Mountain Uplands - Non-Forested Landtype Association. They are found on open mountain sideslopes in the alpine regions.

O1	1 - 0 cm (1/2 - 0")	Living moss and roots.
A2	0 - 7 cm (0 - 3")	Dark reddish-brown (5YR3/2) loam when moist; weak, fine granular structure; friable, non-sticky, non-plastic consistency; very strongly acid; clear, wavy boundary.
B22	7 - 14 cm (3 - 6")	Reddish-brown (5YR4/4) loam when moist; weak, fine granular structure; friable, slightly sticky, slightly plastic consistency; 5 percent gravel; very strongly acid; clear, wavy boundary.
B23	14 - 22 cm (6 - 9")	Dusky-red (2.5YR3/2) loam when moist; weak, fine granular structure; friable, non-sticky, non-plastic consistency; 5 percent gravel; very strongly acid; gradual, wavy boundary.
B3	22 - 46 cm (9 - 18")	Dark reddish-brown (5YR3/3) loam when moist; single grain; very friable consistency; 25 percent gravel; strongly acid; abrupt, irregular boundary.
R	46 cm + (18" +)	Rhyolite.

DC WD
MC M
RC M/S

Soil Number 19
Typic Cryumbrepts, loamy-skeletal, mixed

These soils are mapped in the Mountain Uplands - Non-Forested Landtype Association. They are usually found on grass and brush covered side-slopes.

A1	0 - 12 cm (0 - 5")	Dark brown (7.5YR3/2) loam when moist; weak, fine granular structure; friable, non-sticky, non-plastic consistency; 10 percent gravel and cobbles; very strongly acid; gradual, wavy boundary.
B22	12 - 42 cm (5 - 16")	Dark brown (7.5YR3/2) loam when moist; weak, fine granular structure; friable, non-sticky, non-plastic consistency; 15 percent gravel and cobbles; strongly acid; gradual, wavy boundary.
B23	42 - 70 cm (16 - 28")	Dark brown (7.5YR4/4) loam when moist; weak, fine granular structure; friable, non-sticky, non-plastic consistency; 25 percent gravel, 15 percent cobble; medium acid; abrupt, irregular boundary.
R	70 cm + (28" +)	Sandstone.

DC WD
MC M
RC M/S

Soil Number 20
Lithic Cryumbrepts, coarse-loamy, mixed

These soils are mapped in the Ice Scoured Lands and the Mountain Uplands - Non-Forested Landtype Associations. They are usually found on sideslopes with a grass and some Alaskan Hemlock vegetation.

O1	6 - 0 cm (2 - 0")	Living moss and roots.
A1	0 - 6 cm (0 - 2")	Dark reddish-brown (5YR2/2) silt loam when moist; weak, fine granular structure; friable, non-sticky, non-plastic consistency; very strongly acid; clear, wavy boundary.
A2	6 - 10 cm (2 - 4")	Dark reddish-brown (5YR3/2) silt loam when moist; weak, fine subangular blocky structure; friable, slightly sticky, slightly plastic consistency; very strongly acid; clear, wavy boundary.
B2	10 - 16 cm (4 - 6")	Dark reddish-gray (5YR4/2) loam when moist; weak, fine subangular blocky structure; friable, slightly sticky, slightly plastic consistency; very strongly acid; abrupt, irregular boundary.
R	16 cm + (6" +)	Sandstone.

DC MWP

MC M

RC M/S

Soil Number 21
Typic Cryofibrists

These soils are mapped in the Undifferentiated Glacial Moraines Landtype Association. They are usually found in the low-lying moss-sedge muskegs.

Oi1	0 - 6 cm (0 - 2")	Living moss and sedge roots.
Oi2	6 - 23 cm (2 - 9")	Yellowish-red (5YR4/6) color; about 95 percent fiber unrubbed and 90 percent rubbed; very strongly acid; clear, smooth boundary.
Oi3	23 - 46 cm (9 - 18")	Reddish-brown (5YR4/3) unrubbed and dark reddish-brown (5YR3/2) rubbed organic fiber; about 85 percent fiber unrubbed and 70 percent fiber rubbed; very strongly acid; difuse, smooth boundary.
Oi4	46 cm + (18" +)	Dark reddish-brown (5YR3/3) color; about 75 percent fiber unrubbed and 70 percent fiber rubbed; very strongly acid.

DC SPD/PD
MC M/W
RC S/VS

Soil Number 22
Typic Cryohemists

These soils are mapped in the Mountain Sideslopes Landtype Association. They are usually found in muskegs on slopes of less than 5 percent gradient.

Oi1	0 - 5 cm (0 - 2")	Living moss and roots.
Oi2	5 - 23 cm (2 - 9")	Dark reddish-brown (5YR2/2) color; about 100 percent fiber unrubbed and 80 percent fiber rubbed; very strongly acid; abrupt, smooth boundary.
Oa1	23 - 46 cm (9 - 22")	Black (5YR2/1) unrubbed and dark reddish-brown (5YR2/2) rubbed and pressed; about 80 percent fiber unrubbed and 10 percent fiber rubbed; very strongly acid; gradual, smooth boundary.
Oe1	56 - 94 cm (22 - 37")	Reddish-brown (2.5YR4/4) unrubbed and dusky-red (2.5YR3/2) rubbed and pressed; about 90 percent fiber unrubbed and 35 percent fiber rubbed; medium acid.

DC SPO
MC m/w
RC S

Soil Number 23
Terric Borohemists, dysic

These soils are mapped in the Undifferentiated Glacial Moraines Landtype Association. They are found in muskegs on hillslopes steeper than 21 percent gradient.

Oi1	0 - 12 cm (0 - 5")	Living moss and sedge roots.
Oi2	12 - 27 cm (5 - 11")	Dark reddish-brown (5YR3/4) color; about 80 percent fiber unrubbed and 70 percent fiber rubbed; very strongly acid; gradual, smooth boundary.
Oe1	27 - 61 cm (11 - 24")	Dusky-red (2.5YR3/2) color; about 50 percent fiber unrubbed and 20 percent fiber rubbed; very strongly acid; gradual, smooth boundary.
Oe2	61 - 100 cm (24 - 40")	Dusky-red (2.5YR3/2) color; about 50 percent fiber unrubbed and 20 percent fiber rubbed; very strongly acid; clear, wavy boundary.
IIC1	100 cm + (40" +)	Dark brown (7.5YR3/2) loam when moist; massive; friable, non-sticky, non-plastic consistency; 25 percent gravel and cobbles; strongly acid.

These soils correlate closely to the Doroshin Soil Series but the organic material is deeper than 27 inches.

DC SPD/PD
MC M/W
RC S/VS

91,94

Soil Number 24
Lithic Borohemists, dysic

These soils are mapped in the Ice Scoured Lands Landtype Association. They are usually found in muskegs on hillsides of slopes of less than 21 percent gradient.

