United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with English Bay Corporation; Port Graham Corporation; Seldovia Native Association; U.S. Department of the Interior, Bureau of Indian Affairs; University of Alaska Fairbanks, Agricultural and Forestry Experiment Station; and Homer Soil and Water Conservation District

Soil Survey of Lower Kenai Peninsula Area, Alaska

How to Use This Soil Survey

General Soil Map

The general soil map, which is a color map, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

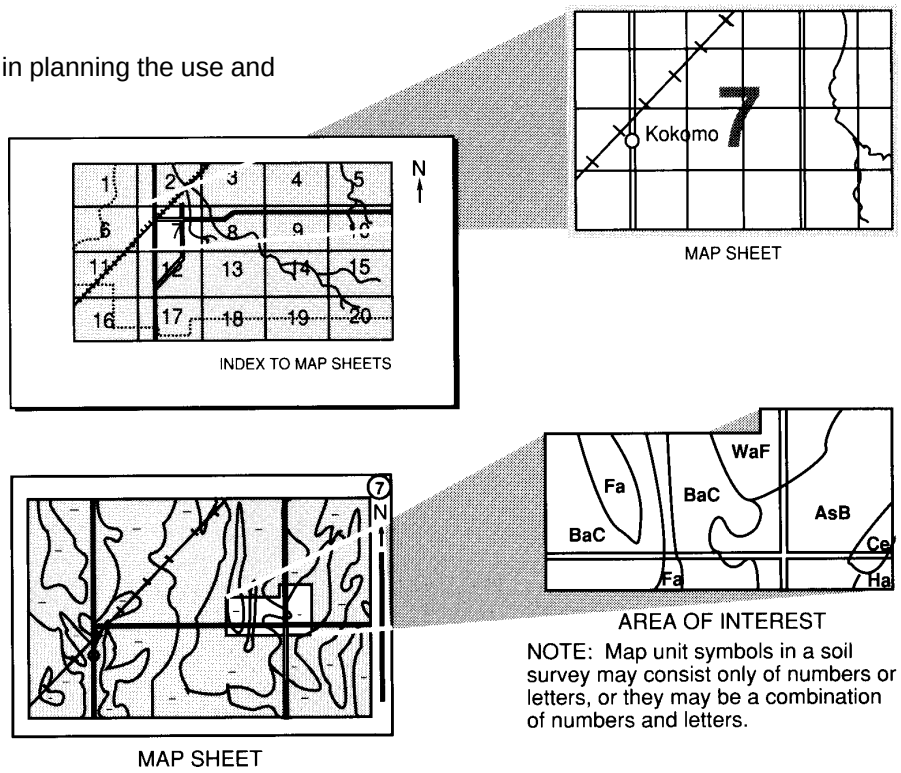
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1994. Soil names and descriptions were approved in 1998. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1994. This survey was made cooperatively by the Natural Resources Conservation Service and the University of Alaska Fairbanks, Agricultural and Forestry Experiment Station. It is part of the technical assistance furnished to the Homer Soil and Water Conservation District. In-kind services were provided by the English Bay Corporation, the Port Graham Corporation, the Seldovia Native Association, and the Bureau of Indian Affairs.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: This view is to the southwest from the north side of Port Chatham. The rugged Kenai Mountains of the mainland are on the left, and Chugach Passage and Elizabeth Island are in the background on the right.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov (click on "Technical Resources").

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Foreword

This soil survey contains information that can be used in land-planning programs in the Lower Kenai Peninsula. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Foresters and agronomists can use it to evaluate the potential of the soil and the management needed for sustainable timber harvest and small-scale vegetable production. Planners, community officials, engineers, and builders can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

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State Conservationist
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Soil Survey of
Lower Kenai Peninsula Area, Alaska

By Douglas J. Van Patten, Natural Resources Conservation Service

Fieldwork by Bob Ahrens, Mark H. Clark, Rex Cochran, Ted E. Cox, Pete Crews, Rex Davis, David J. Trochlell, Douglas J. Van Patten, and Joe D. White, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service,
in cooperation with
the University of Alaska Fairbanks, Agricultural and Forestry Experiment Station

The survey area is in south-central Alaska (fig. 1). It has a total land area of about 211,000 acres. The area includes East Chugach Island of the Chugach Islands group, which is off the southern coast of the Peninsula. The survey area is bounded on the north by Kachemak Bay, on the west by Cook Inlet, on the south by Kennedy Entrance, and on the east by Kachemak Bay State Wilderness Park.

General Nature of the Survey Area

This section provides some general information about the survey area. It describes history; industry, transportation facilities, and recreation; geology, geomorphology, and neotectonics; and climate.

History

Susan Woodward Springer, volunteer historian, prepared this section.

Seldovia

Ancient people camped along Seldovia's beaches and gathered food from the rich coastal waters hundreds of years before the Russian explorer Mikhail Teben'kov sailed by in 1849, saw schools of herring, and gave the bay its name (Springer, 1997). Stone tools and bones identified as Eskimoid have been unearthed at numerous sites around the bay. Dr. Frederica deLaguna's Yukon Island excavations in the 1930's began to define the prehistoric culture of Kachemak Bay, but she did not excavate sites in Seldovia Bay. The only scientific excavation to take place in the Seldovia area occurred in 1993. It yielded stone and bone artifacts and the remains of berries, land and marine birds, and mammals. Although the site cannot be assigned to any known culture, radio carbon dating revealed that it was occupied, probably as a temporary camping spot, around A.D. 1478.

The first known written reference to Seldovia is found in the 1875 confessional records of the Russian Orthodox Church of Alaska. There, reference is made to a family having gone from a village near Kenai to Seldovia. By 1880, the church had recognized Seldovia as a village. Seldovia was also included in the 10th United States census (counted together with Ostrovski, which is perhaps Yukon Island) with 74 residents.

The nature of human occupation at Seldovia between 1478 and 1875 is difficult to describe. It is likely that the bay was home to hunting parties and perhaps seasonal residents from villages elsewhere on the Kenai Peninsula, but whether or not there were any settlements of a permanent nature is not known. A 1784 Russian cartographer made note of Kenaitsy or Tanaina Indians living on Kachemak Bay, but he did not specify which fiord. In 1793, the Russian American Company had a "zimove," or winter cabin, for hunting on Kachemak Bay, but its exact location is not clear. No other mention of habitation in the area is made by any of the well known European explorers who plied the waters of Cook Inlet in the late 18th and early 19th centuries.

A documented period of glacial advancement on

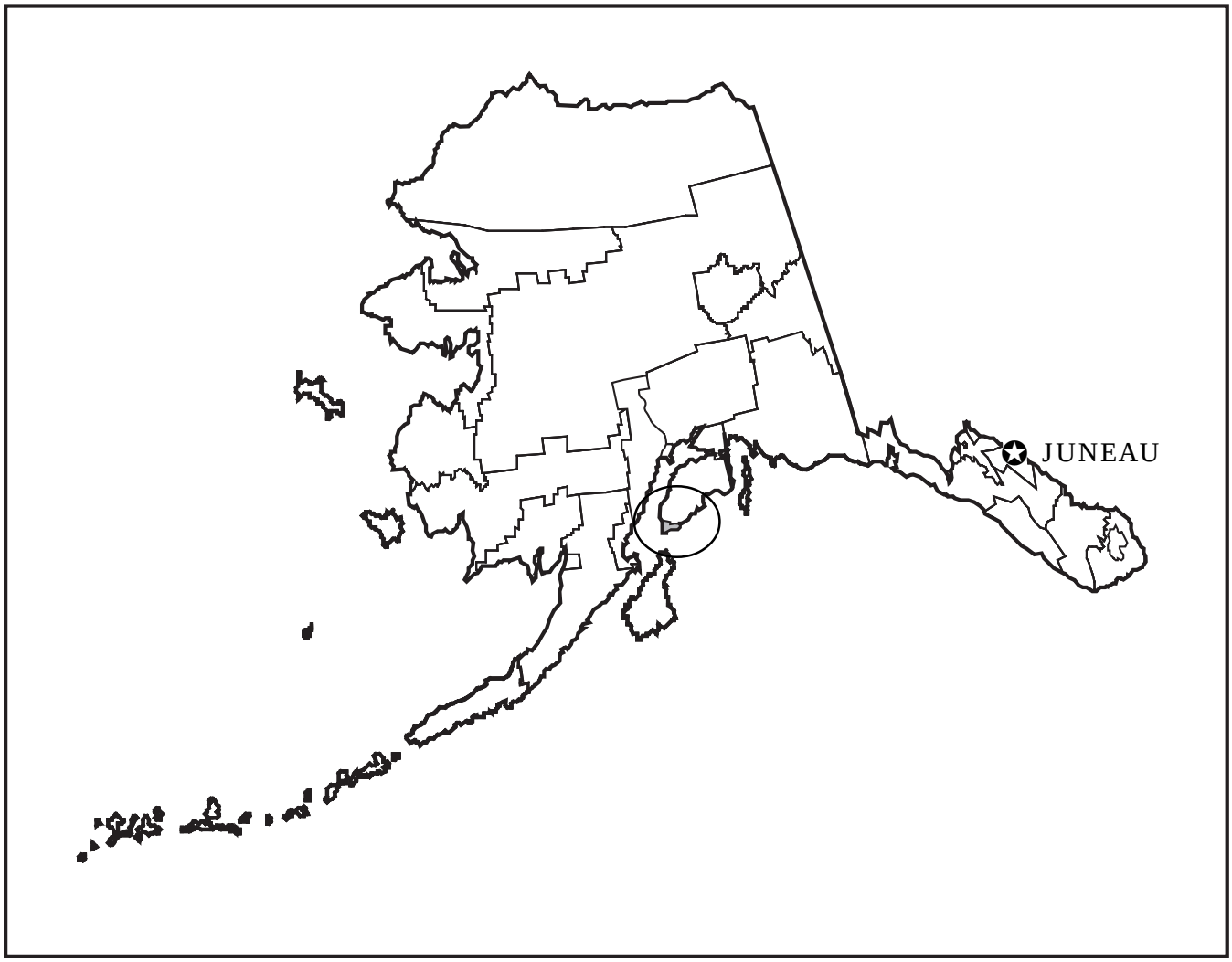

Figure 1.—Location of the survey area in Alaska (see circled area).

Kachemak Bay lasted from about 1450 through 1880. Local temperatures probably dropped slightly, and increased glacial runoff probably added silt to the coastal waters. Whether these climatic factors conspired to discourage year-round settlement in the area for these hundreds of years is unknown, but the possibility is intriguing.

By the 1880's, the current period of global warming had begun and so had Seldovia's recorded history. The first residents were likely a mix of Kenai Peninsula Tanaina, Aleut, and Chugach Eskimo. A village was at the head of Seldovia Bay and flourished even into the 20th century, although by the 1920's it was only used as a summer fishing camp. The first record of non-native occupation was that of the Western Fur Company. The probable location of their trading post was near Backer's Island and Schooner Beach; the land there sloped off sharply into the water, and sailing ships could come in close to shore.

By 1883, the Western Fur Company post had been abandoned. The next decade found the Alaska Commercial Company and the Northern Commercial Company in rival operation on land that is the present Seldovia townsite, seaward and near the mouth of the bay. Local natives were pressed into service as hired hunters for the commercial companies. Bidarkis full of men were sent out in search of the increasingly elusive and highly valuable sea otter. Russian priests from the Kenai parish made periodic visits here and instructed and indoctrinated the natives into the Orthodox faith. St. Nicholas chapel, which was built in 1891, stands today overlooking the bay and is a registered historic building.

Decades of hunting pressure in the Cook Inlet

region had taken their toll. The Russian American Company had effectively wiped out much of the land and marine furbearing animals. By the turn of the century, the two commercial companies were pulling out of Seldovia. Seldovia might have reverted to a quiet native settlement at this point had it not been for the gold rush in Alaska's interior.

Because of its southerly location, Seldovia was one of the few Cook Inlet ports to remain open to navigation into the winter months; thus, it was a natural staging area for gold seekers headed north. Steamers from the Lower 48 brought men and their outfits to Seward, and then smaller vessels carried them to Seldovia. From here, boats ran up the Inlet to Hope, Sunrise, Tyonek, and Knik, where men could engage river boats to take them into the gold-rich interior.

The first decade of the 20th century was marked by tremendous growth in the local population. In 1906, the first commercial dock was built on Seldovia Bay, greatly facilitating the smooth transfer of men, livestock, and freight. Merchants, sea captains, shipbuilders, and their families swelled the formerly native village.

As land routes from Seward to the interior were established, Seldovia's importance as the gateway to Cook Inlet diminished somewhat; but on the heels of the gold rush came the dawn of the salmon fishery. This industry created an economic boom that would sustain the community for decades to come.

In 1911, the first commercial dock became Seldovia's first cannery. From that time on, the fishing industry grew steadily. The 1920's are remembered as the herring boom years. At the peak of this activity, as many as 20 different firms were packing salted herring. After World War II, with the advent of refrigeration technology, crab, halibut, cod, salmon, shrimp, and clams were packed in even greater volume than ever before.

Fox farming was another part of Seldovia's economic base during the 1920's and 1930's and, to some extent, the 1940's. Timber harvesting and chromium ore have also played a part in building the community. Today, the economy centers around fishing and tourism. Although no cannery has operated in Seldovia for nearly 5 years, there is still a modest resident commercial fishing fleet.

Until the construction of the Seward/Sterling highway in the late 1950's, Seldovia was one of the major logistical, cultural, and industrial centers for all of Cook Inlet. Mail, freight, and passengers all traveled by sea, and Seldovia was the jumping-off or transfer point for all points north. Once the road system was built, however, cheaper transportation ended the era of steamship travel and Seldovia's importance diminished.

Fishing sustained the community, but it too was suffering. In the 1960's, declining stocks were beginning to cause some processors to consider relocating. The 1964 Good Friday earthquake shook Seldovia, and although the community escaped immediate tsunami damage, it became evident in the ensuing weeks that the land mass had dropped. This meant that the lovely community nestled on its trademark boardwalk along the waterfront would be flooded during every extreme high tide or storm surge.

The decision to accept Federal funds to rebuild the community was a difficult and painful one. The boardwalk was razed with bulldozers, and a huge hill in the center of town was blasted apart. From the rubble, a new waterfront was created and a modern water and sewer system installed. Just as the land was being torn apart, so was the fabric of the community. Many residents, bitter at the decision to tear down the boardwalk, took advantage of the Urban Renewal buy-out policy and moved away. The fish processors fled as well. Only one company stayed on to rebuild in Seldovia.

Thirty years after its destruction and rebirth, Seldovia is on its feet once again. It is becoming a favorite getaway for Alaskans from the city and for tourists wishing to experience a bit of "real Alaska." Although it continues to grow in importance, tourism will likely remain just one part of the economic base.

Port Graham and Nanwalek

Nanwalek is the older of these two neighboring villages. Nanwalek's recorded history begins in 1741, when native occupation of the site was noted by European explorers (McClintock Land Survey, 1989). In 1785, the Russian Shelikov established a strategic base there and named it Alexandrovsk. It was the first Russian settlement on the Alaskan mainland, and for nearly a hundred years it provided an outpost for the Russians to observe the sea-going movements of rival fur traders.

When the United States purchased Alaska from Russia in 1867, Alexandrovsk was abandoned by the Russians. The native population stayed on, and eventually the Alaska Commercial Company and canneries made it their base. The eruption of Mount St. Augustine in 1883 sent residents of at least seven other native villages in the region fleeing to the relative high ground in Nanwalek.

The first Russian Orthodox church in Alexandrovsk was built in 1870. After this church was destroyed by fire, another church, which is still standing, was

constructed from the old Alaska Commercial Company trading post in 1890. Both Nanwalek and Port Graham remain active seats of the Russian Orthodox faith.

In 1909, Alexandrovsk became “English Bay” when it was mistakenly named by a USGS survey and mapping party. The body of water bearing this name is actually at Port Graham, but the erroneous name stuck to the village until recently. Today, the Alutiq native name of “Nanwalek” is the officially recognized name for the village. “Nanwalek” means “place with a lagoon.” Anyone who has visited this tiny community bravely perched between sea, mountain, and lagoon would undoubtedly find this is a fitting name.

Port Graham was probably a seasonal hunting and food-gathering site when it was first recorded in 1786 by Captain Portlock of the Cook party. Portlock found unoccupied huts and also noted a large coal vein at the mouth of the harbor. Within 10 years, the Russians had mined some of this coal to provide fuel to heat iron for the construction of a ship at Resurrection Bay. For about a decade in the mid-1800’s, the Russians operated the mine at Port Graham. At its peak, this mine employed more than 100 people. The mine remained idle until just after the turn of the 20th century, when a Seldovian named Whorf rediscovered it and operated it briefly.