Oi1	0 - 3 cm (0 - 1")	Living moss and sedge.
Oi2	3 - 12 cm (1 - 5")	Dark reddish-brown (5YR3/2) color; about 90 percent fiber unrubbed and 75 percent rubbed; some small mineral lenses; very strongly acid; gradual, wavy boundary.
Oe1	12 - 38 cm (5 - 15")	Dusky-red (2.5YR3/3) color; about 80 percent fiber unrubbed and 40 percent fiber rubbed; some small mineral lenses (less than 5 percent); very strongly acid; gradual, wavy boundary.
Oe2	38 - 100 cm (15 - 40")	Very dusky-red (2.5YR2/2) color; about 40 percent fiber unrubbed and 20 percent fiber rubbed; 5-10 percent small lenses and mixed mineral material; very strongly acid.

DC PD
MC M/W
RC VS

Soil Number 25
Typic Cryosaprists

These soils are mapped in the Muskeg Landtype Association. They are usually found in open areas of willow, sedge, moss, and bluegrass cover.

Oi1	0 - 8 cm (0 - 3")	Living moss, sedge, and plant roots.
Oe1	8 - 13 cm (3 - 5")	Dusky-red (2.5YR3/2) color; about 40 percent fiber unrubbed and 15 percent fiber rubbed; very strongly acid; clear, smooth boundary.
Oa1	13 - 70 cm (5 - 28")	Dark brown (10YR3/3) color; about 40 percent fiber unrubbed and 10 percent rubbed; very strongly acid; difuse, wavy boundary.
Oa2	70 - 100 cm (28 - 40")	Dusky-red (2.5YR3/2) color; about 10 percent fiber unrubbed and 0 percent fiber rubbed; very strongly acid.

DC PD/VPD
MC W
RC VS/P

Soil Number 26
Sphagnic Cryofibrists, dysic

These soils are mapped in the Muskeg Landtype Association. They are usually found in sphagnum moss with some bog buckbean.

Kogish Series

The Kogish series comprises Sphagnic Cryofibrists (family criteria are not yet established). This classification is tentative. These soils have surface layers of extremely acid sphagnum moss over many feet of layered fibrous moss and sedge peat. They are seldom frozen.

Typifying Pedon: Kogish peat - muskeg
(Colors are for wet condition)

Oi1	0 - 8 cm (0 - 3")	Living mosses and sedges, with some twigs and leaves.
Oi2	8 - 15 cm (3 - 6")	Very dusky red (2.5YR2/2) to dark reddish brown (5YR3/3, squeezed dry) moss peat; fibrous; slightly decomposed organic matter; many fine, and common medium matted roots; extremely acid (pH 3.6); clear, wavy boundary.
Oi3	15 - 31 cm (6 - 12")	Very dusky red (2.5YR2/2) to dark reddish brown (2.5YR2/4), squeezed dry) fibrous moss peat; slightly decomposed remains of sedges, forbs, and shrubs; many fine, and common medium roots; extremely acid (pH 3.6); clear, smooth boundary.
Oi4	31 - 56 cm (12 - 22")	Brown (10YR4/3) to light yellowish-brown (10YR6/4, squeezed dry) with finely layered fibrous moss peat; dark brown (7.5YR3/2) stains; slightly decomposed remains of sedges, forbs, and shrubs; common fine, and few medium roots; extremely acid (pH 3.4); gradual, smooth boundary.
Oe1	56 - 117 cm (22 - 46")	Yellowish-brown (10YR5/6) to very pale brown (10YR7/4, squeezed dry) peat; slightly decomposed organic matter consisting mainly of mosses with some sedges, forbs, and shrubs; common fine roots; extremely acid (pH 3.6); clear, smooth boundary.
Oe2	117 - 198 cm (46 - 78")	Very dark brown (10YR2/2) to dark yellowish-brown (10YR3/4, squeezed dry) peat; slightly to moderately decomposed organic matter derived from mosses, sedges, forbs, and shrubs; extremely acid (pH 3.8); clear, smooth boundary.

Oa1	198 - 213 cm (78 - 84")	Very dark brown (10YR2/2, wet and squeezed dry) peat with a slightly silty feel; few small woody remains; extremely acid (pH 3.8).

Due to the lack of a field pedon description the modal description for the Kogish Series was used.

DC VPD
MC W
RC P

APPENDIX E

Precipitation, Temperature and Runoff Data

Table 1

Cape St. Elias PRECIPITATION

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1944	6.96	5.34	5.44	6.21		2.98	10.13	12.01	13.74	12.97	10.22	9.35	
1945	14.96	11.11	6.13	5.41	4.88	3.37	5.97	16.92	14.73	16.20	11.93	11.61	123.22
1946	7.72	9.48	5.40	5.42	3.36	1.46	3.62	9.49	5.67	13.03	7.91		
1947	3.96	7.85	6.27	6.12	8.93	4.23	5.18	5.07	14.45	11.27	17.53	11.13	101.99
1948	14.41	7.27	5.90	.21	2.34	5.28	8.32	4.20	10.44	19.20	8.68	12.54	99.19
1949	19.75	8.13	9.50	4.38	5.26	6.07	5.39	3.52	10.17	9.31	6.55	7.42	95.45
1950	2.57	8.23	4.70	7.48	9.50	8.80	3.42	5.05	9.13	8.13	2.72	8.49	78.22
1951	9.38	6.61	6.44	5.04	2.65	6.41	4.42	9.02	17.88	10.00	13.92	6.31	97.45
1952	8.16	6.10	4.50	5.31	2.30	2.10	3.36	3.48	1.82	14.06	16.78	13.48	81.45
1953	7.97	10.99	1.98	2.61	5.51	2.24	2.21	17.04	17.02	15.50	7.63	10.36	101.06
1954	9.17	6.19	7.30	1.82	3.06	1.70	5.45	10.97	10.60	17.50	9.35	6.59	89.70
1955	12.79	7.57	10.02	4.62	6.34	6.14	8.04	11.35	6.01	8.37		11.15	
1956	9.18	5.89	7.51	6.99	11.41	1.88	3.98	11.38		8.49	21.55	5.96	
1957	4.61	5.51	4.29	3.75	2.82	1.06	3.88	11.68	20.29	12.06	15.92	11.25	97.12
1958	12.06	5.77	3.99	5.46	10.44	5.95	25.88	14.97	13.38	16.53	17.29	10.22	141.94
1959	8.91	6.51	5.94	10.39	7.39	1.67	15.03	5.63	11.92	11.19	7.59	7.66	93.16
1960	3.74	2.37	4.14	1.69	3.19	4.70	11.68	9.30	18.48	8.16	5.54	13.65	86.64
1961	5.22	3.04	4.64	3.63	7.70	3.94	9.93	11.42	16.80	16.39	10.00	8.35	101.06
1962	11.38	5.16	5.34	7.39	7.33	10.89	9.10	3.87	3.92	4.23	1.04	5.95	75.60
1963	11.81	9.48	8.76	7.37	8.22	5.00	8.70	4.55	12.43	12.20	7.55	16.49	112.06
1964	9.52	15.14	5.48	8.54	7.32	5.38	6.05	12.63	9.68	14.24	11.89	4.71	110.58
1965	8.11	2.09	12.76	8.78	8.88	7.99	6.53	6.78	13.78	15.96	6.41	11.23	109.23
1966	6.07	5.50	9.80	5.57	9.37	1.50	4.27	12.19	18.07	14.57	9.03	10.07	106.01
1967	6.16	7.09	8.86	4.62	2.67	5.04	6.77	16.04	20.19	8.99	16.23	17.62	120.28
1968	6.48	18.74	7.39	9.53	5.43	2.77	4.13	2.59	11.32	13.74	10.23	3.16	95.56
1969	2.11	4.77	9.46	4.87	8.19	2.23	7.95	4.00	8.17	15.60	11.04	19.67	98.06
1970	5.27	10.47	10.89	10.25	2.99	4.46	7.61	12.47	7.60	8.56	3.79	8.40	92.77
1971	6.02	10.48	7.48	11.18	11.67	3.64	12.30	11.22	12.56	18.90	8.74	9.79	123.98
1972	3.40	4.50	1.65	3.93	.45	T	.76	4.55	13.07	18.10	9.89	3.81	64.11
1973	6.24	5.89	9.73	11.10	5.63	5.40	6.89	10.84	7.33	9.13	1.33	4.34	83.85
1974	3.20	4.85	1.85	1.77	.67	1.15	2.53						
AVE.	8.02	7.67	6.89	6.15	5.63	4.32	7.09	9.30	12.32	13.00	10.39	10.06	101.10