With its deep, protected harbor, Port Graham enjoyed its role as an Alaska Commercial Company post and fox-farming and fish-processing center. Today, both Port Graham and Nanwalek are primarily native villages. The inhabitants keep alive a rich culture and language, and they divide their economy between commercial fishing and a traditional subsistence lifestyle.

Industry, Transportation Facilities, and Recreation

Because of the proximity of the survey area to the rich waters of Kachemak Bay and Cook Inlet, commercial fishing has been the economic mainstay of the local economy for years. In the past, seafood canneries have operated at Seldovia, Port Graham, and Portlock.

Timber has also been of economic importance. Majestic stands of Sitka spruce blanket most of the landscape below the timberline. These stands have been harvested sporadically since the Russians occupied the territory, and harvesting has continued to the present day. Many of the accessible stands of old-growth timber have been cut. The earliest of these stands have successfully regenerated as second-growth timber. Sawmills have dotted the coastline because of the supply of good stands of spruce with close proximity to water transportation. Major round log transfer sites have been established at Jakolof Bay, Seldovia, Koyuktolik Bay, Port Chatham, and Windy Bay. A fledgling berry products industry has developed in the clear-cut areas of Seldovia Valley.

Mining has also had a sporadic but colorful economic impact. Russians mined coal at Coal Cove at the mouth of Port Graham long before Alaska was purchased by the United States. Chrome mines have operated at Claim Point and Red Mountain. Limestone was mined for a short time at the mouth of Seldovia Bay. Gravel extraction for local use has continued over the years in the Seldovia area. Hardrock used for riprap has been mined in the Seldovia Valley as recently as 1994.

The southern coast of the Peninsula was oiled by the grounding of the Exxon Valdez in 1989. The beaches of East Chugach Island, Windy Bay, and Chugach Bay were heavily impacted.

Air taxi services connect the villages with Homer, which is the commercial center of the area. The State provides seasonal ferry service between Seldovia and Homer. Villagers use fishing boats and skiffs for travel between the ice-free harbors of Port Graham, Seldovia, and Jakolof Bay and the lagoon at Nanwalek. Roads were constructed primarily to facilitate logging. Limited, disconnected road systems exist in the areas of Seldovia-Jakolof Bay, Rocky Bay-Windy Bay, and English Bay Valley-Koyuktolik Bay. A severe storm in October 1986 severed the road and washed out bridges between Jakolof Bay and Rocky Bay; rebuilding the road was determined to be too expensive.

Seldovia has entered the seasonal tourist industry with shops, lodges, sport fishing charters, and naturalist tours providing daily service by water taxi from Homer during the summer months.

Recreational and subsistence uses include hiking, biking, cross-country skiing, ocean kayaking, hunting, fishing, and berry picking. Hikers and mountain bikers use the Jakolof Bay Road to access the Rocky River Valley and beyond. Civilian Conservation Corps personnel improved many miles of valley bottom trails in the 1930’s; these trails connected the villages with remote bays. Most of the trails have been reclaimed by the forest undercover, but a few sections of blazed trail and rotting footbridges can still be found. The mountainous ridges of the area provide excellent hiking opportunities in the alpine tundra. At this time the villages of Port Graham and Nanwalek are not recreational destinations.

Geology, Geomorphology, and Neotectonics

Dwight Bradley, U.S. Geological Survey, Anchorage, Alaska, prepared this section.

This section describes the bedrock geology, surficial geology, geomorphology, and neotectonics of the lower Kenai Peninsula. The bedrock geology (fig. 2) was mapped at a scale of 1:250,000 as part of the U.S. Geological Survey's Alaska Mineral Resource Assessment Program (Bradley and others). The surficial geology, geomorphology, and neotectonics have been studied less thoroughly than the bedrock geology.

The coast of south-central Alaska, including the survey area, lies above the boundary between the North American plate and the Pacific plate. For many millions of years, the two plates have been converging at a rate of about 6 cm per year (about twice as fast as fingernails grow). The Pacific sea floor has descended hundreds of kilometers into the earth's mantle beneath south-central Alaska. This process is known as subduction, and the place where it takes place is called a subduction zone. Subduction is ultimately responsible for the main features of the bedrock geology of south-central Alaska, the many earthquakes, the frequent explosive eruptions of the Cook Inlet volcanoes, and some very pronounced long-term uplift and subsidence (ups and downs) of the Kenai Mountains.

Bedrock Geology.—The bedrock geology is best described in terms of two terranes (i.e., profoundly different tracts of rock that originated far from each other and were later faulted together). Bedrock of the Peninsular terrane underlies the area to the northwest of the Border Ranges fault, a major but inactive fault that can be traced northward from Koyuktolik (Dogfish) Bay to Seldovia Village. The Peninsular terrane in this area consists of a mildly folded succession of sedimentary and volcanic rocks and one diorite pluton. These rocks most likely formed along a volcanic arc above an ancient subduction zone, probably thousands of kilometers farther south than their present location. The oldest rocks in the area are assigned to the Port Graham Formation (Kelley, 1980), which crops out along both shores of Port Graham and in the adjacent highlands. The Port Graham Formation is largely composed of carbonaceous, silty limestone plus less abundant rock types, including chert, mudstone, siltstone, sandstone, and volcanic rocks. The Port Graham Formation is at least 1,500 meters thick, but it could be thicker because its base is not seen. It is overlain by the Talkeetna Formation (called Pogibshi Formation by Kelley, 1980) of Early Jurassic age, which is the bedrock of most of the remainder of the Peninsular terrane in the survey area. The Talkeetna Formation consists of at least 5,270 meters of volcanic rocks, volcaniclastic sedimentary rocks (conglomerate, sandstone, mudstone), and minor coal and limestone. The Talkeetna Formation is intruded by the Point Bede diorite, which is probably of Jurassic age. This small pluton crops out along the coast at and near Point Bede and extends a few kilometers inland.

To the east of the Border Ranges fault lies the Chugach terrane (Bradley and Kusky, 1992), an area of extremely complex geology that is divided into six rock units that together make up an accretionary prism. Accretionary prisms form where an oceanic plate is subducted beneath a volcanic arc; the process can be compared to the buildup of a wedge of snow in front of a snowplow. Immediately east of the Border Ranges fault is a narrow strip called the Seldovia Metamorphic Complex. This strip consists of metamorphosed volcanic rocks (now amphibolite), clastic sedimentary rocks (now schist and quartzite), and carbonate rocks (now marble and dolostone). Although the metamorphic rocks can only be traced in a thin band from Seldovia Village to just south of Port Graham, they are extremely important to the tectonic history because the metamorphism occurred at conditions of high pressure and low temperature that are characteristic of the deep parts of subduction zones.

East of the Border Ranges fault lies a much broader belt of rocks known as the McHugh Complex, consisting of sedimentary and volcanic rocks scraped off the deep-sea floor at the subduction zone. The main rock types are argillite, graywacke, chert, and pillow basalt, and the more minor types are limestone, gabbro, and ultramafic rocks. Except for the argillite, these rocks are now found in steeply dipping, fault-bounded blocks that range in thickness from a few kilometers down to a few centimeters. Countless blocks of each rock type are jumbled against others and surrounded by an argillite matrix. Such aggregates are commonly referred to as tectonic melange. Figure 2 shows the distribution of some of the larger tracts of basalt and chert, graywacke, and ultramafic rocks. One large tract of mainly Triassic basalt and chert underlies an area near Port Graham and Seldovia Village; another of mainly Jurassic age underlies Mt. Mills and the unnamed low mountains between Mt. Mills and Red Mountain. Cretaceous chert in a band too narrow and discontinuous to be mapped occurs still farther outboard, at Perl Island and Chugach Bay. A broad but poorly defined tract of

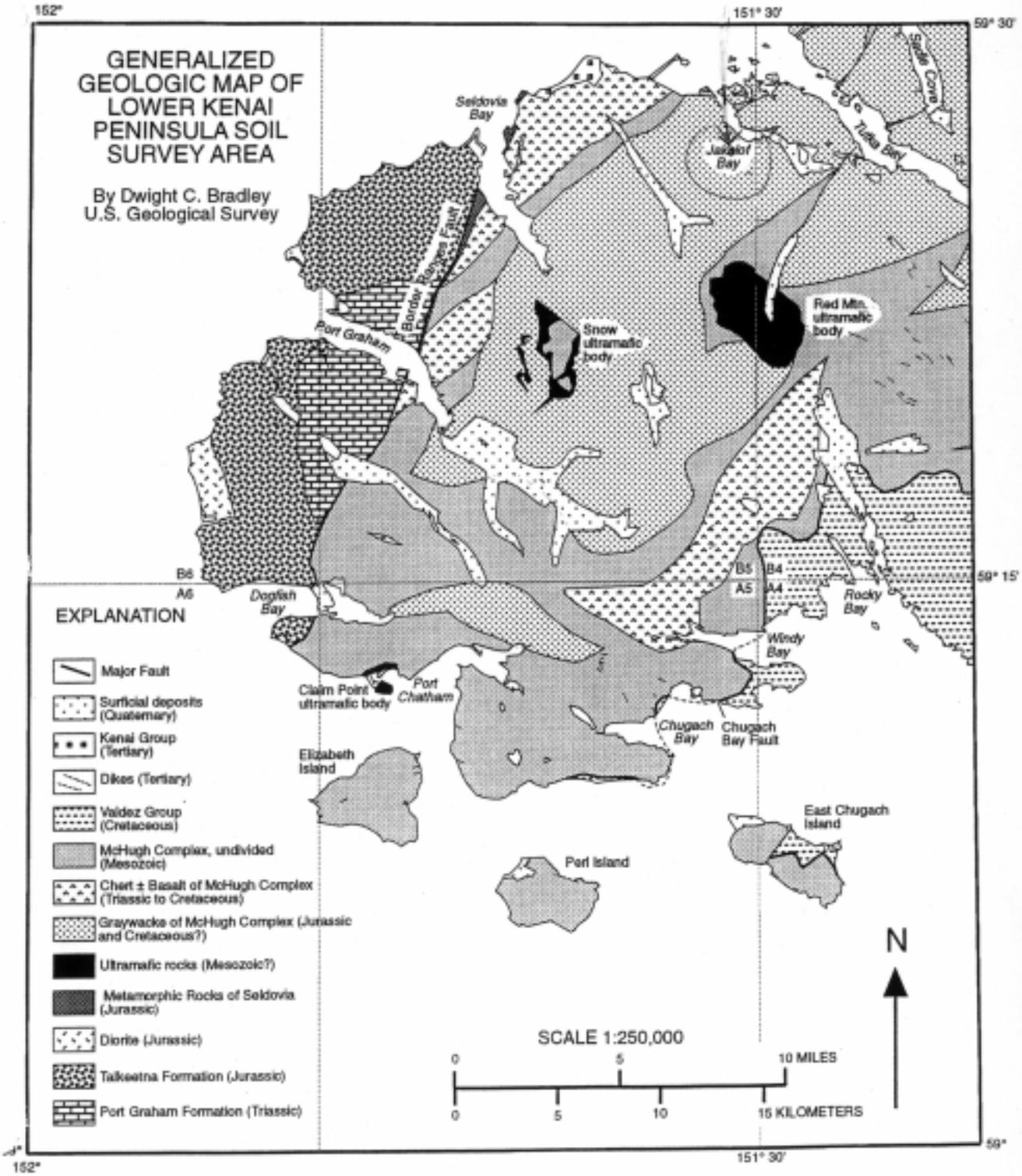

Figure 2.—Generalized geologic map of the Lower Kenai Peninsula Area, Alaska.

graywacke, probably of Jurassic age, underlies much of the high country in the Seldovia and Port Graham drainageways. The remaining parts of the McHugh Complex are mostly tectonic melange containing blocks that are too small to show at the scale of mapping used.

Ultramafic rocks of probable Mesozoic age occur in fault-bounded blocks at Red Mountain, at Chrome Bay, and at the lesser known Snow Prospect, along the Seldovia-Port Graham divide. These ultramafic rocks—mainly dunite, pyroxenite, and serpentinite—warrant special mention because of their stark effects on vegetation. They are nearly devoid of the so-called incompatible elements, including potassium; therefore, not much will grow on soils derived from their breakdown. Soils that formed in the ultramafic rocks are prone to early lithification. Evidence of lithification can be seen along the shores of Chrome Bay and the southern flanks of Red Mountain, where boulder-bearing alluvial or glacial deposits have been thoroughly cemented into conglomerate.

The Valdez Group, consisting of weakly metamorphosed (chlorite-grade), isoclinally folded graywacke and slate, underlies the southeast corner of the survey area. It is separated from the McHugh Complex by the Chugach Bay thrust fault. Along the thrust fault, the Valdez Group is deformed into a tectonic melange of graywacke blocks in a slate matrix. The Valdez Group is Late Cretaceous and represents a younger part of the accretionary prism than the McHugh Complex.

Both the McHugh Complex and the Valdez Group are cut by numerous steeply dipping, light-colored dikes that mostly range from dacite to rhyolite in composition; a few andesites, basaltic andesites, and basalts also are included. The dikes are early Tertiary in age. They mostly trend approximately east-west. The dikes range in thickness up to about 60 meters, although most are less than 5 meters thick.

The youngest bedrock unit, the Kenai Group, is a succession of coal-bearing sandstone, shale, and conglomerate that outcrops throughout the Kenai Lowlands and also beneath the waters of Cook Inlet. Along the margins of its depositional basin, the Kenai Group unconformably overlies both the Peninsular and Chugach terranes. In this survey area, a few small patches of poorly consolidated Kenai Group are preserved where drowned valleys meet the coast. The most notable occurrence is the site of an abandoned Russian-era (1850's) coal mine at the northern entry to Port Graham. The mine entry is now below sea level, a result of subsidence during the great 1964 earthquake.

Surficial Geology and Geomorphology.—The mountains of the lower Kenai Peninsula owe their rugged topography to a complex interplay of tectonically driven vertical motions and episodic glaciation. Red Mountain, at an elevation of 3,524 feet, is the highest peak in the survey area. Northwest of a line that roughly divides the area in two, the major drainageways flow into Kachemak Bay. The most important of these are the English Bay River, the Port Graham River, Fourth of July Creek, the Seldovia River, Barabara Creek, and Jakolof Creek. Their courses are relatively straight and parallel to one another, and it is likely that they follow late faults or Tertiary dikes. On the other side of the divide, the rivers and creeks (notably the Rocky River) drain into the Gulf of Alaska; most flow to the southeast, except at the tip of the Kenai Peninsula.

Although the glacial geology of the survey area has not been studied, some generalizations can be made. The landscape shows abundant evidence of glacial erosion—presumably during a series of Pleistocene glaciations—of what had been more rounded mountains. The mountains are heavily carved by cirques, although none of the cirques are occupied by active glaciers. (In contrast, just 20 km to the northeast, the mountains are somewhat higher and many glaciers are present.) Moraines have not been observed in the cirques, although diligent search might reveal their presence. The cirques drain into broad valleys that have U-shaped profiles and are typically filled with Quaternary sediments that include glacial deposits, fluvial deposits, alluvial fan deposits, and lacustrine deposits. A rock glacier has been reported in the cirque about 3 miles east-northeast of Port Graham Village. No effort was made in the course of bedrock mapping to study these sediments, and they are combined together in figure 2 as a single unit. Downstream, some of the U-shaped valleys reach all the way to the coast. The deepest of them, Seldovia and Port Graham, are drowned by seawater and hence are true fiords.

Another feature in the area deserves special mention because it bears on the pre-glacial character of the Kenai Mountains. A few of the higher mountains, such as Mt. Bede (3,255 feet) and Peak 2224 (section 13, 3 miles south of Seldovia Village), have strikingly flat-topped summits. These mountains appear to be part of a prominent family of flat-topped mountains and ridge crests, which can be readily seen not far northeast of the survey area, opposite Homer. The high-level surfaces are nearly accordant, and they clearly have been dissected by cirque glaciers. It seems likely, therefore, that prior to glaciation the Kenai Mountains were about as high as they are now but that the relief was more subdued. At that time, the

valleys probably had V-shaped profiles. The unnamed creek that enters the sea about a mile south of Pt. Pogibshi retains its original V-shaped profile, presumably because it never was scoured by a valley glacier.

Neotectonics.—A northwest-dipping seismic zone, which lies about 40 km beneath the project area, defines the Pacific-North America plate boundary. This plate boundary has been, and will continue to be, the site of great earthquakes, such as the Good Friday quake of 1964, which was the second largest earthquake of the century (magnitude of 9.2). Even though its epicenter was about 300 km away, the 1964 quake was intense enough to cause net tectonic subsidence throughout the entire area (Plafker, 1968). The land dropped (that is, the relative sea level rose) about 3 feet at the western tip of the Peninsula and about 5 feet at the eastern boundary of the survey area. Large stands of dead trees, still standing after more than three decades, are at the heads of many bays and inlets. The trees were killed by saltwater incursion following the 1964 earthquake. The effects of the 1964 quake are not particularly representative of longer term vertical motions in the survey area. An uplifted wave-cut platform, for example, fringes the coastline of much of the area. The elevation of this platform is estimated from topographic maps at between 65 and 100 feet.

The survey area is within 100 km of three active volcanoes. These are the Douglas, the Augustine, and the Iliamna. Explosive eruptions are common at these and other volcanoes of the Aleutian-Alaska Range magmatic arc, and ash has occasionally been laid down as a blanket across the area. Work just north of the project area suggests that the region has received an average of one major ash fall every 500 years and that about 5 cm of ash accumulates per 1,000 years (Riehle, 1985). Observations by members of the Alaska Volcano Observatory of the U.S. Geological Survey suggest that thin blankets of ash are redistributed by wind, water, and other agents, so that within a few years the distribution of ash becomes very patchy.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Tutka Bay Lagoon for the period 1979 to 1998. The Tutka Bay Lagoon station is to the immediate northeast of the survey area. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season. Table 4 gives average snowpack depths and snow water equivalents (swe) that accumulate during the winter at elevations of 650, 980, and 1,300 feet (USDA, 1994). Snowpack is the measurement, in inches, of the depth of snow on the ground at the first of the month. Snow water equivalent is the amount of water in the snowpack if it were melted.

The survey area is influenced by maritime climatic factors. Summers are cool, and winters are long and moderately cold. In May and June the weather is generally sunny and fairly dry, but in August and September it is dominantly cloudy and rainy.

The waters surrounding the area have a moderating effect on the temperature, and the Alaska Range to the north protects it from the most severe arctic cold fronts that are prevalent in interior Alaska. The Kenai Mountains block the flow of moisture from the Pacific out of the south, creating somewhat of a rain-shadow effect in the northern part of the survey area. There are no climate data available on the southern or outside coast, but cloudy and rainy conditions appear to be common. Annual precipitation may be more than 100 inches at the higher elevations (above 1,000 feet), based on data from the nearby Bradley Lake hydroelectric project (USDA, 1994).

In winter, the average temperature is 26 degrees F and the average daily minimum temperature is 21 degrees. The lowest temperature on record, which occurred at Tutka Bay Lagoon on January 29, 1989, is -18 degrees. In summer, the average temperature is 54 degrees and the average daily maximum temperature is 64 degrees. The highest temperature, which occurred on August 10, 1994, is 81 degrees. Areas at the higher elevations may have significantly lower temperatures. Generally, temperatures drop 3.5 degrees F for each 1,000-foot increase in elevation.

Growing degree days are shown in table 1. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 68.2 inches. Of this, 26.14 inches, or about 38 percent, usually falls in April through September. The growing season for most plants falls within this period. The heaviest 1-day rainfall during the period of record was 10.31 inches at Tutka Bay Lagoon on October 10, 1986. Thunderstorms occur infrequently, but most occur in July.

The average seasonal snowfall is 84 inches. The greatest snow depth at any one time during the period of record was 72 inches. On an average, 120 days per

year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 14 inches.

The average relative humidity in midafternoon is about 70 percent. Humidity is higher at night, and the average at dawn is about 78 percent. The sun shines 44 percent of the time possible in summer and 38 percent in winter. The prevailing wind is from the northeast. Average windspeed is highest, 8 miles per hour, in January.

Limited climatic data for the Seldovia Village vicinity suggest that the annual precipitation is about 45 inches.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Because of its small scale, the map is not suitable for planning the management of small parcels of land or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general soil map units in this survey have been grouped for broad interpretive purposes. Each of the broad groups and the map units in each group are described on the following pages. The textures given for the soils in the map unit descriptions are for the fraction less than 2 millimeters (fine earth) of the particle-size class in the control section.

Soils on Flood Plains, Spits, Stream Terraces, and Alluvial Fans

This group makes up 4 percent of the survey area.

1. Petrof-Portdick

These nearly level soils are on flood plains and low stream terraces. Petrof soils are very deep, moderately well drained and somewhat poorly drained, and loamy. They formed in stratified alluvium. Portdick soils are very deep, moderately well drained and somewhat poorly drained, and loamy over sandy. They formed in stratified alluvium.

The soils in this unit support a mixed forest of Sitka spruce and cottonwood and an understory of riparian willow. This habitat is utilized by moose throughout the year. It also provides feeding and reproduction cover for black bear and nest sites for hawk and bald eagle and a variety of other small mammals, such as beaver, river otter, and mink.

2. Jakolof-Typic Cryaquents-Ismailof-Taluwik

These nearly level to moderately sloping soils are on flood plains, spits, stream terraces, and alluvial fans. Jakolof soils are very deep, moderately well drained, and loamy over sandy. They formed in a mantle of volcanic ash over alluvium. They support a mixed forest of Sitka spruce and cottonwood. Typic Cryaquents are very deep, poorly drained, and loamy over sandy. They formed in stratified alluvium. They support stands of willow and grass. Ismailof soils are very deep, moderately well drained, and sandy. They formed in marine deposits. They support a forest of Sitka spruce bordered by stands of beach wildrye. Taluwik soils are very deep, well drained and moderately well drained, and loamy over sandy. They formed in volcanic ash over alluvium. They support stands of grass and forbs.

This unit is utilized as habitat by black bear for foraging, by bald eagles for nesting, and by mountain goats as spring range in areas that are close to other mountain goat habitats. Other wildlife species that inhabit areas of this unit include snowshoe hare, porcupine, and spruce grouse. Waterfowl and a variety of furbearers inhabit the wetland sites.

Soils on Moraines, Bedrock Benches, and Mountain Side Slopes

This group makes up 28 percent of the survey area.

3. Kasitsna-Nuka

These nearly level to hilly soils are on moraines. Kasitsna soils are very deep, well drained, and loamy. They formed in a mantle of volcanic ash over glacial till or colluvium. They support stands of Sitka spruce. Nuka soils are very deep, very poorly drained, and peaty. They formed in layers of organic material over glacial till.

The soils in this unit support stands of low shrubs and moss. Black bear are common in areas of this unit during summer and fall. At the higher elevations, snowshoe hare and mountain goat utilize areas of the unit for spring range.

4. Kasitsna-Seldovia

These rolling to very steep soils are on moraines and mountain side slopes. Kasitsna and Seldovia soils are very deep, well drained, and loamy. They formed in a mantle of volcanic ash over glacial till or colluvium.

These soils support stands of Sitka spruce. Black bear, spruce grouse, and snowshoe hare inhabit areas of this unit. At the lower elevations, wintering moose utilize areas of the unit. Areas at the higher elevations are utilized by mountain goats during the spring.

5. Kasitsna-Tutka

These rolling to very steep soils are on moraines, bedrock benches, and mountain side slopes. Kasitsna soils are very deep, well drained, and loamy. They formed in a mantle of volcanic ash over glacial till or colluvium. Tutka soils are shallow and very shallow, well drained, and loamy. They formed in a mantle of volcanic ash and glacial till over bedrock.

The soils in this unit support a forest of Sitka spruce. This habitat is utilized by snowshoe hare, porcupine, spruce grouse, northern goshawk, and black bear. Marbled murrelet may also nest in areas of these soils.

Soils on Cool Uplands and Mountains

This group makes up 46 percent of the survey area.

6. Nanwalek-Kasitsna, cool-Tutka

These moderately steep to very steep soils are on uplands and mountain side slopes. Nanwalek soils are very deep, well drained, and loamy. They formed in a mantle of volcanic ash over reworked glacial till and colluvium. They support stands of alder and grass. Kasitsna, cool, soils are very deep, well drained, and loamy. They formed in a mantle of volcanic ash over glacial till or colluvium. They support stands of stunted Sitka spruce. Tutka soils are shallow and very shallow, well drained, and loamy. They formed in a mantle of volcanic ash and glacial till over bedrock.

The soils in this unit support a forest of stunted Sitka spruce. This habitat is used by moose for summer range and by black bear throughout the summer for feeding and reproduction. Ptarmigan, snowshoe hare, mountain goats, and a variety of passerines also utilize areas of this unit.

Soils on Cold Mountains

This group makes up 22 percent of the survey area.

7. Cryorthents-Cryods-Rock Outcrop

This unit consists of Rock outcrop and gently sloping to very steep soils on mountain summits, cirques, and talus slopes. Cryorthents are shallow to moderately deep, well drained, and loamy and sandy. They formed in glacial till, colluvium, and residuum. Cryods are moderately deep and deep, well drained, and loamy. They formed in glacial till, colluvium, and residuum.

This unit supports alpine tundra vegetation. This habitat is utilized by black bear during the early summer and by ptarmigan and mountain goats.

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some “included” areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, soils. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are referred to as minor components in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit. The principal hazards and limitations to be considered in planning for specific uses are described in other parts of this survey.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Kasitsna silt loam, 15 to 25 percent slopes, cool, is a phase of the Kasitsna series.

Map units that are made up of only one soil are called consociations.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Kasitsna-Seldovia complex, 25 to 45 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Koyuktolik and Nuka peats, 0 to 8 percent slopes, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Beaches, gravelly, is an example.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

101—Beaches, gravelly

Setting

Location: Marine shorelines throughout the survey area
Elevation: 0 to 5 feet
Map unit type: Consociation

Composition

Major component
Beaches: 90 to 100 percent
Minor components
Tutka soils: 0 to 5 percent
Ismailof soils: 0 to 5 percent

Major Component Description

Definition: Sandy, gravelly, or cobbly shores that are washed and rewashed by waves and that may be partly covered by water during high tides or storms
Landform: Beaches
Slope range: 0 to 10 percent
Dominant parent material: Marine deposits

102—Chenega silt loam, 0 to 3 percent slopes

Setting

Location: Widely distributed throughout the survey area
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 90 inches
Frost-free period: 100 to 130 days
Map unit type: Consociation
Note: This map unit is on flood plains along streams and on gently sloping alluvial fans.

Composition

Major components
Chenega and similar soils: 85 to 90 percent
Minor components
Jakolof soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Landform: Flood plains, stream terraces, and alluvial fans
Slope range: 0 to 3 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Flooding: Frequent
Depth to water table: More than 6 feet
Available water capacity: Mainly 2.3 inches
Note: In some areas the soil has a network of ephemeral channels on the surface.
Representative pedon: The surface layer is silt loam about 3 inches thick. Below this to a depth of 60 inches or more is very gravelly sand.

A detailed soil series description with range in characteristics is included under the heading “Taxonomic Units and Their Morphology.” For additional information specific to this map unit, see the “Soil Properties” section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section “Use and Management of the Soils.”

103—Chenega silt loam, 3 to 8 percent slopes

Setting

Location: Widely distributed throughout the survey area
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 90 inches
Frost-free period: 100 to 130 days

Map unit type: Consociation
Note: This map unit is on alluvial fans at the base of steep, deeply incised intermittent streams (fig. 3).

Composition

Major components
Chenega and similar soils: 85 to 90 percent
Minor components
Jakolof soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Landform: Alluvial fans
Slope range: 3 to 8 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Dominant parent material: Alluvium
Flooding: Frequent
Depth to water table: More than 6 feet
Available water capacity: Mainly 2.3 inches
Note: In some areas the soil has a network of ephemeral channels on the surface.
Representative pedon: The surface layer is silt loam about 3 inches thick. Below this to a depth of 60 inches or more is very gravelly sand.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

104—Cryods-Cryorthents-Rock outcrop complex, 5 to 120 percent slopes

Setting

Location: Above the timberline throughout the survey area (fig. 4)
Elevation: 1,500 to 3,000 feet
Mean annual precipitation: 75 to 100 inches
Frost-free period: 60 to 100 days
Map unit type: Complex
Note: This map unit is along summits, cirque basins, and talus slopes.

Composition

Major components
Cryods and similar soils: 30 to 40 percent
Cryorthents and similar soils: 30 to 40 percent
Rock outcrop: 20 to 30 percent
Minor components
Nanwalek soils: 0 to 3 percent
Poorly drained soils: 0 to 3 percent

Major Component Description

Cryods

Landform: Mountains
Position on landform: Shoulders and summits
Slope range: 5 to 120 percent
Slope type: All shapes
Depth class: Moderately deep and deep (20 to 60 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Colluvium or residuum
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 4.8 inches
Note: As much as 30 percent of the surface may be covered with rock fragments.
Representative pedon: The surface layer is gravelly silt loam about 4 inches thick. The next layer to a depth of 40 inches or more is very gravelly silt loam.

A detailed description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Cryorthents

Landform: Mountains
Position on landform: Shoulders and summits
Slope range: 5 to 120 percent
Slope type: All shapes
Depth class: Shallow and moderately deep (10 to 40 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Colluvium or residuum
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 2.0 inches
Note: As much as 50 percent of the surface may be covered with rock fragments. Very sparse vegetation grows on these soils in areas where they formed in ultramafic parent material. An example is the Red Mountain area.

Representative pedon: The surface layer, to 1 depth of about 13 inches, is very gravelly sandy loam. The next layer, to a depth of about 24 inches, is very gravelly loamy sand. The substratum to a depth of 40 inches or more is extremely gravelly sand.

A detailed description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Rock outcrop

Definition: Exposures of unvegetated bedrock
Landform: Aretes, horns, and cirques
Slope range: 5 to 120 percent

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

105—Ismailof sandy loam, 0 to 3 percent slopes

Setting

Location: Mainly the southern and western parts of the survey area
Elevation: 0 to 20 feet
Mean annual precipitation: 45 to 90 inches
Frost-free period: 110 to 140 days
Map unit type: Consociation
Note: This map unit is on spits and beach ridges (fig. 5).

Composition

Major components
Ismailof and similar soils: 85 to 90 percent
Minor components
Jakolof soils: 0 to 5 percent
Tutka soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Landform: Spits and beach ridges
Slope range: 0 to 3 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Marine deposits
Flooding: Rare
Depth to water table: 3 to 6 feet below the mineral soil surface
Available water capacity: Mainly 2.0 inches
Note: As much as 10 percent of the surface may be covered with gravel. The pH increases with increasing depth because of saltwater intrusion.
Representative pedon: The surface layer is sandy loam about 1 inch thick. The subsoil is gravelly fine sandy loam about 5 inches thick. Below this to a depth of 60 inches or more is very gravelly sand.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

106—Ismailof sandy loam, 0 to 3 percent slopes, tide flats

Setting

Location: Southern and western parts of the survey area
Elevation: 0 to 10 feet
Mean annual precipitation: 45 to 90 inches
Frost-free period: 110 to 140 days
Map unit type: Consociation
Note: This map unit is on portions of spits and beach ridges that subsided during tectonic activity.

Composition

Major components
Ismailof and similar soils: 85 to 90 percent
Minor components
Cobbly soils: 0 to 10 percent

Major Component Description

Landform: Spits and beach ridges
Slope range: 0 to 3 percent
Slope type: Plane or concave
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Marine deposits
Flooding: Frequent
Depth to water table: 2.5 to 5.0 feet below the mineral soil surface
Available water capacity: Mainly 2.0 inches
Note: This unit is periodically inundated by high tides.

Saltwater intrusion has killed trees and other vegetation.

Representative pedon: The surface layer is sandy loam about 1 inch thick. The subsoil is gravelly fine sandy loam about 5 inches thick. Below this to a depth of 60 inches or more is very gravelly sand.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

107—Jakolof silt loam, 0 to 3 percent slopes

Setting

Location: Widely distributed throughout the survey area
Elevation: 10 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Consociation
Note: This map unit is on stream terraces and on a few isolated alluvial fans.

Composition

Major components
Jakolof and similar soils: 85 to 90 percent
Minor components
Poorly drained soils: 0 to 10 percent
Chenega soils: 0 to 5 percent

Major Component Description

Landform: Alluvial fans and stream terraces
Slope range: 0 to 3 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Volcanic ash over alluvium
Flooding: Rare
Depth to water table: 3 to 4 feet below the mineral soil surface
Available water capacity: Mainly 3.2 inches
Representative pedon: The surface layer, to a depth of about 7 inches, is silt loam. The substratum to a depth of 60 inches or more is very gravelly sand.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

108—Jakolof silt loam, 3 to 8 percent slopes

Setting

Location: Widely distributed throughout the survey area
Elevation: 10 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Consociation
Note: This map unit is on alluvial fans and short segments of remnant stream terraces.