Table 2

Cordova - Mile 13

PRECIPITATION

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1945	10.02	9.16	3.83	1.16	6.15	3.23	3.52	13.03	10.67	17.13	2.38	5.16	85.45
1946	4.83	8.01	5.39	5.54	8.63	1.51	3.02	11.12	5.03	12.12	6.27	5.95	77.42
1947	5.63	3.05	10.57	4.03	7.64	4.69	5.30	9.24	22.77	6.33	15.17	8.38	102.80
1948	12.19	2.83	2.04	.08	4.14	5.59	9.69	4.29	20.26	24.07	9.02	3.32	97.52
1949	14.21	2.56	9.58	5.41	5.57	6.95	4.47	5.54	22.19	13.51	12.12	4.14	105.25
1950	.72	1.07	1.98	4.65	9.92	9.47	4.91	4.54	17.09	5.82	1.75	4.85	66.77
1951	6.55	3.27	3.87	7.72	5.86	5.79	3.47	6.27	27.72	9.81	13.00	5.56	98.89
1952	2.95	4.65	4.05	8.71	4.80	3.33	17.78	5.50	8.59	26.63	21.13	9.19	117.31
1953	2.35	13.22	2.00	5.46	3.97	1.44	3.74	14.33	13.59	15.39	3.65	12.51	91.65
1954	5.48	7.11	3.86	.28	2.49	1.67	7.82	8.13	9.76	18.79	12.71	5.25	83.35
1955	10.48	5.51	4.75	3.55	3.19	4.30	5.93	9.35	4.32	6.45	1.46	10.77	70.06
1956	3.92	4.65	3.99	7.99	9.61	1.76	4.07	9.48	8.81	6.15	15.57	2.69	78.69
1957	3.92	3.76	1.26	1.53	1.91	.69	4.12	6.57	16.50	11.97	12.16	6.38	70.77
1958	9.31	2.78	1.67	1.29	7.35	5.74	16.36	11.05	6.68	8.29	6.13	4.62	80.77
1959	1.52	3.78	3.29	7.10	4.56	.80	14.33	6.36	7.93	15.08	8.82	9.12	82.69
1960	7.97	5.80	5.02	4.05	2.59	2.40	9.10	7.98	19.40	7.90	2.99	13.63	88.83
1961	7.59	4.02	4.37	4.18	9.49	7.52	6.13	15.43	13.51	8.54	9.96	4.86	95.60
1962	6.88	2.72	5.75	2.76	5.16	7.36	3.96	4.85	12.45	12.58	7.58	5.42	77.47
1963	8.13	8.46	10.32	7.30	6.66	7.28	9.17	7.50	7.57	10.44	2.00	8.37	93.20
1964	4.74	18.97	3.33	4.97	5.45	7.30	5.03	9.59	6.94	13.37	11.10	5.41	96.20
1965	3.54	3.33	11.25	8.34	10.85	9.68	5.83	7.35	14.18	16.61	1.46	1.87	94.29
1966	.64	3.41	8.95	2.96	8.86	2.15	4.61	18.31	23.03	11.67	7.25	6.16	98.00
1967	3.87	3.82	.80	2.71	3.13	5.61	5.86	11.48	24.28	7.39	14.40	9.73	93.08
1968	3.53	18.37	6.10	7.53	7.20	5.56	4.39	2.57	11.59	10.25	6.90	4.60	88.64
1969	1.61	3.63	6.84	2.96	7.20	2.00	6.18	3.22	5.91	15.69	8.58	18.67	82.49
1970	3.53	11.59	12.41	11.63	3.42	7.20	6.41	12.46	9.36	10.18	2.83	7.49	98.51
1971	3.89	8.94	4.03	12.17	13.56	7.55	10.71	10.69	7.59	13.40	8.24	5.29	106.06
1972	3.45	3.14	10.77	4.60	5.48	3.61	1.71	8.47	15.45	14.32	5.96	3.35	80.31
1973	3.65	5.23	7.55	6.46	6.62	6.23	6.25	8.72	6.87	5.73	1.72	6.89	72.01
1974	1.36	5.89	3.13	7.91	2.11	2.89	3.80	3.74	12.55	16.52	11.73	10.92	82.55
1975	4.28	6.22	2.57	8.00	4.31	6.93	6.86	3.52	17.15	7.85	2.11	9.60	79.40
1976	7.49	5.07	5.95	8.40	7.04	4.55	1.73	6.39	22.00	16.28	30.59	10.95	126.58
1977	12.46	11.69	3.87	8.53	4.53								
AVE.	5.76	5.63	5.20	5.36	6.13	4.45	6.33	8.73	13.57	11.73	8.22	7.54	88.65

Table 3

Cape St. Elias

TEMPERATURE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVERAGE
Ave. (14 yr) 1938-1952	33.5	33.0	35.4	39.3	45.3	51.1	55.1	55.6	52.1	45.3	37.9	34.5	43.2
Ave. (7 yr) 1954-1960	32.7	33.3	34.0	38.7	44.4	50.4	53.8	54.3	50.8	43.3	38.2	34.0	42.3
1961	38.2	35.4	36.5	40.5	47.3	52.8	54.9	55.5	51.7	42.3	36.4	28.8	43.4
1962	32.1	32.8	30.9	38.3	43.1	48.4	54.3	58.4	52.7	44.7	39.5	32.2	42.3
1963	35.5	38.4	35.1	37.4	46.6	49.8	55.1	56.7	53.3	45.9	32.4	38.9	43.7
1964	34.5	34.7	31.8	38.2	43.2	51.4	54.2	54.4	51.6	42.9	34.9	23.6	41.3
1965	29.2	28.0	34.2	38.0	41.0	45.5	50.5	52.6	50.6	41.9	35.9	31.7	39.9
1966	29.7	32.7	31.0	39.8	42.5	50.6	53.0	52.8	51.0	41.6	34.2	33.4	41.0
1967	31.4	34.4	32.6	38.8	46.1	49.8	53.0	54.4	50.7	43.2	38.0	34.6	42.3
1968	28.0	34.3	34.9	37.5	45.9	51.1	56.7	56.6	40.6	42.6	39.1	31.9	42.4
1969	23.7	32.7	35.5	40.3	42.7	50.3	54.3	52.8	50.8		38.2	40.5	
1970	31.1	39.5	38.9	38.7	44.4	49.2	51.8	51.6	48.8		37.9	30.5	
1971	24.0	32.0	30.4	36.7	40.1	46.6	51.7	53.9	50.7	42.8	36.6	30.9	39.7
1972		29.1	30.0	35.0	42.0	47.9	56.8	54.5	49.5	42.4	38.0	33.1	
1973	29.4	32.8	34.8	38.9	42.9	48.2	52.0	52.4	49.4	42.8	33.9	31.4	40.7
1974	28.3	32.1	32.0	38.9	44.7	50.0	53.5						
AVE.	32.1	33.3	34.3	38.8	44.5	50.3	54.3	54.9	51.4	44.1	37.4	33.6	

Table 4

Cordova - Mile 13 TEMPERATURE

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	AVERAGE
1945	33.7	30.3	30.6	35.4	43.2	49.2	52.0	51.0	46.7	38.8	24.2	29.8	38.7
1946	26.8	29.6	27.4	34.8	43.4	52.2	54.5	51.3	47.8	39.5	26.3	14.8	37.4
1947	13.8	25.2	34.2	36.8	44.1	48.9	55.3	52.7	48.0	41.4	36.2	33.8	39.2
1948	30.0	27.6	28.0	32.9	44.2	50.4	52.4	51.6	45.3	39.4	23.4	13.8	36.2
1949	24.8	14.9	31.6	34.4	42.1	47.4	51.0	52.1	48.8	39.9	34.2	18.6	36.6
1950	14.3	20.1	31.3	34.6	41.6	50.3	52.1	53.8	47.0	38.5	21.2	27.0	36.0
1951	17.0	19.9	20.4	35.4	42.3	48.2	55.8	52.8	49.0	36.5	31.3	20.5	35.8
1952	13.4	26.7	30.2	33.3	40.6	48.0	50.8	52.5	47.2	42.8	37.6	31.6	37.9
1953	21.1	31.7	27.9	38.1	44.4	52.6	54.9	52.9	47.4	39.3	30.4	30.9	39.3
1954	24.4	20.1	27.0	31.7	44.1	50.3	52.8	52.9	49.2	42.1	35.6	19.9	37.5
1955	30.4	27.8	28.4	33.2	41.1	46.7	53.5	50.9	46.3	36.7	22.6	19.2	36.4
1956	17.5	17.0	23.6	35.1	39.9	46.8	52.8	51.6	45.7	34.3	31.2	22.8	34.9
1957	20.4	23.9	33.4	37.4	45.4	52.9	53.9	55.4	50.8	42.6	38.3	22.3	39.7
1958	28.3	29.0	32.5	40.4	44.0	51.4	53.2	52.3	46.2	36.2	30.7	28.7	39.4
1959	19.7	29.1	23.7	36.5	45.2	54.2	51.6	53.2	46.7	39.0	33.2	31.0	38.6
1960	23.4	33.3	30.2	36.9	46.1	50.3	52.7	52.1	47.4	40.5	31.7	32.3	39.7
1961	32.6	29.0	27.2	36.6	44.7	50.1	52.8	51.2	46.3	37.3	29.1	17.7	37.9
1962	26.4	26.9	25.1	38.2	42.1	48.5	53.4	54.0	46.9	41.9	33.0	26.7	38.6
1963	27.8	35.4	28.8	34.2	45.0	48.2	53.7	54.1	50.9	41.5	25.2	32.9	39.8
1964	27.1	28.4	23.0	35.2	40.5	51.6	53.4	54.3	43.7	39.7	30.4	12.3	37.0
1965	20.7	16.5	34.0	36.0	38.9	45.2	51.4	50.4	48.5	36.5	24.5	20.9	35.3
1966	16.2	19.1	21.3	33.3	40.7	51.1	54.5	52.1	47.7	36.0	26.0	25.5	35.3
1967	20.6	26.1	27.6	34.8	44.6	52.6	54.8	55.8	50.1	40.8	34.7	25.3	39.0
1968	20.5	30.8	32.8	35.4	46.9	51.1	55.7	56.4	48.1	38.9	33.0	15.7	38.8
1969	5.1	25.2	29.2	39.7	46.1	54.1	54.9	50.9	48.3	44.3	31.4	37.0	38.9
1970	21.3	36.7	36.5	36.2	45.4	49.9	53.9	52.9	48.0	37.6	32.0	21.8	39.3
1971	13.3	27.8	25.0	37.1	42.4	51.7	55.5	55.3	48.2	37.5	30.3	21.3	37.1
1972	10.9	18.7	20.9	27.8	40.4	49.2	56.6	53.3	45.2	36.9	29.9	21.8	34.3
1973	14.4	19.3	30.4	37.0	42.1	48.2	51.9	50.6	45.9	37.9	19.2	26.0	35.2
1974	13.1	26.2	25.9	37.2	45.3	51.0	53.6	55.2	49.8	42.2	33.8	29.8	38.6
1975	20.9	23.1	26.4	35.2	44.3	47.5	54.6	54.1	48.4	36.8	24.5	19.7	36.3
1976	22.7	19.7	39.6	35.6	41.5	49.2	54.3	53.4	48.8	40.3	40.4	35.5	39.3
1977	38.3	39.0	31.9	38.8	45.7								
AVE.	22.6	25.1	28.4	34.8	43.3	50.0	52.0	52.9	47.8	39.4	30.4	23.9	36.7