Composition

Major components
Jakolof and similar soils: 85 to 90 percent
Minor components
Poorly drained soils: 0 to 10 percent
Chenega soils: 0 to 5 percent

Major Component Description

Landform: Alluvial fans
Slope range: 3 to 8 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Volcanic ash over alluvium
Flooding: Rare
Depth to water table: 3 to 4 feet below the mineral soil surface
Available water capacity: Mainly 3.2 inches
Representative pedon: The surface layer, to a depth of about 7 inches, is silt loam. The substratum to a depth of 60 inches or more is very gravelly sand.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section “Use and Management of the Soils.”

109—Jakolof, cool-Taluwik complex, 0 to 15 percent slopes

Setting

Location: Throughout the survey area
Elevation: 1,000 to 1,500 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 90 to 120 days
Map unit type: Complex

Composition

Major components
Jakolof, cool, and similar soils: 50 to 60 percent
Taluwik and similar soils: 30 to 40 percent
Minor components
Chenega soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Jakolof, cool

Landform: Alluvial fans
Slope range: 0 to 15 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Volcanic ash over alluvium
Flooding: None
Depth to water table: 3 to 4 feet below the mineral soil surface
Available water capacity: Mainly 3.2 inches
Representative pedon: The surface layer, to a depth of about 7 inches, is silt loam. The substratum to a depth of 60 inches or more is very gravelly sand.

A detailed soil series description with range in characteristics is included under the heading “Taxonomic Units and Their Morphology.” For additional information specific to this map unit, see the “Soil Properties” section.

Taluwik

Landform: Alluvial fans
Slope range: 0 to 15 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Volcanic ash over alluvium
Flooding: None
Depth to water table: 3 to 6 feet below the mineral soil surface
Available water capacity: Mainly 12.2 inches
Representative pedon: The surface layer is very fine sandy loam about 4 inches thick. The subsoil, to a depth of about 38 inches, is very fine sandy loam. The substratum to a depth of 60 inches or more is very gravelly sand.

A detailed soil series description with range in characteristics is included under the heading “Taxonomic Units and Their Morphology.” For additional information specific to this map unit, see the “Soil Properties” section.

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section “Use and Management of the Soils.”

110—Jakolof-Typic Cryaquents complex, 0 to 8 percent slopes

Setting

Location: Throughout the survey area
Elevation: 500 to 1,200 feet
Mean annual precipitation: 65 to 75 inches
Frost-free period: 90 to 120 days
Map unit type: Complex
Note: This map unit is on valley floors.

Composition

Major components
Jakolof and similar soils: 50 to 60 percent
Typic Cryaquents and similar soils: 30 to 40 percent
Minor components
Chenega soils: 0 to 10 percent
Taluwik soils: 0 to 5 percent

Major Component Description

Jakolof

Landform: Flood plains, stream terraces, and alluvial fans
Slope range: 0 to 8 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained

Dominant parent material: Volcanic ash over alluvium
Flooding: Rare
Depth to water table: 3 to 4 feet below the mineral soil surface
Available water capacity: Mainly 3.2 inches
Representative pedon: The surface layer, to a depth of about 7 inches, is silt loam. The substratum to a depth of 60 inches or more is very gravelly sand.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Typic Cryaquents

Landform: Flood plains
Slope range: 0 to 3 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Flooding: Frequent
Depth to water table: 1 to 2 feet below the mineral soil surface
Available water capacity: Mainly 5.6 inches
Representative pedon: The surface layer is very fine sandy loam about 21 inches thick. The substratum to a depth of 60 inches or more is very gravelly loamy sand.

A detailed description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

111—Kasitsna silt loam, 15 to 25 percent slopes, cool

Setting

Location: Throughout the survey area
Elevation: 20 to 1,500 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 90 to 120 days
Map unit type: Consociation

Composition

Major components
Kasitsna and similar soils: 85 to 90 percent
Minor components
Tutka soils: 0 to 10 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Landform: Mountain slopes
Position on landform: Summits, shoulders, backslopes, and footslopes
Slope range: 15 to 25 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Note: In some areas the soil formed in compact basal till and may be slightly cemented.
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

112—Kasitsna silt loam, rolling to steep

Setting

Location: Widely distributed throughout the survey area
Elevation: 20 to 800 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 120 days
Map unit type: Consociation
Note: This map unit is on moraines at the base of steep walls of U-shaped valleys.

Composition

Major components
Kasitsna and similar soils: 85 to 90 percent
Minor components
Portgraham soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent
Tutka soils: 0 to 5 percent

Major Component Description

Landform: Moraines
Position on landform: Summits, shoulders, backslopes, and footslopes
Slope range: 8 to 25 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Note: In some areas the soil formed in compact basal till and may be slightly cemented.
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

113—Kasitsna silt loam, hilly to very steep

Setting

Location: Widely distributed throughout the survey area
Elevation: 20 to 800 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 120 days
Map unit type: Consociation
Note: This map unit is on moraines at the base of steep walls of U-shaped valleys.

Composition

Major components
Kasitsna and similar soils: 85 to 90 percent
Minor components
Portgraham soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent
Tutka soils: 0 to 5 percent

Major Component Description

Landform: Moraines
Position on landform: Summits, shoulders, backslopes, and footslopes
Slope range: 25 to 45 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Note: In some areas the soil formed in compact basal till and may be slightly cemented.
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

114—Kasitsna-Kasitsna, cool-Seldovia complex, 45 to 65 percent slopes

Setting

Location: Mainly in the western part of the survey area
Elevation: 20 to 1,500 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 80 to 100 days
Map unit type: Complex
Note: This map unit is on steep walls of U-shaped valleys.

Composition

Major components

Kasitsna and similar soils: 35 to 40 percent
Kasitsna, cool, and similar soils: 30 to 35 percent
Seldovia and similar soils: 20 to 25 percent

Minor components

Tutka soils: 0 to 10 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Kasitsna

Landform: Mountain slopes
Position on landform: Backslopes and footslopes
Slope range: 45 to 65 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Kasitsna, cool

Landform: Mountain slopes
Position on landform: Backslopes, shoulders, and footslopes
Slope range: 45 to 65 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Note: As much as 10 percent of the surface may be covered with rock fragments.
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Seldovia

Landform: Mountain slopes
Position on landform: Backslopes and footslopes
Slope range: 45 to 65 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 12.2 inches
Representative pedon: The surface layer, to a depth of about 29 inches, is silt loam. The subsoil, to a depth of about 46 inches, is very gravelly silt loam. Below this to a depth of 60 inches or more is gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

115—Kasitsna-Nuka complex, nearly level to hilly

Setting

Location: Widely distributed throughout the survey area
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 120 days
Map unit type: Complex
Note: This map unit is on gently rolling ground moraines on floors of U-shaped valleys.

Composition

Major components

Kasitsna and similar soils: 65 to 80 percent
Nuka and similar soils: 20 to 30 percent

Minor components

Tutka soils: 0 to 10 percent

Major Component Description

Kasitsna

Landform: Ground moraines
Position on landform: Summits, shoulders, backslopes, and footslopes
Slope range: 8 to 25 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Note: In some areas the soil formed in compact basal till and may be slightly cemented.
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Nuka

Landform: Muskegs
Position on landform: Toeslopes
Slope range: 0 to 3 percent
Slope type: Concave
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic material over gravelly till
Flooding: None
Water table: At the surface to 0.5 foot below the surface
Available water capacity: Mainly 14.0 inches
Representative pedon: The surface layer is fibrous peat about 9 inches thick. The next layer, to a depth of about 47 inches, is partially decomposed peat. The substratum to a depth of 60 inches or more is very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

116—Kasitsna-Nuka-Tutka complex, nearly level to hilly

Setting

Location: Mainly in the Windy Bay area
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 120 days
Map unit type: Complex
Note: This map unit is on gently rolling ground moraines on floors of U-shaped valleys.

Composition

Major components

Kasitsna and similar soils: 30 to 40 percent
Nuka and similar soils: 20 to 30 percent
Tutka and similar soils: 15 to 25 percent

Minor components

Rock outcrop: 0 to 5 percent

Major Component Description

Kasitsna

Landform: Ground moraines
Position on landform: Summits, shoulders, backslopes, and footslopes
Slope range: 15 to 25 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Note: In some areas the soil formed in compact basal till and may be slightly cemented.
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For

additional information specific to this map unit, see the "Soil Properties" section.

Nuka

Landform: Muskegs
Position on landform: Toeslopes
Slope range: 0 to 3 percent
Slope type: Concave
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic material over gravelly till
Flooding: None
Water table: At the surface to 0.5 foot below the surface
Available water capacity: Mainly 14.0 inches
Representative pedon: The surface layer is fibrous peat about 9 inches thick. The next layer, to a depth of about 47 inches, is partially decomposed peat. The substratum to a depth of 60 inches or more is very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Tutka

Landform: Roches moutonnées
Position on landform: Shoulders and summits
Slope range: 15 to 25 percent
Slope type: All shapes
Depth class: Very shallow and shallow (less than 20 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 3.7 inches
Representative pedon: The surface layer is silt loam about 6 inches thick. The substratum is very gravelly silt loam. Bedrock is at a depth of 6 to 14 inches.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

117—Kasitsna-Seldovia complex, 25 to 45 percent slopes

Setting

Location: Mainly in the western part of the survey area
Elevation: 20 to 800 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 120 days
Map unit type: Complex
Note: This map unit is on the lower parts of steep walls of U-shaped valleys.

Composition

Major components
Kasitsna and similar soils: 45 to 50 percent
Seldovia and similar soils: 35 to 40 percent
Minor components
Tutka soils: 0 to 10 percent
Poorly drained soils: 0 to 10 percent

Major Component Description

Kasitsna

Landform: Mountain slopes
Position on landform: Backslopes, shoulders, and footslopes
Slope range: 25 to 45 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Note: In some areas the soil formed in compact basal till and may be slightly cemented.
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Seldovia

Landform: Mountain slopes

Position on landform: Backslopes, shoulders, and footslopes
Slope range: 25 to 45 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 12.2 inches
Representative pedon: The surface layer, to a depth of about 29 inches, is silt loam. The subsoil, to a depth of about 46 inches, is very gravelly silt loam. Below this to a depth of 60 inches or more is gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

118—Kasitsna-Seldovia-Portgraham complex, rolling to steep

Setting

Location: Mainly in the northwestern part of the survey area
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Complex
Note: This map unit is on undulating moraines and the lower slopes of U-shaped mountain valleys.

Composition

Major components
Kasitsna and similar soils: 35 to 45 percent
Seldovia and similar soils: 25 to 35 percent
Portgraham and similar soils: 20 to 30 percent
Minor components
Tutka soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Kasitsna

Landform: Mountain slopes
Position on landform: Backslopes, shoulders, and footslopes
Slope range: 8 to 25 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Seldovia

Landform: Mountain slopes
Position on landform: Footslopes and toeslopes
Slope range: 8 to 25 percent
Slope type: Concave
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 12.2 inches
Representative pedon: The surface layer, to a depth of about 29 inches, is silt loam. The subsoil, to a depth of about 46 inches, is very gravelly silt loam. Below this to a depth of 60 inches or more is gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Portgraham

Landform: Mountain slopes

Position on landform: Backslopes and shoulders
Slope range: 15 to 25 percent
Slope type: Convex
Depth class: Moderately deep (20 to 40 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 7.7 inches
Representative pedon: The surface layer is silt loam about 2 inches thick. The subsoil, to a depth of about 46 inches, is very gravelly silt loam. The substratum to a depth of 60 inches or more is very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

119—Kasitsna-Seldovia-Portgraham complex, hilly to very steep

Setting

Location: Mainly in the northwestern part of the survey area
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Complex
Note: This map unit is on the lower and mid slopes of U-shaped valleys.

Composition

Major components
Kasitsna and similar soils: 35 to 45 percent
Seldovia and similar soils: 25 to 35 percent
Portgraham and similar soils: 20 to 30 percent
Minor components
Tutka soils: 0 to 10 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Kasitsna

Landform: Mountain slopes
Position on landform: Backslopes and footslopes
Slope range: 25 to 35 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Seldovia

Landform: Mountain slopes
Position on landform: Footslopes and toeslopes
Slope range: 25 to 35 percent
Slope type: Concave
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 12.2 inches
Representative pedon: The surface layer, to a depth of about 29 inches, is silt loam. The subsoil, to a depth of about 46 inches, is very gravelly silt loam. Below this to a depth of 60 inches or more is gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Portgraham

Landform: Mountain slopes
Position on landform: Backslopes and shoulders

Slope range: 25 to 35 percent
Slope type: Convex
Depth class: Moderately deep (20 to 40 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 7.7 inches
Representative pedon: The surface layer is silt loam about 2 inches thick. The subsoil, to a depth of about 46 inches, is very gravelly silt loam. The substratum to a depth of 60 inches or more is very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

120—Kasitsna-Tutka complex, 45 to 65 percent slopes

Setting

Location: Widely distributed throughout the survey area
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 120 days
Map unit type: Complex
Note: This map unit is midslope on steep walls of U-shaped valleys (fig. 6).

Composition

Major components
Kasitsna and similar soils: 40 to 50 percent
Tutka and similar soils: 35 to 40 percent
Minor components
Seldovia soils: 0 to 10 percent
Rock outcrop: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Kasitsna

Landform: Mountain slopes
Position on landform: Backslopes and footslopes
Slope range: 45 to 65 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Tutka

Landform: Mountain slopes
Position on landform: Shoulders and summits
Slope range: 45 to 65 percent
Slope type: All shapes
Depth class: Very shallow and shallow (less than 20 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 3.7 inches
Note: As much as 10 percent of the surface may be covered with rock fragments. In some areas the substratum is glacial till or residuum.
Representative pedon: The surface layer is silt loam about 6 inches thick. The substratum is very gravelly silt loam. Bedrock is at a depth of 6 to 14 inches.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

Figure 3.—Small meadows are common in areas of Chenega silt loam, 3 to 8 percent slopes.

Figure 4.—A typical area of Cryods-Cryorthents-Rock outcrop complex, 5 to 120 percent slopes. This map unit is on mountaintops. Nanwalek silt loam, 25 to 65 percent slopes, is in the lower areas on the smoother slopes.

Figure 5.—An area of Ismailof sandy loam, 0 to 3 percent slopes, on the forested spit. The beach wildrye in the foreground is in an area of Beaches, gravelly.

Figure 6.—An area of Kasitsna-Tutka complex, 45 to 65 percent slopes. The Kasitsna soil (at left) is very deep. The Tutka soil (at right) is less than 20 inches deep over unweathered bedrock.

Figure 7.—Areas of Kasitsna-Tutka complex, rolling to steep, and Kasitsna-Tutka complex, hilly to very steep, are used primarily for timber production and wildlife habitat.

Figure 8.—Taluwik silt loam, 0 to 3 percent slopes, is used mainly for wildlife habitat, but some areas of this map unit have potential for agricultural uses.

Figure 9.—Natural regeneration of Sitka spruce in an area of Tutka silt loam, hilly to very steep.

Figure 10.—An area of Typic Cryaquents, salt marsh, in the foreground. This map unit provides important habitat for waterfowl and other wildlife. Kasitsna and Tutka soils are in the background.

For general and detailed information about managing this map unit for these and other land uses, see the section “Use and Management of the Soils.”

121—Kasitsna-Tutka complex, 65 to 120 percent slopes

Setting

Location: Widely distributed throughout the survey area
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 120 days
Map unit type: Complex
Note: This map unit is on the upper part of steep walls of U-shaped valleys.

Composition

Major components
Kasitsna and similar soils: 35 to 50 percent
Tutka and similar soils: 35 to 50 percent
Minor components
Nanwalek soils: 0 to 5 percent
Rock outcrop: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Kasitsna

Landform: Mountain slopes
Position on landform: Backslopes and footslopes
Slope range: 65 to 120 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading “Taxonomic Units and Their Morphology.” For additional information specific to this map unit, see the “Soil Properties” section.

Tutka

Landform: Mountain slopes
Position on landform: Backslopes and footslopes
Slope range: 65 to 120 percent
Slope type: All shapes
Depth class: Very shallow and shallow (less than 20 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 3.7 inches
Note: As much as 10 percent of the surface may be covered with rock fragments. In some areas the substratum is glacial till or colluvium.
Representative pedon: The surface layer is silt loam about 6 inches thick. The substratum is very gravelly silt loam. Bedrock is at a depth of 6 to 14 inches.

A detailed soil series description with range in characteristics is included under the heading “Taxonomic Units and Their Morphology.” For additional information specific to this map unit, see the “Soil Properties” section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section “Use and Management of the Soils.”

122—Kasitsna-Tutka complex, rolling to steep

Setting

Location: Widely distributed throughout the survey area
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 120 days
Map unit type: Complex
Note: This map unit is on the lower part of steep walls of U-shaped valleys (fig. 7).

Composition

Major components
Kasitsna and similar soils: 40 to 50 percent
Tutka and similar soils: 35 to 40 percent
Minor components
Poorly drained soils: 0 to 5 percent
Seldovia soils: 0 to 5 percent
Rock outcrop: 0 to 5 percent

Major Component Description

Kasitsna

Landform: Mountain slopes
Position on landform: Backslopes and footslopes
Slope range: 15 to 25 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Note: In some areas the soil formed in compact basal till and may be slightly cemented.
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Tutka

Landform: Mountain slopes
Position on landform: Shoulders and summits
Slope range: 15 to 25 percent
Slope type: All shapes
Depth class: Very shallow and shallow (less than 20 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 3.7 inches
Note: As much as 10 percent of the surface may be covered with rock fragments. In some areas the substratum is glacial till or residuum.
Representative pedon: The surface layer is silt loam about 6 inches thick. The substratum is very gravelly silt loam. Bedrock is at a depth of 6 to 14 inches.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

123—Kasitsna-Tutka complex, hilly to very steep

Setting

Location: Widely distributed throughout the survey area
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 120 days
Map unit type: Complex
Note: This map unit is on the lower part of steep walls of U-shaped valleys and on bedrock benches on valley walls (fig. 7).

Composition

Major components
Kasitsna and similar soils: 40 to 50 percent
Tutka and similar soils: 35 to 40 percent
Minor components
Poorly drained soils: 0 to 10 percent
Seldovia soils: 0 to 5 percent
Rock outcrop: 0 to 5 percent

Major Component Description

Kasitsna

Landform: Mountain slopes
Position on landform: Backslopes and footslopes
Slope range: 25 to 65 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading

"Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Tutka

Landform: Mountain slopes
Position on landform: Shoulders and summits
Slope range: 15 to 120 percent
Slope type: All shapes
Depth class: Very shallow and shallow (less than 20 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 3.7 inches
Note: As much as 10 percent of the surface may be covered with rock fragments. In some areas the substratum is glacial till or residuum.
Representative pedon: The surface layer is silt loam about 6 inches thick. The substratum is very gravelly silt loam. Bedrock is at a depth of 6 to 14 inches.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

124—Koyuktolik and Nuka peats, 0 to 8 percent slopes

Setting

Location: Widely distributed throughout the survey area
Elevation: 10 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Undifferentiated group
Note: This map unit is in depressions between glacial moraines and on slopes affected by seepage.

Composition

Major components
Koyuktolik and similar soils: 65 to 75 percent
Nuka and similar soils: 25 to 30 percent

Minor components
Poorly drained mineral soils: 0 to 10 percent

Major Component Description

Koyuktolik

Landform: Muskegs
Slope range: 0 to 8 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic material over gravelly till
Flooding: None
Water table: At the surface to 0.5 foot below the surface
Available water capacity: Mainly 14.3 inches
Note: In some areas the soil has thin layers of volcanic ash throughout.
Representative pedon: The surface layer is fibrous organic matter about 3 inches thick. The next layer, to a depth of about 55 inches, is partially decomposed organic matter. The substratum to a depth of 60 inches or more is very gravelly loamy sand.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Nuka

Landform: Muskegs
Slope range: 0 to 8 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Organic material over gravelly till
Flooding: None
Water table: At the surface to 0.5 foot below the surface
Available water capacity: Mainly 14.0 inches
Note: In some areas the soil has thin layers of volcanic ash throughout.
Representative pedon: The surface layer is fibrous peat about 9 inches thick. The next layer, to a depth of about 47 inches, is partially decomposed peat. The substratum to a depth of 60 inches or more is very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For

additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

125—Nanwalek silt loam, 25 to 65 percent slopes, warm

Setting

Location: Mainly in the western and central parts of the survey area
Elevation: 20 to 800 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Consociation
Note: This map unit is on warm south-facing slopes.

Composition

Major components
Nanwalek and similar soils: 85 to 95 percent
Minor components
Kasitsna soils: 0 to 5 percent
Tutka soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Landform: Mountain slopes
Position on landform: Backslopes and footslopes
Slope range: 25 to 65 percent
Slope type: Concave (south aspect)
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 7.9 inches
Representative pedon: The surface layer is silt loam about 4 inches thick. The next layer to a depth of 60 inches or more is very gravelly silt loam and very gravelly very fine sandy loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

126—Nanwalek-Kasitsna, cool, complex, 25 to 65 percent slopes

Setting

Location: Widely distributed throughout the survey area
Elevation: 20 to 1,500 feet
Mean annual precipitation: 45 to 85 inches
Frost-free period: 80 to 100 days
Map unit type: Complex
Note: This map unit is on steep mountain slopes.

Composition

Major components
Nanwalek and similar soils: 55 to 65 percent
Kasitsna, cool, and similar soils: 30 to 40 percent
Minor components
Tutka soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent
Rock outcrop: 0 to 5 percent

Major Component Description

Nanwalek

Landform: Mountain slopes
Position on landform: Backslopes, shoulders, and footslopes
Slope range: 25 to 65 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 7.9 inches
Note: As much as 10 percent of the surface may be covered with rock fragments.
Representative pedon: The surface layer is silt loam about 4 inches thick. The next layer to a depth of 60 inches or more is very gravelly silt loam and very gravelly very fine sandy loam.

A detailed soil series description with range in characteristics is included under the heading

"Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Kasitsna, cool

Landform: Mountain slopes
Position on landform: Backslopes, shoulders, and footslopes
Slope range: 25 to 65 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Note: As much as 10 percent of the surface may be covered with rock fragments.
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

127—Nanwalek-Kasitsna, cool, complex, 65 to 120 percent slopes

Setting

Location: Widely distributed throughout the survey area
Elevation: 20 to 1,500 feet
Mean annual precipitation: 45 to 85 inches
Frost-free period: 80 to 100 days
Map unit type: Complex
Note: This map unit is on very steep mountain slopes.

Composition

Major components
Nanwalek and similar soils: 60 to 70 percent
Kasitsna, cool, and similar soils: 25 to 35 percent

Minor components
Tutka soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent
Rock outcrop: 0 to 5 percent

Major Component Description

Nanwalek

Landform: Mountain slopes
Position on landform: Backslopes
Slope range: 65 to 120 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 7.9 inches
Note: As much as 10 percent of the surface may be covered with rock fragments.
Representative pedon: The surface layer is silt loam about 4 inches thick. The next layer to a depth of 60 inches or more is very gravelly silt loam and very gravelly very fine sandy loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Kasitsna, cool

Landform: Mountain slopes
Position on landform: Backslopes
Slope range: 65 to 120 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 9.5 inches
Note: As much as 10 percent of the surface may be covered with rock fragments.
Representative pedon: The surface layer is silt loam about 18 inches thick. The next layer, to a depth of about 31 inches, is loam. Below this to a depth of 60 inches or more is loam grading to very gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For

additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

128—Nanwalek-Rock outcrop complex, 65 to 120 percent slopes

Setting

Location: Widely distributed throughout the survey area
Elevation: 20 to 2,000 feet
Mean annual precipitation: 45 to 85 inches
Frost-free period: 90 to 130 days
Map unit type: Complex
Note: This map unit is on very steep mountain slopes.

Composition

Major components
Nanwalek and similar soils: 60 to 80 percent
Rock outcrop: 20 to 30 percent
Minor components
Tutka soils: 0 to 10 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Nanwalek

Landform: Mountain slopes
Position on landform: Backslopes, shoulders, and footslopes
Slope range: 65 to 120 percent
Slope type: Concave
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 7.9 inches
Note: As much as 10 percent of the surface is covered with rock fragments.
Representative pedon: The surface layer is silt loam about 4 inches thick. The next layer to a depth of 60 inches or more is very gravelly silt loam and very gravelly very fine sandy loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Rock outcrop

Definition: Exposures of unvegetated bedrock
Landform: Ridges
Slope range: 65 to 120 percent
Slope type: All shapes

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

129—Nanwalek silt loam, 25 to 65 percent slopes

Setting

Location: Widely distributed throughout the survey area
Elevation: 20 to 2,000 feet
Mean annual precipitation: 45 to 85 inches
Frost-free period: 90 to 130 days
Map unit type: Consociation
Note: This map unit is on steep mountain slopes.

Composition

Major components
Nanwalek and similar soils: 85 to 90 percent
Minor components
Tutka soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent
Rock outcrop: 0 to 5 percent

Major Component Description

Landform: Mountain slopes
Position on landform: Backslopes, shoulders, and footslopes
Slope range: 25 to 65 percent
Slope type: Concave
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 7.9 inches
Note: As much as 10 percent of the surface is covered with rock fragments.
Representative pedon: The surface layer is silt loam about 4 inches thick. The next layer to a depth of

60 inches or more is very gravelly silt loam and very gravelly very fine sandy loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

130—Petrof-Portdick complex, occasionally flooded

Setting

Location: Occurs only in the Rocky River Valley
Elevation: 20 to 150 feet
Mean annual precipitation: 65 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Complex
Note: This map unit is in a broad, braided stream valley.

Composition

Major components
Petrof and similar soils: 35 to 50 percent
Portdick and similar soils: 35 to 50 percent
Minor components
Poorly drained soils: 0 to 10 percent
Chenega soils: 0 to 3 percent
Jakolof soils: 0 to 2 percent

Major Component Description

Petrof

Landform: Flood plains and stream terraces
Slope range: 0 to 3 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Flooding: Occasional
Depth to water table: 2 to 4 feet below the mineral soil surface
Available water capacity: Mainly 6.5 inches
Note: Textures and arrangement of stratification can vary within relatively short distances.
Representative pedon: The surface layer is silt loam about 7 inches thick. The substratum to a depth of 60 inches or more is fine sandy loam. It is stratified.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Portdick

Landform: Flood plains and stream terraces
Slope range: 0 to 3 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Flooding: Occasional
Depth to water table: 2 to 4 feet below the mineral soil surface
Available water capacity: Mainly 6.4 inches
Note: Textures and arrangement of stratification can vary within relatively short distances.
Representative pedon: The surface layer is silt loam about 19 inches thick. The subsoil, to a depth of about 37 inches, is stratified silt loam and fine sandy loam. The substratum to a depth of 60 inches or more is very gravelly loamy sand.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

131—Rock outcrop, sea cliffs

Setting

Location: Along the western and southern coastline of the survey area
Elevation: 0 to 1,500 feet
Map unit type: Consociation
Note: This map unit consists of areas of nearly vertical cliffs and small shelves.

Composition

Major component
Rock outcrop: 90 to 95 percent

Minor components
Cryorthents: 0 to 5 percent

Major Component Description

Definition: Exposures of unvegetated bedrock
Landform: Sea cliffs
Position on landform: Backslopes
Slope range: 100 to 200 percent

132—Rock outcrop-Cryorthents, very steep

Setting

Location: Above the timberline throughout the survey area
Elevation: 1,500 to 3,500 feet
Mean annual precipitation: 75 to 100 inches
Frost-free period: 60 to 100 days
Map unit type: Complex
Note: This map unit is on aretes, horns, and rock glaciers.

Composition

Major components
Rock outcrop: 50 to 60 percent
Cryorthents and similar soils: 30 to 40 percent
Minor components
Nanwalek soils: 0 to 5 percent
Poorly drained soils: 0 to 2 percent

Major Component Description

Rock outcrop

Definition: Exposures of unvegetated bedrock
Landform: Aretes, horns, and cirques
Slope range: 5 to 120 percent
Slope type: All shapes

Cryorthents

Landform: Mountains
Position on landform: Summits
Slope range: 5 to 120 percent
Slope type: All shapes
Depth class: Shallow and moderately deep (10 to 40 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Colluvium or residuum
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 2.0 inches
Note: As much as 50 percent of the surface is covered with rock fragments.
Representative pedon: The surface layer, to a depth of about 13 inches, is very gravelly sandy loam. The next layer, to a depth of about 24 inches, is very gravelly loamy sand. The substratum to a depth of 40 inches or more is extremely gravelly sand.

A detailed description with range in characteristics is included under the heading “Taxonomic Units and Their Morphology.” For additional information specific to this map unit, see the “Soil Properties” section.

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section “Use and Management of the Soils.”

133—Rubble land

Setting

Location: Mainly along coastlines
Elevation: 20 to 1,500 feet
Map unit type: Consociation
Note: This map unit is on steep mountain slopes.

Composition

Major component
Rubble land: 90 to 95 percent
Minor components
Cryorthents: 0 to 5 percent

Major Component Description

Definition: Areas of cobbles, stones, and boulders, commonly at the base of mountains
Landform: Mountain slopes
Position on landform: Backslopes and footslopes
Slope range: 25 to 120 percent
Slope type: Plane
Dominant parent material: Colluvium or residuum

134—Seldovia silt loam, 8 to 15 percent slopes

Setting

Location: Mainly in the western part of the survey area
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Consociation
Note: This map unit is on marine terraces and in areas of gently sloping ground moraine.

Composition

Major components
Seldovia and similar soils: 85 to 90 percent

Minor components
Tutka soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Landform: Marine terraces
Slope range: 8 to 15 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 12.2 inches
Representative pedon: The surface layer, to a depth of about 29 inches, is silt loam. The subsoil, to a depth of about 46 inches, is very gravelly silt loam. Below this to a depth of 60 inches or more is gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

135—Seldovia silt loam, 25 to 45 percent slopes

Setting

Location: Mainly in the western part of the survey area
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Consociation
Note: This map unit is on the lower slopes of U-shaped mountain valleys.

Composition

Major components
Seldovia and similar soils: 85 to 90 percent
Minor components
Tutka soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Landform: Mountain slopes
Position on landform: Backslopes and footslopes
Slope range: 25 to 45 percent
Slope type: All shapes
Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Volcanic ash over till or colluvium
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 12.2 inches
Representative pedon: The surface layer, to a depth of about 29 inches, is silt loam. The subsoil, to a depth of about 46 inches, is very gravelly silt loam. Below this to a depth of 60 inches or more is gravelly loam.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

136—Taluwik silt loam, 0 to 3 percent slopes

Setting

Location: Mainly in English Bay Valley and Port Graham Valley
Elevation: 200 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Consociation
Note: This map unit is on individual or coalesced alluvial fans.

Composition

Major components
Taluwik and similar soils: 85 to 90 percent
Minor components
Chenega soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Landform: Alluvial fans

Position on landform: Footslopes and toeslopes
Slope range: 0 to 3 percent
Slope type: Plane
Slope length: 100 to 400 feet
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Volcanic ash over alluvium
Flooding: None
Depth to water table: 3 to 6 feet below the mineral soil surface
Available water capacity: Mainly 12.2 inches
Note: In some areas the substratum is sand and gravel and may be many feet in thickness.
Representative pedon: The surface layer is very fine sandy loam about 4 inches thick. The subsoil, to a depth of about 38 inches, is very fine sandy loam. The substratum to a depth of 60 inches or more is very gravelly sand.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Wildlife habitat (fig. 8)

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

137—Taluwik silt loam, 3 to 8 percent slopes

Setting

Location: Mainly in English Bay Valley and Port Graham Valley
Elevation: 200 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Consociation
Note: This map unit is on individual or coalesced alluvial fans.

Composition

Major components
Taluwik and similar soils: 85 to 90 percent
Minor components
Chenega soils: 0 to 5 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Landform: Alluvial fans
Position on landform: Footslopes and toeslopes
Slope range: 3 to 8 percent
Slope type: Plane
Slope length: 100 to 400 feet
Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Volcanic ash over alluvium
Flooding: None
Depth to water table: 3 to 6 feet below the mineral soil surface
Available water capacity: Mainly 12.2 inches
Note: In some areas the substratum is sand and gravel that may be many feet in thickness.
Representative pedon: The surface layer is very fine sandy loam about 4 inches thick. The subsoil, to a depth of about 38 inches, is very fine sandy loam. The substratum to a depth of 60 inches or more is very gravelly sand.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

138—Tutka silt loam, 45 to 65 percent slopes

Setting

Location: In the Rocky Bay and Windy Bay areas
Elevation: 20 to 1,500 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 120 days
Map unit type: Consociation
Note: This map unit is on glacially abraded ridges of broad U-shaped mountain valleys.