Table 5

POWER CREEK - (20.5 mi.^{2}) ANNUAL RUNOFF (ACRE FEET)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	ANNUAL TOTAL	INCHES
1961	13470	6030	10110	7950	3690	2580	3510	18950	25000	31130	36070	28930	187400	171.4
1962	17880	6900	3770	5320	2500	2570	2570	10660	23720	29040	21820	21620	148400	135.7
1963	15270	11230	7900	5630	8660	6040	6210	14780	22740	36490	26530	19410	180900	165.5
1964	15700	3880	8620	3860	3970	2870	2600	6130	29510	37520	30140	17340	162200	148.3
1965	15840	11680	6800	2650	2170	2890	5690	11500	25440	26650	26810	33080	171200	156.6
1966	20050	4740	3310	2010	1250	1350	2320	8980	22710	26490	34780	42440	170400	155.9
1967	22160	10570	2960	2190	2730	3630	5280	11110	27050	29930	30380	43810	191800	175.4
1968	10680	15440	6290	3580	10050	8250	3150	16840	23880	27810	20700	18500	165200	151.1
1969	11340	6500	3630	1650	1990	5750	5590	14030	27260	24520	15520	12970	130700	119.6
1970	27520	12110	11690	6190	7940	7020	6170	10620	25440	32390	39580	21820	208300	190.5
1971	15910	9630	4530	3460	2500	1660	2810	7150	27720	41890	34360	18930	170500	156.0
1972	17660	4830	2390	1540	1090	952	936	6210	19530	34720	31030	32230	153100	140.1
1973	20900	5360	3730	2390	1640	1270	2230	11600	20870	27610	29370	13930	140900	128.9
1974	9520	3340	2920	2210	1540	1180	2860	11460	21050	21650	20880	31580	130200	119.1
1975	28270	15130	5170	3440	2370	1600	2360	10990	22750	38850	23870	35940	190700	174.5
1976	16410	2910	2500	1860	2060	1280	5350	28800	47760	33570	28820	40830	212200	194.1
AVE.	17411	8156	5401	3496	3509	3181	3727	12488	25777	31266	28154	27085	169651	
INCH.	15.92	7.46	4.94	3.20	3.21	2.91	3.41	11.42	23.58	28.60	25.75	24.77	155.16	161.6

AVERAGE 29 years = 176,800 acre feet = 161.6 inches/year

*NOTE: Only total available for 13 years prior to 1961.

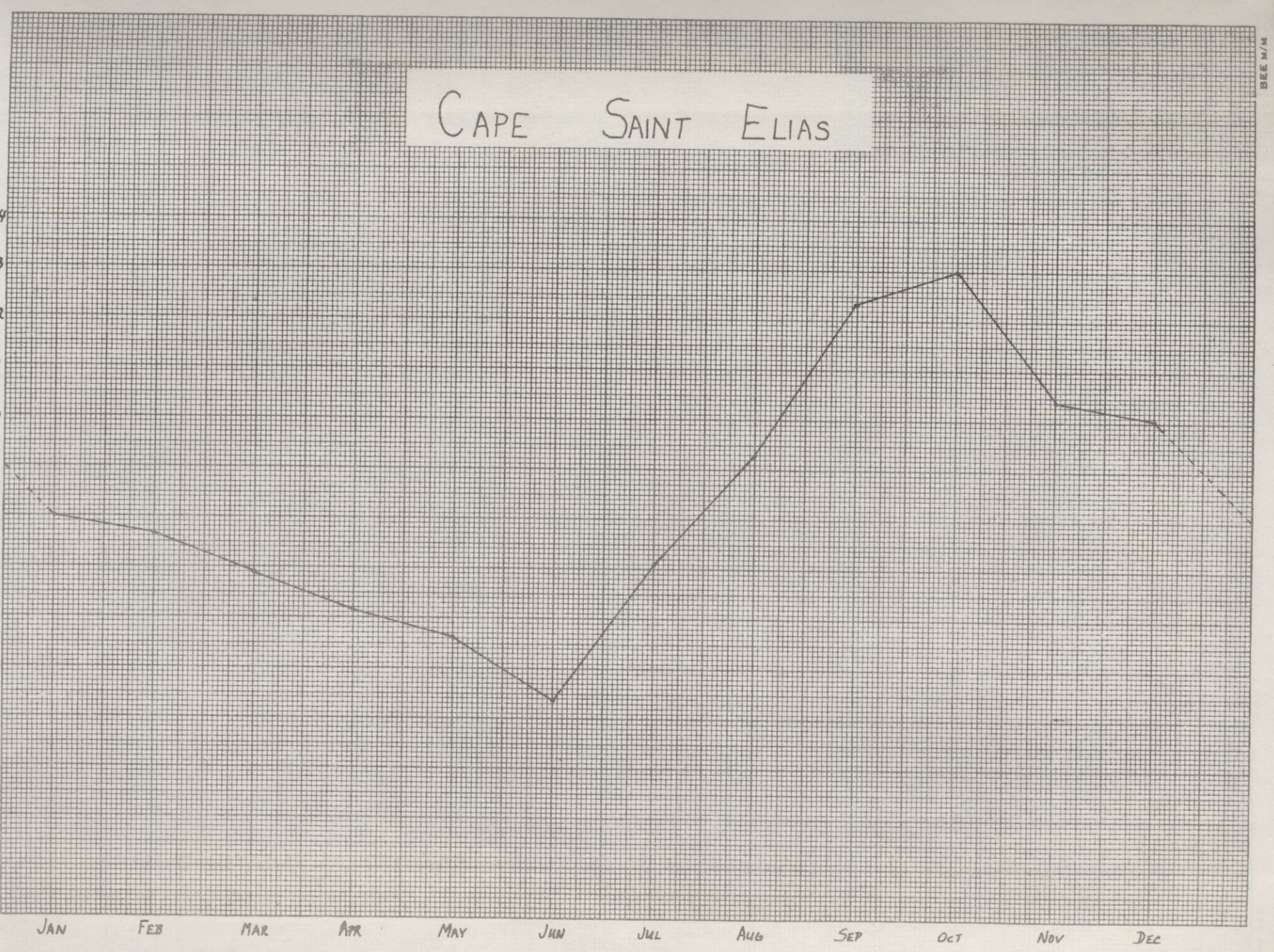
Table 6

DICK CREEK (7.95 mi.^{2}) ANNUAL FLOW (ACRE FEET)

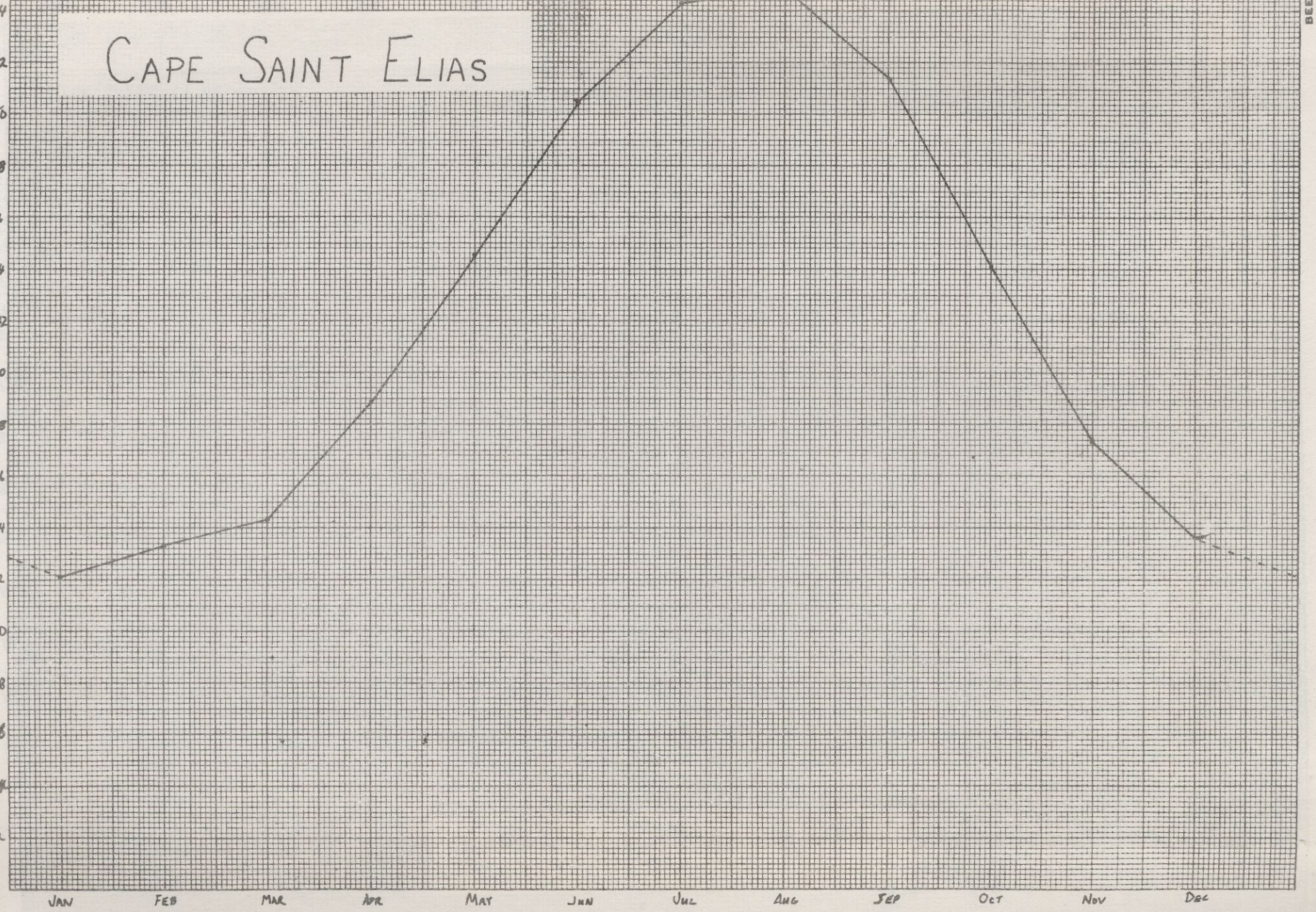
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL TOTAL	INCHES
1970									11990	9620	12190	9070		
1971	7630	5620	1700	2150	736	553	877	4400	11580	14180	8770	7650	65860	155.4
1972	14830	3660	1270	758	480	359	397	8950	12800	9800	12980	8210	74490	175.7
1973	13760	4900	1230	494	756	1590	6030	13530	12560	13080	12310	8480	74620	176.0
1974	9210	762	1720	445	346	282	3930	10150	10680	6120	5570	15710	64920	153.1
1975	16120	8470	2330	1150	657	476	2780	17450	18540	15070	8010	14130	105201	248.1
1976	8050	1220	3300	2890	1080	948	4400	17180	13350	9750	9120	16150	87830	207.2
AVE.	11600	4105	1925	1315	676	701	3069	11943	13129	11089	8281	11343	78820	
INCH.	27.4	9.7	4.5	3.1	1.6	1.7	7.2	28.2	31.0	26.2	19.5	26.8		