Composition

Major components
Tutka and similar soils: 85 to 90 percent
Minor components
Kasitsna soils: 0 to 10 percent
Rock outcrop: 0 to 3 percent
Poorly drained soils: 0 to 2 percent

Major Component Description

Landform: Roches moutonnées
Position on landform: Summits, shoulders, backslopes, and footslopes

Slope range: 45 to 65 percent
Slope type: All shapes
Depth class: Very shallow and shallow (less than 20 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 3.7 inches
Representative pedon: The surface layer is silt loam about 6 inches thick. The substratum is very gravelly silt loam. Bedrock is at a depth of 6 to 14 inches.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

139—Tutka silt loam, rolling to steep

Setting

Location: Mainly in the Rocky Bay and Windy Bay areas
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Consociation
Note: This map unit is on glacially abraded bedrock ridges of broad U-shaped mountain valleys.

Composition

Major components
Tutka and similar soils: 85 to 90 percent
Minor components
Kasitsna soils: 0 to 10 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Landform: Roches moutonnées
Position on landform: Summits, shoulders, backslopes, and footslopes
Slope range: 8 to 25 percent
Slope type: All shapes
Depth class: Very shallow and shallow (less than 20 inches) to unweathered bedrock
Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 3.7 inches
Representative pedon: The surface layer is silt loam about 6 inches thick. The substratum is very gravelly silt loam. Bedrock is at a depth of 6 to 14 inches.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

140—Tutka silt loam, hilly to very steep

Setting

Location: Mainly in the Rocky Bay and Windy Bay areas
Elevation: 20 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 100 to 130 days
Map unit type: Consociation
Note: This map unit is on glacially abraded bedrock ridges of broad U-shaped mountain valleys.

Composition

Major components
Tutka and similar soils: 85 to 90 percent
Minor components
Kasitsna soils: 0 to 10 percent
Poorly drained soils: 0 to 5 percent

Major Component Description

Landform: Roches moutonnées
Position on landform: Summits, shoulders, backslopes, and footslopes
Slope range: 25 to 45 percent
Slope type: All shapes
Depth class: Very shallow and shallow (less than 20 inches) to unweathered bedrock

Drainage class: Well drained
Dominant parent material: Volcanic ash over till
Flooding: None
Depth to water table: More than 6 feet
Available water capacity: Mainly 3.7 inches
Representative pedon: The surface layer is silt loam about 6 inches thick. The substratum is very gravelly silt loam. Bedrock is at a depth of 6 to 14 inches.

A detailed soil series description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Forestry (fig. 9)
- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

141—Typic Cryaquents, salt marsh

Setting

Location: Mainly in the southern and western parts of the survey area
Elevation: 0 to 5 feet
Mean annual precipitation: 45 to 90 inches
Frost-free period: 100 to 140 days
Map unit type: Consociation
Note: This map unit is at the interface of the lower reaches of major streams and the supratidal zone.

Composition

Major components
Typic Cryaquents and similar soils: 90 to 95 percent
Minor components
Cobbly soils: 0 to 10 percent

Major Component Description

Landform: Deltas and estuaries
Slope range: 0 to 1 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Dominant parent material: Estuarine deposits
Flooding: Frequent
Depth to water table: 0.5 foot to 2.0 feet below the mineral soil surface
Available water capacity: Mainly 7.3 inches
Note: These soils are stratified and have a variety of surface textures.
Representative pedon: The surface layer is silt loam about 33 inches thick. The substratum to a depth of 60 inches or more is very gravelly loamy sand.

A detailed description with range in characteristics is included under the heading "Taxonomic Units and Their Morphology." For additional information specific to this map unit, see the "Soil Properties" section.

Suitable Uses of the Unit

- Wildlife habitat (fig. 10)

For general and detailed information about managing this map unit for these and other land uses, see the section "Use and Management of the Soils."

142—Typic Cryaquents-Andic Cryofluvents complex, 0 to 3 percent slopes

Setting

Location: Mainly in the English Bay Valley
Elevation: 10 to 1,000 feet
Mean annual precipitation: 45 to 75 inches
Frost-free period: 110 to 130 days
Map unit type: Complex
Note: This map unit is on broad valley floors.

Composition

Major components
Typic Cryaquents and similar soils: 35 to 50 percent
Andic Cryofluvents and similar soils: 30 to 40 percent
Minor components
Jakolof soils: 0 to 10 percent
Chenega soils: 0 to 5 percent
Very poorly drained soils: 0 to 5 percent

Major Component Description

Typic Cryaquents

Landform: Flood plains
Slope range: 0 to 3 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained
Dominant parent material: Alluvium
Flooding: Frequent
Depth to water table: 1 to 2 feet below the mineral soil surface
Available water capacity: Mainly 5.6 inches
Representative pedon: The surface layer is very fine

sandy loam about 21 inches thick. The substratum to a depth of 60 inches or more is very gravelly loamy sand.

A detailed description with range in characteristics is included under the heading “Taxonomic Units and Their Morphology.” For additional information specific to this map unit, see the “Soil Properties” section.

Andic Cryofluvents

Landform: Flood plains and stream terraces
Slope range: 0 to 3 percent
Slope type: Plane
Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Volcanic ash over alluvium
Flooding: Occasional
Depth to water table: 1.5 to 2.5 feet below the mineral soil surface
Available water capacity: Mainly 4.2 inches
Representative pedon: The surface layer is very fine sandy loam about 8 inches thick. It has thin strata of loamy fine sand. The substratum to a depth of 60 inches or more is very gravelly sand.

A detailed description with range in characteristics is included under the heading “Taxonomic Units and Their Morphology.” For additional information specific to this map unit, see the “Soil Properties” section.

Suitable Uses of the Unit

- Wildlife habitat

For general and detailed information about managing this map unit for these and other land uses, see the section “Use and Management of the Soils.”

143—Urban land

Setting

Location: In the city of Seldovia and at Jakolof Bay
Map unit type: Consociation

Composition

Major component
Urban land: 85 to 95 percent

Minor components
Cryaquents: 0 to 5 percent
Tutka soils: 0 to 5 percent
Kasitsna soils: 0 to 5 percent

Major Component Description

Definition: Large areas that have been excavated, covered with fill material, or both for the construction of roads, buildings, and other structures
Slope range: 0 to 8 percent
Slope type: Plane

144—Water, fresh

Setting

Location: Lakes and ponds
Map unit type: Consociation

Composition

Major component
Water, fresh: 100 percent

Major Component Description

Definition: Freshwater lakes and ponds larger than about 5 acres in size

145—Water, saline

Setting

Location: Coastal water bodies
Map unit type: Consociation

Composition

Major component
Water, saline: 100 percent

Major Component Description

Definition: Saltwater inlets, bays, and open ocean areas larger than about 5 acres in size

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for agronomic applications, for forestry, as sites for parks and other recreational facilities, for wildlife habitat, and as construction materials. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Soil Characteristics

This section describes some of the general characteristics of the soils in the survey area and relates them to the management of the soils for various uses. More detailed information about soil characteristics is available under the heading “Soil Properties.”

Most of the upland soils in the survey area are blanketed with a mantle of volcanic ash and small amounts of eolian glacial silt that has been accumulating over the past several thousand years since the last glacial recession. Tutka soils, which are shallow to bedrock, have a relatively thin mantle of ash. Kasitsna, Portgraham, and Taluwik soils have about 15 to 35 inches of ash. Nanwalek and Seldovia soils have accumulations of ash ranging from 35 inches to more than 60 inches in thickness. The amount of volcanic glass in the sand fraction for some surface horizons in the Seldovia area has been reported in the 92 to 93 percent range (Ping and others, 1989).

Soils that formed in volcanic ash have many unique physical properties that are attributable directly to the volcanic ash, the noncrystalline materials formed by weathering, and the organic matter accumulated during soil formation (Nanzyo and others, 1993). These materials are amorphous—that is, they have no definite structure and have properties that have significant influence on the hydrology, engineering behavior, flora and fauna, and use and management of soils in the survey area.

The bulk density of the ashy horizons is about 0.4 to 0.9. This range is very low compared to that in the underlying glacial till, which has a bulk density of about 1.4. The content of organic carbon is high; some horizons commonly have 12 to 16 percent. Selected chemical and physical properties of Kasitsna soils, Cryods, and Nanwalek soils are presented in table 6.

Physical characteristics and properties that are important to engineering uses and that distinguish ashy soils include a high natural water content, low bulk density, a high plastic limit and a low range of plasticity, high permeability, and marked change in physical properties on drying (Warkentin, 1985). These properties of ashy soils have some undesirable aspects for engineering applications. The ashy soils have low shear strength, low bearing capacity, and poor compactibility and are susceptible to severe frost action. They are slippery in moist or wet conditions

and are unable to support the load of heavy equipment or structures. When disturbed by physical impact, they tend to collapse or fail. The matrix of the soil is weak; crushing destroys the voids and releases free water.

A mantle of ashy soils that have low strength generally overlies less permeable glacial till or bedrock on steep slopes. Shallow soil failures (slumping) result when strata with lower permeability underlie ashy horizons. The water content of the upper horizons increases, and the loss of strength combined with the steep slopes leads to slumping (Taskey and others, 1979). Similar conditions exist in parts of southeastern Alaska and the Pacific Northwest. Slope failures in those regions are common, and the frequency increases if poor management practices are applied (Swanston, 1974). Numerous small, naturally occurring landslides or slumps can be found on steep mountain slopes in the survey area. At least one major soil failure has occurred in the area. This event destroyed a section of road along the Rocky River during a severe storm on October 10, 1986.

The design of road building and logging activities should include consideration of slope stability and the potential for soil mass movement.

Important chemical characteristics of the soils are pH of 4 to 5, phosphorus absorption capacity in some horizons of as much as 99 percent, and high levels of extractable aluminum and iron. Sitka spruce forests and luxuriant stands of grass and shrubs occupy most landscapes, except at the highest elevations, despite the predominance of strongly acid, naturally infertile soils. In marked contrast, however, are the sparsely vegetated areas of Cryorthents in map unit 104 (including Red Mountain, which is a site of known chrome deposits). Soils that formed in ultramafic materials commonly have high levels of exchangeable magnesium and toxic concentrations of heavy metals. Laboratory analysis of a soil sample from the Red Mountain area indicated a calcium to magnesium ratio of 1:4. Calcium to magnesium ratios of 2:1 are common for most of the other soils in the area.

Agronomy

At the present time use of the soils in the survey area for growing food is limited to a few small gardens, wild berry production, and native plants harvested for subsistence. In the past there have been a few small homesteads in the Seldovia area that provided produce and other farm products for home consumption and possibly the local market when the village was the center of commerce for the area. For a short time the Windy River Valley (elevation 900 to 1,000 feet) to the north of Red Mountain was farmed. Hay fields provided grazing and a source of hay for winter feed for cattle. Cattle were sometimes moved to the lower elevations around Jakolof Bay to forage on native grasses during the long winter. Sugar beets were also grown for forage.

The soils that formed in the ashy mantle have good physical properties for agricultural use. They are easily tilled, are rapidly permeable but can hold sufficient water, and have a high content of organic carbon that contributes to good structure. The chemical properties of these soils, however, are not particularly favorable. The soils are naturally infertile, are very strongly acid, and make as much as 99 percent of the phosphorus unavailable to plants. When tilled and left without cover, they are susceptible to water erosion in all but the gently sloping areas.

The areas that have the highest potential for small-scale vegetable production are areas of Taluwik and Jakolof soils in the English Bay and Port Graham Valleys. These soils, which support native vegetation of grass and forbs and scattered stands of Sitka spruce and cottonwood, would not require extensive clearing prior to production.

The Petrof and Portdick soils in the Rocky River Valley formed in alluvium. These soils are unique in the survey area in that they are nonacid, probably because of the influence of ultramafic parent materials in the upper part of the watershed at Red Mountain. These soils would probably require less lime and fertilizer for agricultural production than some of the other soils in the area; however, this advantage is offset by their exposure to the cooler and wetter conditions of the southern coast.

The design of any land development adjacent to wetlands or streams should include measures that minimize runoff and seepage of agricultural chemicals that would degrade those valuable resources.

Native Vegetation

Tom Ward, forester, Anchorage, Alaska, prepared this section.

The Lower Kenai Peninsula area is near the northern and western limits of the Sitka spruce forest cover type (Eyre, 1980). Sitka spruce forests are on flood plains, stream terraces, and mountain slopes in areas of very poorly drained organic soils to well drained mineral soils. Stands on very poorly drained to moderately well drained soils are generally open grown with relatively short trees. Productive commercial stands are in areas of well drained mineral soils. Most spruce stands are apparently uneven-aged. Mature dominant trees on well drained soils are more than 200 years old and as much as 50 inches in diameter and 150 feet in height.

The less extensive forest cover types include black cottonwood and mixed Sitka spruce-black cottonwood on well drained soils along major rivers. Scattered throughout the forest zone are thickets of Sitka alder scrub along the smaller drainageways, avalanche chutes, and forest openings; willow scrub on flood plains and in drainageways; and bluejoint reedgrass meadows in forest openings and on steep south-facing slopes.

Treeline elevation is approximately 1,500 feet but varies considerably depending on slope, aspect, and other conditions. Many steep south-facing slopes in the western part of the survey area are unforested down to sea level. Above the treeline the vegetation consists of a mosaic of Sitka alder scrub, bluejoint reedgrass grasslands, and dwarf alpine scrub and herbs. Rock outcrops are extensive in the alpine zone. Barren scree and boulder fields are common in avalanche chutes on mountain slopes.

A vegetation cover type is a basic unit of vegetation classification and represents a type of vegetation with relatively uniform structure and floristic composition. Each cover type is distinguished by the dominant and codominant plant species in the major strata (horizontal layers) in the existing vegetation.

The various cover types recognized for the Lower Kenai Peninsula survey area are described below. The most common cover types on each soil are listed in table 7. In the type descriptions, each type is linked to the best-fit level III and IV classes in the Alaska Vegetation Classification (Viereck and others, 1992). Level IV classes are given in parentheses following the corresponding level III type. Scientific names of plants used in the descriptions are given in table 8 (Hultén, 1968; Pojar and MacKinnon, 1994).

Forest Types in River Bottoms

Black Cottonwood Forest.—This forest type consists of open to closed black cottonwood forests on flood plains and stream terraces of major rivers and alluvial fans below an elevation of about 400 feet. Sitka spruce is a common associated tree in most stands. Total tree canopy ranges from less than 25 to more than 80 percent. The understory is dominated by an open to closed layer of tall and low shrubs and dense herbs in the ground layer. Dominant shrubs include Sitka alder, nootka rose, various willows, and salmonberry. Herbs are represented by a wide variety of species, the most common of which are bluejoint reedgrass, lady fern, oak fern, and shield fern, common fireweed, Canadian burnet, and boreal yarrow. Dwarf herbs and leafy litter cover most of the ground surface.

Alaska Vegetation Classification: Closed broadleaf forest (Black cottonwood); Open broadleaf forest (Black cottonwood)

Sitka Spruce-Black Cottonwood Forest.—This forest type consists of moderately open to closed, mixed Sitka spruce-black cottonwood forests on flood plains and stream terraces of major rivers and alluvial fans. Most stands occur below an elevation of 200 feet. Total tree canopy cover is generally more than 50 percent. The understory is dominated by an open to closed layer of tall and low shrubs and dense herbs in the ground layer. Dominant shrubs include Sitka alder, salmonberry, devil's club, red elderberry, and highbush cranberry. Herbs are represented by a wide variety of species, the most common of which are bluejoint reedgrass, lady fern, oak fern, and shield fern. Dwarf herbs and leafy litter cover most of the ground surface.

Alaska Vegetation Classification: Open mixed forest; Closed mixed forest

Sitka Spruce/Bluejoint Reedgrass Forest.—This forest type consists of open Sitka spruce forests on flood plains and stream terraces of major rivers and alluvial fans below an elevation of about 250 feet. Total tree canopy ranges from about 20 to 40 percent. The understory is characterized by a nearly continuous, open to closed cover of bluejoint reedgrass up to 4 feet tall; common lady fern, shield fern, and oak fern; and a variety of medium and low-growing forbs. Tall shrubs, primarily Sitka alder, salmonberry, and red elderberry, protrude through the grass cover forming an irregular tall shrub layer. Scattered patches of moss, leaf litter, and grass mulch cover most of the ground surface.

Alaska Vegetation Classification: Open needleleaf forest (Sitka spruce)

Forest Types on Moraines and Mountain Slopes

Sitka Spruce/Black Crowberry Forest.—This forest type consists of open Sitka spruce forests on steep mountain slopes at the upper elevations and on some organic soils at the lower elevations. Total tree canopy generally ranges between about 30 and 45 percent. The understory is characterized by a moderately open to closed low and dwarf shrub layer dominated by black crowberry and, in many stands, bog blueberry and luetkea. Within the dwarf shrub layer are common dwarf and low herbs, including bunchberry dogwood, caltha-leaf avens, subalpine fleabane, and five-leaf bramble. Scattered low and tall shrubs, primarily Sitka alder, rusty menziesia, and oval-leaf blueberry, are common in many stands. At the upper elevations, this type often forms a transitional type to subalpine scrub and herbaceous vegetation types.

Alaska Vegetation Classification: Open needleleaf forest (Sitka spruce)

Sitka Spruce/Devil's Club Forest.—This forest type consists of open to closed Sitka spruce forests on mountain slopes and ground moraines, generally below an elevation of about 400 feet. Total tree canopy cover ranges from about 30 to 90 percent. The understory is characterized by an open to moderately closed layer of devil's club and other common forest shrubs that grow to a height of about 6 feet. Tall ferns, primarily lady fern, shield fern, and oak fern, dominate the herb layer. Five-leaf bramble, mosses, and litter cover the ground surface. This is the most common and widespread forest type at the lower elevations.

Alaska Vegetation Classification: Open needleleaf forest (Sitka spruce); Closed needleleaf forest (Sitka spruce)

Sitka Spruce/Mixed Shrub Forest.—This forest type consists of open to closed Sitka spruce forests on ground moraines and mountain slopes from near sea level to an elevation of about 1,400 feet. Total tree canopy cover ranges from about 25 to 90 percent. Woodland stands near the treeline (less than 25 percent canopy cover) are common. The understory is characterized by a moderately closed or closed shrub layer about 5 to 7 feet tall. Dominant tall shrubs include devil's club, Sitka alder, salmonberry, oval-leaf blueberry, and red elderberry. Actual shrub composition varies considerably throughout the extent of this type. Sitka alder and red elderberry are more abundant under more open forest cover, and devil's club and oval-leaf blueberry increase in abundance in closed stands. The herb layer is dominated by lady fern, shield fern, oak fern, and beech fern. Five-leaf bramble, bunchberry dogwood, mosses, and litter cover the ground surface. This is the most common and widespread forest type at mid elevations.

Alaska Vegetation Classification: Closed needleleaf forest (Sitka spruce); Open needleleaf forest (Sitka spruce)

Sitka Spruce/Moss Forest.—This forest type consists of moderately open to closed Sitka spruce forests on mountain slopes. It generally occurs below an elevation of about 500 feet, but the range can extend to about 1,300 feet. Total tree canopy cover ranges from about 45 to 90 percent, but a few woodland and open stands (10 to 45 percent cover) also occur. The understory is characterized by a nearly continuous layer of dwarf herbs and feathermosses on the ground surface. Many stands, particularly younger stands and stands with more open forest cover, also have common or abundant ferns. In these stands, the abundance of moss is generally greatly reduced. Common dwarf herbs include bunchberry dogwood, stiff clubmoss, and five-leaf bramble.

Alaska Vegetation Classification: Closed needleleaf forest (Sitka spruce); Open needleleaf forest (Sitka spruce)

Scrub Types

Alpine Scrub.—This type consists of dwarf scrub on mountain slopes and ridges in the alpine zone above an elevation of about 1,400 feet. Shrub cover ranges from open to closed. Shrub height is generally less than about 6 inches and in some stands is less than 2 inches. Shrub composition varies widely depending on soil and site characteristics. One or more of the following are dominant in most stands: black crowberry, Aleutian mountain-heath, starry mountain-heath, bog blueberry, luetkea, and arctic willow. Herbs are represented by a wide variety of species; however, as a group they are not generally very abundant. Sedges are typically the most common herbs. Ground surface cover varies widely and consists of patches of moss and lichen, litter, and rock fragments.

Alaska Vegetation Classification: Ericaceous dwarf scrub (Vaccinium tundra; Crowberry tundra; Mountain-heath tundra; Cassiope tundra); Willow dwarf scrub (Willow tundra)

Low Willow Scrub.—This type consists of low scrub dominated by Barclay's willow and Sitka willow on flood plains, stream terraces, and alluvial fans from near sea level to an elevation of about 1,000 feet. Sitka alder is intermixed with the willow in many stands. Total shrub canopy cover is typically greater than 75 percent. Shrub height ranges from about 3 to 6 feet. In some stands, scattered Sitka spruce trees protrude through the shrub canopy, forming a discontinuous woodland. Common plants below the shrub canopy include bluejoint reedgrass, Canadian burnet, common fireweed, boreal yarrow, and horsetail. Arctic starflower, northern blackberry, and other dwarf herbs and leafy litter cover most of the ground surface.

Alaska Vegetation Classification: Closed low scrub (Low willow; Low alder-willow)

Tall Sitka Alder Scrub.—This type consists of tall scrub dominated by Sitka alder on mountain slopes and in forest openings between elevations of about 400 and 1,400 feet. Other tall shrubs that may occur include salmonberry, devil's club, and red elderberry. Total shrub canopy cover ranges from about 25 to 100 percent. Shrub height ranges from about 5 to more than 15 feet. Understory plant cover is generally high and is composed of a wide variety of tall herbs and ferns. The most abundant species typically include bluejoint reedgrass, lady fern, shield fern, oak fern, common fireweed, and false hellebore. In general, as the shrub canopy cover increases, fern cover and dominance increase. Conversely, under more open

shrub cover, bluejoint reedgrass and common fireweed are more abundant. Leafy litter covers most of the ground surface.

Alaska Vegetation Classification: Closed tall scrub (Alder); Open tall scrub (Alder)

Tall Sitka Alder-Devil's Club Scrub.—This type consists of tall scrub codominated by mixed Sitka alder and devil's club on mountain slopes and in forest openings, generally below an elevation of 600 feet. Red elderberry and salmonberry are common in most stands. Total shrub canopy cover is typically greater than 75 percent. Shrub height ranges from about 6 to 20 feet. The understory is generally lush and is dominated by ferns (primarily lady fern, shield fern, and oak fern) and scattered tall forbs. Leafy litter covers most of the ground surface.

Alaska Vegetation Classification: Closed tall scrub (Alder); Open tall scrub (Alder)

Tall Sitka Alder-Salmonberry Scrub.—This type consists of tall scrub codominated by mixed Sitka alder and salmonberry on mountain slopes between elevations of about 400 and 1,200 feet. Red elderberry and devil's club are common tall shrubs in some stands, particularly at the lower elevations. Total shrub canopy cover ranges from about 65 to 100 percent. Shrub height ranges from about 5 to more than 15 feet. The understory varies from one stand to another and within a given stand, but it is typically dominated by ferns (primarily lady fern, shield fern, and oak fern), bluejoint reedgrass, and common fireweed. Bluejoint reedgrass and common fireweed are more abundant in areas in which the shrub cover is more open and in canopy openings. Leafy litter covers most of the ground surface.

Alaska Vegetation Classification: Closed tall scrub (Alder); Open tall scrub (Alder)

Herbaceous Types

Alpine Herbland.—This type consists of herbaceous alpine communities on shallow, gravelly and cobbly soils above an elevation of about 1,700 feet. Bedrock outcrops are common. Plant cover is generally fairly sparse, and species dominance varies widely. The best represented plants in most stands are sedges.

Alaska Vegetation Classification: Mesic graminoid herbaceous (Mesic sedge-herb meadow tundra; Mesic sedge-herb meadow tundra); Dry forb herbaceous (Alpine herb-sedge; Alpine herbs)

Beach Wildrye Grassland.—This type consists of herbaceous communities dominated by beach wildrye on well drained coastal sand dunes and beach terraces from sea level to an elevation of about 50 feet. In most places, beach wildrye forms nearly pure stands. Other grasses and forbs are of minor extent. Associated plants include sedge, Pacific hemlock-parsley, orache, scurvy-grass, and beach lovage. Plant cover varies from even and moderately closed to patchy and open. Drifting sand is exposed across much of the ground surface throughout most stands.

Alaska Vegetation Classification: Dry graminoid herbaceous (Elymus)

Bluejoint Reedgrass-Forb Grassland.—This type consists of herbaceous communities dominated by bluejoint reedgrass and a wide variety of forbs on steep, southerly and westerly mountain slopes between elevations of about 500 and 1,400 feet. Principal forbs include common fireweed, lady fern, Canadian burnet, false hellebore, cow-parsnip, northern geranium, and oak fern. In some stands at the higher elevations, bluejoint reedgrass is less abundant and forbs dominate the community. Sitka alder, salmonberry, and red elderberry are scattered throughout many stands. Herbaceous vegetation ranges in height from about 1 to 3 feet at maturity.

Alaska Vegetation Classification: Mesic graminoid herbaceous (Bluejoint meadow; Bluejoint-herb meadow)

Bluejoint Reedgrass-Forb Meadow.—This type consists of herbaceous communities dominated by bluejoint reedgrass and a wide variety of forbs in openings in Sitka spruce forest below an elevation of about 400 feet. Stands range from less than an acre to several acres in size. Principal forbs include common fireweed, mountain goldenrod, boreal yarrow, northern geranium, and Canadian burnet. Vegetation ranges in height from about 1 to 3 feet at maturity.

Alaska Vegetation Classification: Mesic graminoid herbaceous (Bluejoint meadow; Bluejoint-herb meadow)

Halophytic Wet Meadow.—This type consists of wetland herbaceous communities dominated or codominated by salt-tolerant forbs and grasses on beaches in the upper tidal zone. Common plants include Lyngby's sedge, sea plantain, sea-milkwort, alkali grass, and scurvy-grass. Beach wildrye is common on the higher beaches and adjacent to dunes.

Alaska Vegetation Classification: Wet forb herbaceous (Halophytic herb wet meadow); Wet graminoid herbaceous (Halophytic grass wet meadow, small areas of Halophytic sedge wet meadow)

Sedge-Moss Bog Meadow.—This type is characterized by low sedges, cottonsedge, and other herbs and scattered dwarf shrubs growing out of a matrix of sphagnum and other mosses. Stunted Sitka spruce occurs in many places as scattered individuals and small thickets. Common dwarf shrubs include shrub birch, black crowberry, and small cranberry. In

addition to sedges, common herbs include cloudberry, round-leaf sundew, and horsetail. Bluejoint reedgrass is common in places. This wetland cover type occurs in depressions in Sitka spruce forests. Stands range from less than an acre to several acres in size. This type generally occurs below an elevation of 300 feet, but it can occur at elevations as high as 900 feet.

Alaska Vegetation Classification: Wet graminoid herbaceous (Subarctic lowland sedge-moss bog meadow)

Vegetation in Timber Harvest Areas

Vegetation in timber harvest areas varies widely throughout the survey area depending on differences in soil and site characteristics, the size of the cutting unit, the harvest methods and the degree of ground disturbance, slash loading, seed sources, and time since cutting. In large clearcuts in the Rocky-Windy Bay area, bluejoint reedgrass is the dominant cover. Sitka spruce regeneration and tall shrubs are common or abundant throughout. In smaller clearcuts near Seldovia, Port Graham, and Koyuktolik Bay, bluejoint reedgrass-forbs are the dominant cover. Principal forbs include common fireweed and various ferns. Scattered Sitka spruce regeneration and low and tall shrubs also are common or abundant in these communities. Minor community types in the smaller cuts include lady fern, feathermoss, tall devil's club scrub, and tall salmonberry scrub.

Forestry

Tom Ward, forester, Anchorage, Alaska, prepared this section.

The forests in the survey area provide a variety of wood products for human use. Russian colonists in the early 1800's periodically harvested Sitka spruce for construction materials and fuelwood. Since then, a number of small sawmills have operated in various locations, producing sawn products and raw logs for local consumption and export. Large-scale logging began in the area in the late 1960's; between then and 1978 many thousands of acres were cut in the Rocky-Windy Bay area, near Seldovia Bay, and elsewhere. Since logging resumed in 1989, about 700 acres per year have been cut (ADOF, 1994). Extensive acreages and substantial volumes of timber have been logged from areas of Chenega, Jakolof, Kasitsna, Portdick, Portgraham, and Tutka soils.

The primary harvesting method has been clearcutting. Individual cutting blocks range in size from about 40 to more than 1,000 acres. In most places, timber was removed from the woods with conventional skidding techniques using wheeled and tracked equipment and with high lead cable systems. Helicopter logging has been used in some areas to selectively harvest prime timber. Discoloration and decay from heart rot are common in old-growth Sitka spruce in the area. Apparently slinging and in some cases skidding marginal quality logs out of the woods was not profitable, and defective timber was often cut and left on the ground.

With the exception of limited hand planting in a few locations in the Seldovia Bay and Windy Bay areas, reforestation has been entirely dependent on natural regeneration, usually without deliberate site preparation. In most places, natural regeneration has been marginally successful; results and related problems have been well documented (Harris, 1974; Sanders, 1980; Ward and others, 1994) and are related to a number of factors and conditions. Unlike elsewhere in southeastern Alaska, Sitka spruce in the Lower Kenai Peninsula area produces good seed crops only about every 5 to 8 years (Burns and Honkala, 1990). Optimal regeneration would be expected from high-quality seed on a noncompacted, mineral seedbed.

Regeneration problems in many clearcuts at Rocky-Windy Bay and Port Chatham may be in part the result of the limited seed sources, poor quantity and quality of seed crops, and poor quality of the seedbed. Clearcuts in these areas were typically very large, commonly larger than 1,000 acres, and tended to adjoin one another. Few seed trees or uncut stands were left in most logged areas. Trees that were left were typically low vigor, poor quality, or defective trees and probably not good seed producers. In most cutting units, abundant logging residue, in places many feet thick, was still evident across much of the ground surface. Residue and the minimal amount of ground disturbance across most cutting units significantly reduced the area of suitable mineral seedbed. Average canopy cover of Sitka spruce seedlings and saplings in survey sample stands in the Rocky-Windy Bay area was only 7 percent; about 10 percent of the stands had no regeneration.

Natural regeneration appeared to be more successful in smaller cutting units with closer and healthier seed sources. Average canopy cover of seedlings and saplings in clearcuts of less than 200 acres near Seldovia and Port Graham was 20 percent, and 100 percent of the stands had some regeneration.

A significant regeneration problem identified by Harris (1974) and Sanders (1980) was competition with bluejoint reedgrass. Vegetation succession following timber removal initially leads to dense bluejoint reedgrass, shrubs, and other herbaceous vegetation, particularly in large clearcuts with

moderate ground disturbance. Harris (1974) postulated that there may be only a 4- to 5-year window after clearcutting for natural regeneration and establishment of seedlings before grass competition becomes a significant barrier.

Based on observations along a series of transects on Kasitsna and Tutka soils in the Rocky-Windy Bay and Seldovia Bay areas, Ward and others (1994) concluded that bluejoint reedgrass delays natural regeneration of Sitka spruce but apparently does not prevent it. Seedling and sapling ages, years since release of advanced regeneration, and known or estimated cutting dates indicated that seedlings were becoming established within about 4 to 8 years after harvesting. The measurement of stems per acre of seedlings and saplings was at or greater than minimum recommended levels on eight of nine transects. Future stocking of the commercial stand (trees greater than 10 inches diameter at breast height) was projected to be good (70 percent or greater) for seven of the nine transects.

Although the overall density of tree regeneration on most transects appeared to be approaching an adequate level, regeneration was patchy and irregularly distributed. Segments of all transects were essentially nonstocked in 1993, which is consistent with what Sanders (1980) observed during an earlier survey. Canopy openings that remain unstocked or understocked will reduce future stand volume and tree quality. Trees within and along the edges of canopy openings commonly develop an open-grown form, that is, limbiness, low height to diameter growth, and severe taper. Within the clumps of regeneration, tree growth will likely be somewhat slower, at least initially, than with a more regular spacing. Without natural thinning, trees in clumps may never achieve optimal height or diameter growth.

In contrast to areas with moderate ground disturbance and abundant bluejoint reedgrass, seedling density was high in places with significant ground disturbance, such as along most skid trails, access roads, and landings, even below a closed canopy of Sitka alder. A noted exception was within wheel tracks and other areas of extreme soil compaction, which were generally devoid of seedlings. Skid trails, access roads, and landings encompass a very small portion of the total harvested area.

Soil surveys are becoming increasingly important to forestland owners and managers as they seek ways of improving the productivity and management of their lands and for planning the most efficient use of forest resources. Tables 9, 10, and 11 summarize forestry information developed in conjunction with this soil survey. These tables can serve as quick references for important soils interpretations affecting forestry. The methods and procedures used by foresters and soil scientists to develop the information are described in the National Soil Survey Handbook and the National Forestry Manual (available in local offices of the Natural Resources Conservation Service) and applicable State supplements.