Maximum Discharge (FLOOD) 2030 cfs = 8 inches

Average 6 years = 78,820 acre feet



CAPE SAINT ELIAS

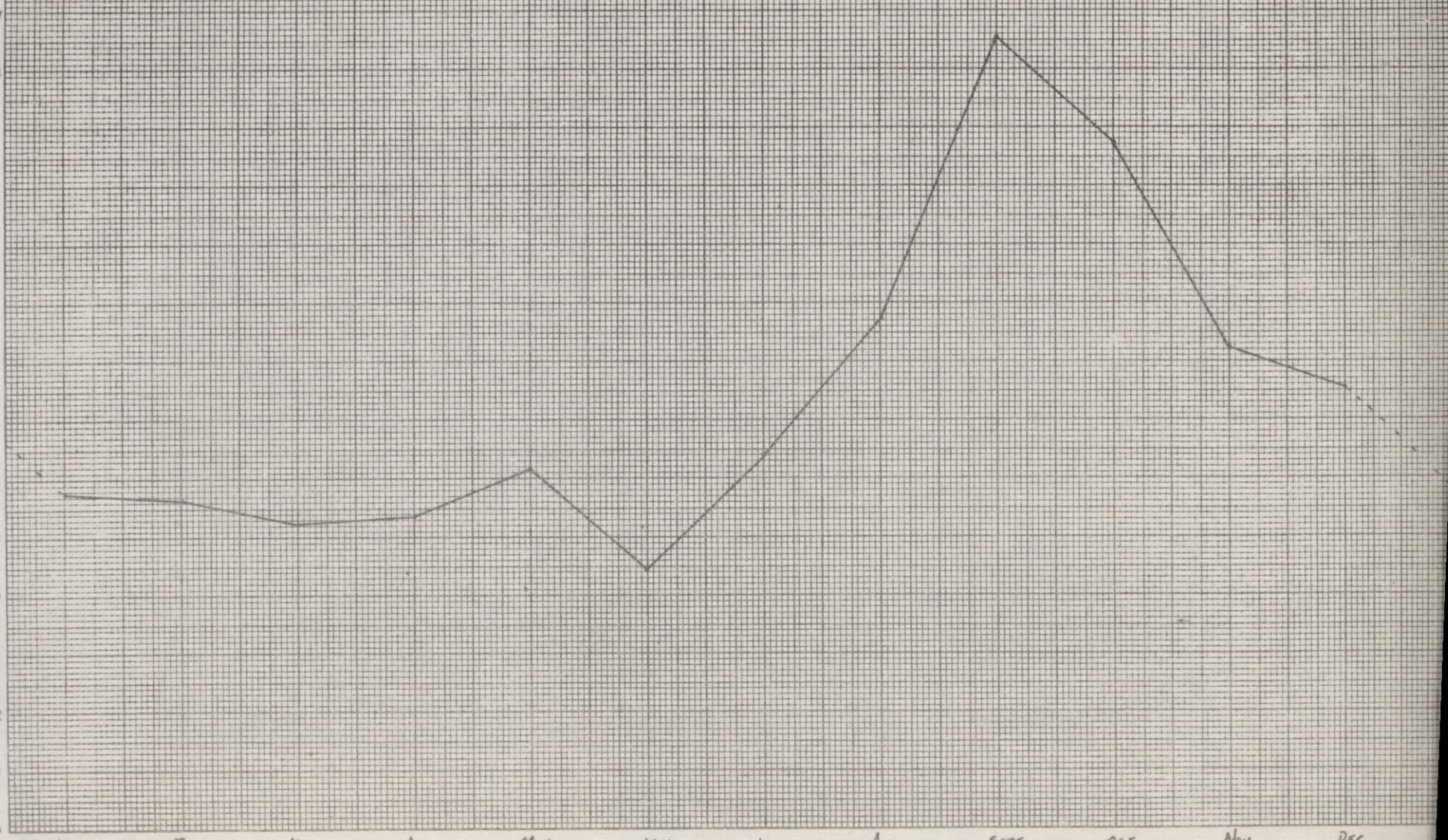


AVERAGE MONTHLY TEMPERATURE IN °F

1938 - 1974

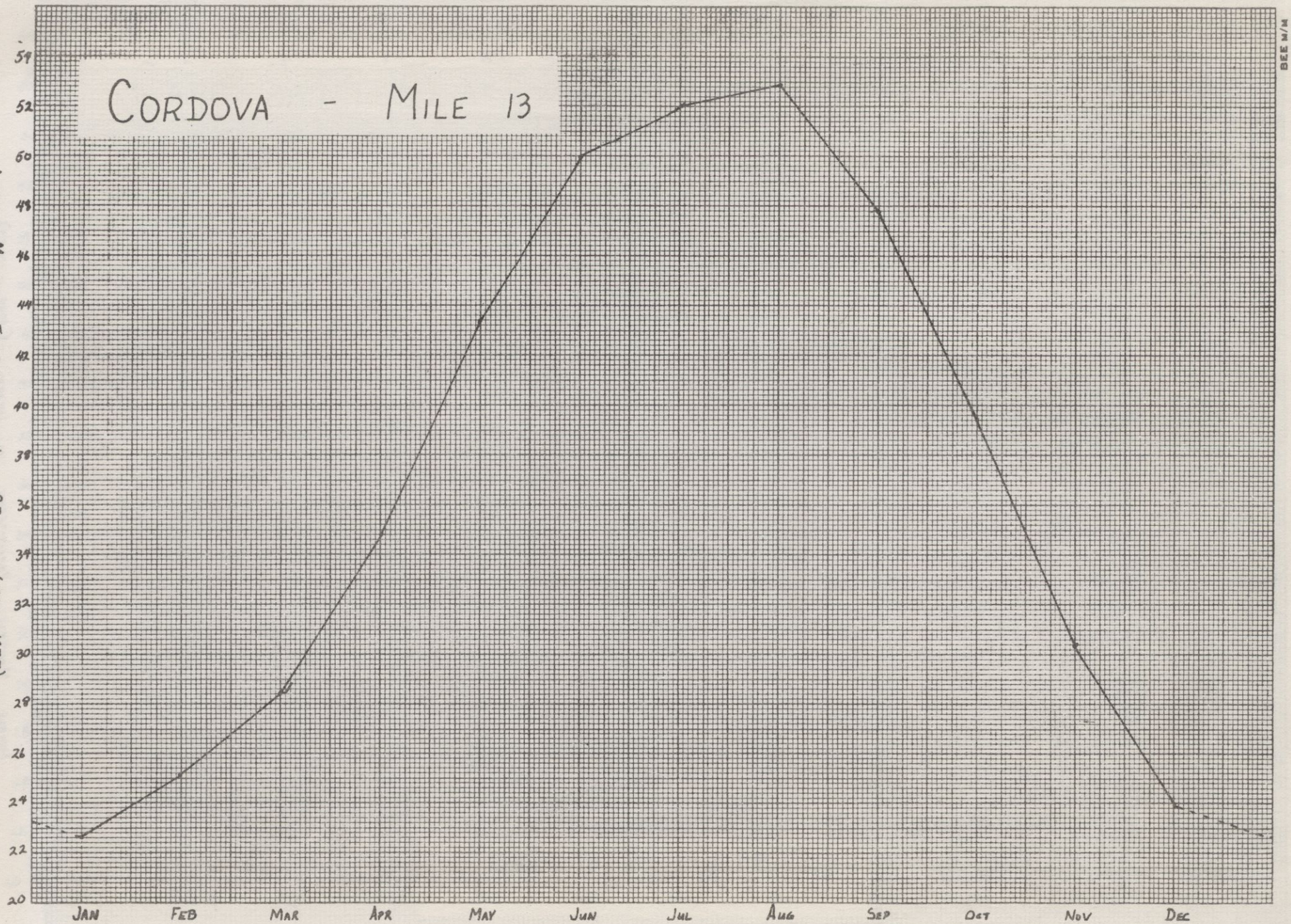
-94-

CORDOVA - MILE 13



AVERAGE MONTHLY PRECIPITATION IN INCHES (1942 - 1972)

-95-


CORDOVA - MILE 13
AVERAGE MONTHLY TEMPERATURES IN °F (1942-1977)
59
52
60
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
BEE M/M


Beartrap Bay
VABM Native
Parshas Bay
Parshas
VABM Parshas Pt
GRAVINA
Comfort Cove
Sablin Lake
Sablin Creek
Sablin Lagoon
Hopper Creek
River
Simpson Bay
VABM Close
VABM Sheep 2
SHEEP
BAY
SIMPSON BAY
VABM Surf
VABM Sheep Pt
Hanks I
Gatherer Rock
VABM Simpson 2
Bomb Pt
ORCA
VABM Narrows
Fox Pt
Windy Bay
Cedar Bay
Hemlock Spruce Creek
Cedar Creek
Paul Creek
Beaver Creek
HAWKINS
VABM Piledriver Rock
Whiskey Cove
Canoe Passage
Hidden Creek
INLET
Mud

Simpson
Raging
Creek
Rogue
Falls Creek
Robinson Falls
Pyrite
Creek
RUDE
RIVER
RUDE
VABM 1923 Britt
VABM Gravel 29
VABM 1303 Sacre
Orca Bay E Base
Wesley Falls
Creek
Snyder Mtn
Snyder Falls Cr
134
Milton Lake
Cabins
THE NARROWS
Channel
Salmo Pt
North I
North Rock
Shepard Pt
Cannery
Humpback
South Rock
ORCA CHANNEL
Observation I
Knot Pt
Deep Bay
ODIAK CHANNEL
Grass I
VABM 30
Sang
ORCA INLET
Fleming Spit
Mt Eyak
VABM Eyak 2506
Carter Lake
Dock
Tripod Hill
VABM 1255
Cordova
Landing Strip
Mud
Odiak Slough
FOREST BOUNDARY
EYAK LAKE
Middle Arm
Mavis I
Boy Scout
Scout Lake
Eccles Lagoon
Eccles Cr
Saddle Pt
Three Mile Bay
Nicolet Cr
Heney Creek
Mt Eccles
HENEY RANGE
EYAK RIVER
Currin Slough
Eyak
Middle Lake
Cabin Lake
Island Lake
31
4
10
53
MSF
MUN
IR
OPN
AST
ISL


GLACIER
Crevasses
MSF
MUN
OPN
GM
IR
AST
CHUGACH
NATIONAL
FOREST
SCOTT
SHERDAN
SHERMAN
GLACIER
MERIDIAN
Mt Marchison
Sleeper Lake
I.W.R.T.E.

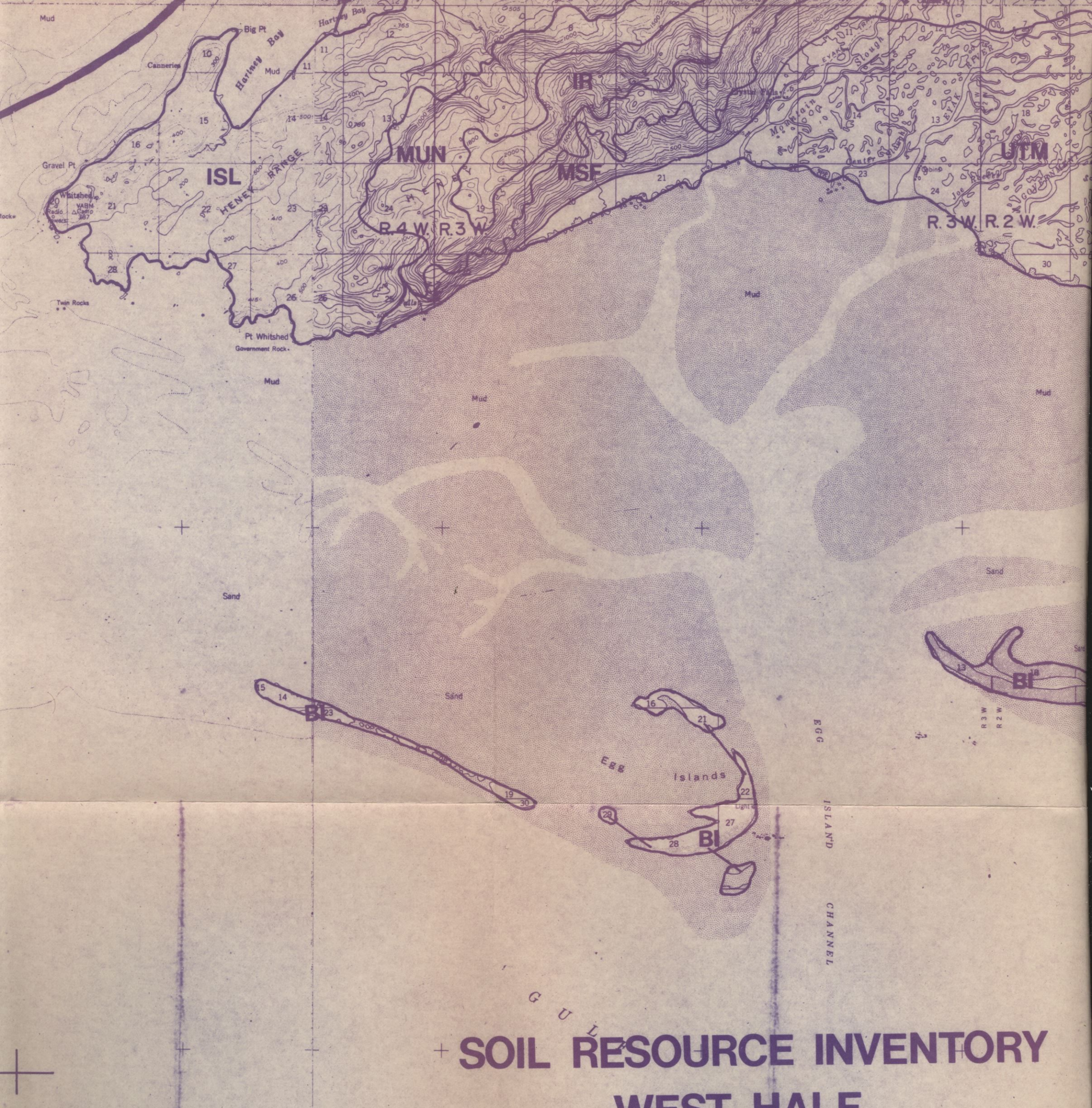

FOREST BOUNDARY
SHERMAN GLACIER
CHUGACH
Crevasses
Mt. Murchison
MSE
GM
OPF
NATIONAL
IR
MUN
SHERMAN
GLACIER


OPF
MSF
GM
IR
ISL
MUN
OPF
OPF
MUN
SD
SD
LONG
ISLAND
GM
MSF
Mt Kinley Lake
Flag Point
Flag Point Channel
Round Island
Long Island Channel
COPPER
DEPRESSION
Alaganik
SD
AST
OPN
SD
SD
CASTLE ISLAND
SLOUGH
SD
SD
SLOUGH
SLOUGH
STOREY
SLOUGH
SD
BRANCH
SD
ISLAND
SD
UTM
KOKINHENIK
STOREY
Island
UTM
SD
UTM
Kokinhenik I
Grass I
Mud
Mud
Sand
R2E
R3E
R.2E.
R.3E.
GULF
OF

AST
Cordova Airport
FOREST
APPROXIMATE BOUNDARY
Radio West Tower
VABM
Radio Tower
OPN
AST
MSF
IR
OPN
ISL
HIGHWAY
OPN
AST
ALAGANIK ROAD
UTM
Mud
Mud
ALAGANIK SLOUGH
MERIDIAN
Cabin
UTM
COPPER RIVER
Tidal Flat
Sand
Tidal Flat
Copper Sands
BI
BI
BI
Tidal Flat
BI Grass Island
GULF OF ALASKA

SOIL RESOURCE INVENTORY

WEST HALF



ISLAND

TOFF

ORCA INLET

Mud

Big Pt

Harney Bay

Canneries

Harney Bay

Mud

Gravel Pt

ISL

HENEY RANGE

MUN

R.4 W. R.3 W.

Whitshed

VABM Camp 387

Radio Towers

Little Mummy I

Shag Rock

ISL

Light

Twin Rocks

Pinnacle Rock

Pt Whitshed

Government Rock

Mud

Mud

Girl

Mud

Boswell Rock

Boswell Bay

Mud

Dock

Strawberry Hill

Range Sta

Pt Bentinck

Sand

Sand

Sand

OF

ALASKA

L F

S