Forestland Productivity

In table 9, for each map unit that includes forested soils, the common trees are listed. Common trees are those species that generally grow on the soil regardless of economic importance. Site index, a commonly used indicator of tree productivity, and cubic feet, a volume estimate based on site index, are not provided in the table because tables or equations for estimating site index and stand volume applicable to Sitka spruce in the Lower Kenai Peninsula area have never been developed. A rough estimate of site indexes for area soils, however, was derived based on tree height and age data collected during this survey and on site index tables for other geographic areas (Meyer, 1937; Farr, 1984). Estimated site indexes, in conjunction with reported yield data from timber cruises and area timber sales, were used to assign the soils to a productivity class for the purpose of ranking soil productivity. In the table, *productivity class* is a number that denotes potential productivity of Sitka spruce in fully stocked stands. A productivity class of 8 or higher indicates an estimated volume, at age 150 years, of 25,000 to 30,000 board feet per acre; a productivity class of 7, 17,000 to 25,000 board feet per acre; a productivity class of 6, 9,000 to 17,000 board feet per acre; and a productivity class of 5 or less, fewer than 9,000 board feet per acre.

Forestland Management

Table 10 lists the ordination symbol and major management concerns for each forested soil. The ordination symbol is based on a uniform system of labeling individual soils and groups of soils that are similar in forest productivity, use, and management. All soils having the same ordination symbol have about the same potential productivity and require the same general kinds of management.

The first element of the ordination symbol is the productivity class for the indicator species (see the explanation of productivity class under the heading “Forestland Productivity”). The indicator species is typically the major tree species having the highest potential productivity on a particular soil.

The second element of the ordination symbol, the subclass, is a capital letter indicating certain soil or physiographic characteristics that contribute to

important hazards or limitations affecting forest management. The letter *R* indicates restrictions resulting from steep slopes; *X* indicates limitations caused by stones or rocks on or in the soil; *W* indicates excessive water in or on the soil; *D* indicates restrictions resulting from limited rooting depth; *C* indicates limitations caused by the kind or amount of clay in the upper part of the soil profile; *S* indicates limitations associated with dry, sandy soils; *and F* indicates restrictions inherent in fragmental or skeletal soils. The letter *A* indicates few or no limitations or restrictions.

In table 10, the soils are rated for a number of factors to be considered in use and management. Ratings of slight, moderate, and severe are used to indicate the degree of major soil limitations. Soils with *slight* limitations require no additional measures other than the normal local procedures used in forest management. Soils with *moderate* and *severe* limitations may require special measures or conservation practices designed to overcome the limitations.

Erosion hazard ratings refer to the risk of water erosion and soil loss from a noncompacted, bare soil surface for a 2- to 5-year period following a major ground disturbance. A rating of *slight* indicates that expected soil loss is small and of no consequence to long-term potential productivity; *moderate* indicates that erosion-control measures are needed during road construction and timber harvesting to prevent site degradation; and *severe* indicates that intensive management or special equipment and methods are needed to prevent excessive soil erosion.

Water erosion results from disturbance of the bare soil surface by raindrop impact and runoff, which detaches soil particles and carries them downslope. The velocity and volume of runoff increase, and thus the erosion hazard also increases, as the gradient and length of slope increase. Soils that have high amounts of silt and fine sand, low amounts of organic matter, weak structure, and slow permeability are susceptible to erosion. Saturated soil conditions, which occur as seasonal frost thaws in late spring, also increase the hazard of erosion. Maintaining an adequate vegetative cover, developing water-management structures, and avoiding surface disturbances, particularly when the soils are saturated, can minimize erosion problems.

Equipment limitation ratings apply to the operability and use of wheeled and tracked equipment. A rating of *slight* indicates that equipment use normally is not restricted in terms of kind of equipment or time of year because of soil factors; *moderate* indicates a limitation because of slope, seasonal wetness, flooding, or some other factor; and *severe* indicates a need for special equipment, a hazard affecting the use of equipment, or a longer seasonal limitation.

The most obvious limitation affecting the use of equipment is slope. As the slope increases, the operability of wheeled equipment becomes restricted and tracked equipment must be used. On the steepest slopes, even tracked equipment cannot be operated safely and more sophisticated harvesting systems must be used. Soil wetness, especially in combination with silty, sandy, and organic surface textures, can limit the use of equipment even in level and gently sloping areas. In addition to the potential for forestry equipment getting stuck in mud, severe soil disturbance contributes to erosion and can reduce water quality. Other soil factors that account for equipment limitations include surface bedrock and rock fragments and cobbly and stony surface textures.

Seedling mortality ratings refer to the probability of death of tree seedlings as influenced by soil properties. The ratings apply to healthy seedlings that are naturally established or properly planted. A rating of *slight* indicates that no problem is expected under normal conditions; *moderate* indicates that some mortality can be expected and extra precautions are advisable; and *severe* indicates that mortality will be high and extra precautions are essential for successful reforestation. Plant competition, adequacy of seed source, and quality of site preparation are not considered in the ratings. These factors, however, may be of greater importance to successful reforestation than the soil properties that contribute to seedling mortality.

Excessive soil wetness resulting from a high water table or saturated soil conditions is a major factor contributing to seedling mortality. Seedlings in areas of wet soils also may be susceptible to frost heaving during periods of diurnal freeze-thaw cycles, particularly at the higher elevations. Another factor affecting seedling mortality is soil droughtiness caused by a low available water capacity in coarse textured soils and in soils that have a high content of coarse fragments. Mortality problems associated with dry soil conditions are compounded in convex slope positions, such as ridges and shoulder slopes. A shallow or restricted rooting depth caused by bedrock, contrasting layers, or compact layers also contributes to seedling mortality. Special site preparation, larger than normal seedling stock, or reinforcement plantings may be needed on soils whose limitations are rated moderate or severe for seedling mortality.

Windthrow hazard ratings consider soil characteristics that affect the development of tree

roots and the ability of the soil to hold trees firmly. Windthrow hazard is highly variable and depends largely on the frequency and duration of strong winds; turbulence and wind funneling created by topography, orographic effects, and cutting boundary patterns; and tree heights and density. Restricted rooting depth is the principal reason for increased windthrow hazard. In Alaska, low soil temperatures and soil wetness restrict root growth. Supporting roots of all tree species typically are concentrated in the upper soil horizons. A shallow depth to bedrock also restricts rooting depth, although in many instances fractures in the bedrock can improve resistance to windthrow by favoring the anchoring of roots.

Because of the shallow rooting characteristics of trees in Alaska, ratings of *slight* are not used. A rating of *moderate* indicates that an occasional tree may be blown down during periods of moderate or strong winds, and a rating of *severe* indicates that many trees may be expected to be blown down during such periods. In areas where the soils are rated moderate or severe, caution in thinning operations, attention to wind occurrence, direction, and speed in the design of timber sales and cuts, and contingency plans for periodic salvage of windthrown trees are needed.

Plant competition ratings refer to the likelihood of invasion or growth of understory plants that would inhibit reforestation and stand development following logging or other soil disturbances. The rating is highly variable and depends on the occurrence and proximity of competitive species. The rating also assumes that seed dispersal or planting on the soil occurs within 3 to 5 years following disturbance. A rating of *slight* indicates that understory plants are not likely to delay reforestation and that natural or planted seedlings have good prospects for development without undue competition; *moderate* indicates that plant competition will delay natural or planted reforestation; and *severe* indicates that competition can be expected to prevent the establishment of a new forest for tree crop production unless precautionary measures are taken.

Favorable climate and soil moisture characteristics, which contribute to rapid and lush growth or invasion of understory plants, account for most plant competition problems. Sources of competing vegetation include sprouting of existing plants, vegetative spread of plants from adjacent areas, and germination of new seed. Moderate and severe ratings indicate the need for careful consideration of the occurrence and competitiveness of understory vegetation during planning, logging, site preparation, and reforestation. Biological, mechanical, or chemical treatments may be needed to retard growth of undesirable plants. Where the competing species is bluejoint reedgrass, intensive grazing by cattle for a few years can reduce grass and mulch cover and create a suitable seedbed for trees.

Forest Roads

Table 11 lists, for each map unit, the limitations and hazards that affect the use of the soils for primitive roads and skid trails. Primitive roads and skid trails are unsurfaced roads and trails constructed directly across the soil surface with a minimum of clearing and grading and without additions of subgrade fill and surfacing. The organic surface layer and some mineral soil may be partially removed or disturbed during construction. Normally, the use of these roads and trails is of relatively low intensity or of short duration. Limitations and hazards are based on the upper 10 inches (25 centimeters) of soil.

Moderate slope applies to soils that have slopes between 15 and 30 percent. *Steep slope* applies to soils that have slopes between 30 and 50 percent. *Very steep slope* applies to soils that have slopes of more than 50 percent. Soils with a limitation caused by very steep slope are unsuited to primitive roads, and additional limitations and hazards are not listed.

Flooding indicates that the soils are subject to either occasional or frequent flooding. The source of floodwater is generally stream overflow but may also be runoff or tide water.

Wetness refers to soils that are poorly drained or very poorly drained. Even soils with good drainage, however, may have a wetness problem following snowmelt in spring and during periods of rainy weather.

Low strength refers to soils that under certain conditions are not strong enough to support loads because of low resistance to deforming and low bearing strength. *Low strength when wet* generally refers to silty soils, which are easily deformed and are subject to failure when saturated.

Slippery when wet refers to soils that have more than 2 inches (5 centimeters) of silt, silt loam, or very fine sandy loam in the surface layer. Tire and track slippage can be a significant problem when the soil is wet following spring snowmelt and during periods of rainy weather.

Dusty when dry refers to soils that have a surface layer of silt, silt loam, or very fine sandy loam. These soils produce dust under traffic during periods of dry conditions.

Areas of rock outcrop applies to soils in map units in which rock outcrop is a named component.

Recreation

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The soils are rated on the basis of soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Paths and trails are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on the basis of soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated *slight*.

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal high water table. These limitations generally require major soil reclamation, special design, or intensive maintenance. Overcoming the limitations generally is difficult and costly.

Wildlife Habitat

Dan LaPlant, biologist, Anchorage, Alaska, prepared this section.

The types of wildlife habitat in the survey area are typical of coastal Sitka spruce communities and upland tundra communities. Diversity is provided by elevation and aspect. Mature Sitka spruce forests, second-growth areas, and transitional areas are abundant. Smaller areas are occupied by estuarian wetlands and palustrine wetlands.

Much of the coastal areas and valley bottoms are covered with coniferous forest that has commercial potential. Most of this land is privately owned, and the habitats could potentially be altered through harvest and related development activities.

Wildlife species in forest habitat settings are black bear, porcupine, red squirrel, northern goshawk, bald eagle, and spruce grouse. Mountain goat, ptarmigan, and ground squirrel utilize alpine areas; beaver, moose, and river otter inhabit valley bottoms and riparian areas; and a wide variety of waterfowl, gulls, and shore birds are in coastal habitats and estuarian environments.

Black bear, moose, salmon, grouse, ptarmigan, and waterfowl are important species for subsistence use and are common in the soil survey area. Of particular importance to these species are riparian habitats consisting of tall shrub and herbaceous plants. Maintenance of coniferous forest plant communities, which are a requirement in the life cycle of most wildlife of the area, also is important. Cutting timber in small blocks ranging from 10 to 40 acres rather than all at once ensures that different age classes remain to provide optimum habitat and that travel corridors remain for porcupine, bear, moose, and grouse. Maintaining den trees and nest sites during timber harvest helps to maintain habitat for northern goshawk, red squirrel, weasel, pine grosbeak, red-breasted nuthatch, three-toed woodpecker, and other passerines. Creating or maintaining openings in timber stands improves habitat for other wildlife, such as

moose, ground squirrels, hermit thrush, and white crowned sparrows.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. If food, cover, or water is missing, inadequate, or inaccessible, wildlife will be scarce or will not inhabit the area. If the soils have potential for habitat development, wildlife habitat can be created or improved by planting appropriate vegetation, properly managing the existing plant cover, and fostering the natural establishment of desirable plants.

Elements of Wildlife Habitat

Habitat elements can consist of plant communities, specific sites (e.g., snags and talus slopes), or types of water areas. Each habitat generally has a number of specific habitat elements that provide specific types and amounts of food, cover, and water. Habitat elements may vary, depending on differences in combinations of plant species or age classes.

Habitat requirements for many wildlife species may consist of several plant communities and various spatial relationships between plant communities. Other less mobile species may have all habitat requisites met within a single plant community. The actual utilization of habitats or habitat elements by wildlife depends upon several factors, such as snow depth, size of an area, physical barriers, competition from other species, predation, disease, and overharvest.

The presence of an individual habitat element (such as the Sitka spruce-black cottonwood community needed by eagles for nesting sites eagles), even in excellent condition, is not by itself necessarily a useful tool for predicting use by wildlife. If a wildlife species is known to occupy an area, however, the assumption can be made that all required habitat elements are available to some degree. Therefore, when a habitat is known to be occupied, individual elements become potentially significant to the overall suitability of the area for that particular wildlife species.

The common plant communities supported by the detailed soil map units in the survey area are rated in tables 13 and 14 in terms of their suitability for habitat elements. The tables identify the suitability of the plant communities for meeting the habitat needs of various wildlife species. This information can be used in the selection of sites that are suitable for establishing, maintaining, or improving specific elements of wildlife habitat and in determining the intensity of management needed for each element of the habitat.

Resource managers should carefully consider both the immediate and long-term effects of large timber harvests and clearcuts on wildlife habitat. One of the immediate effects is the loss of the coniferous forest plant community (a requirement in the life cycle of several species, such as porcupine and spruce grouse) and the creation of sites dominated by bluejoint reedgrass, oval-leaf blueberry, salmonberry, Sitka alder, devil's club, common fireweed, or other forbs (utilized by song birds and small mammals). The overall effect of such changes on wildlife populations can only be predicted with knowledge of the limiting habitat elements for each species.

Long-term conditions are a result of the rates of regrowth. Rates of regrowth are influenced by the amount of soil disturbance during harvest, available seed source, slash load, slope, and aspect. Soils on south-facing slopes experience strong competition from bluejoint reedgrass, which retards the growth of most other vegetation. Sites with less favorable conditions for grass, such as the cooler and wetter north and east aspects, are more favorable for faster regrowth of the Sitka spruce canopy.

Although there is not a clear and consistent relationship between wildlife populations and soil map units, certain general statements can be made. The descriptions under the heading "General Soil Map Units" include some information about the kinds of wildlife and wildlife habitat that are common in areas of each map unit.

Additional information on habitat management for different species of wildlife can be obtained from the local offices of the Alaska Department of Fish and Game and the Natural Resources Conservation Service.

Engineering

This section provides information for planning land uses related to the availability of construction materials. Soils are rated as sources of roadfill, sand and gravel, and topsoil. The most limiting features are identified. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not

eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to locate potential sources of gravel, sand, earthfill, and topsoil. The information, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Construction Materials

Table 15 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 15, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as

shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the descriptions under the heading “Taxonomic Units and Their Morphology.”

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, “gravelly.” Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1998) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1998).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, GP-GM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated

sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index generally are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the descriptions under the heading “Taxonomic Units and Their Morphology.”

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In table 17, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants to be grown. It is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design may be needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, 6 to 9 percent; and very high, more than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill

erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided calcium carbonate. They are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning plant residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for plants.

Water Features

Table 18 gives estimates of several important water features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. The soil properties that affect the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include the depth to a seasonal high water table, the infiltration rate, permeability after prolonged wetting, and the depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have a moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils that have a moderately fine or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clayey soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams, by runoff from adjacent slopes, or by tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered to be ponding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur. Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. *None* means flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year).

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very long* (more than 30 days). The time of year that flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is a zone of saturation at the highest average depth during the wettest season. It is at least 6 inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the surface. Indicated in table 18 are the depth to the seasonal high water table, the kind of water table, and the months of the year when the water table usually is highest.

An *apparent* water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time for adjustments in the surrounding soil.

A *perched* water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. “More than 6.0” indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Soil Features

Table 19 gives estimates of several important soil features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Table 19 shows the expected initial subsidence, which usually is a result of drainage, and total subsidence, which results from a combination of factors.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and

depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a *moderate* potential indicates that the soil is susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a *high* potential indicates that the soil is highly susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1998; USDA, 1999). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Spodosol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Cryod (*Cry*, meaning cold, plus *od*, from Spodosol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Humicryods (*Humi*, meaning translocated humus, plus *cryod*, the suborder of the Spodosols that has a cryic temperature regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. An example is Andic Humicryods.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is medial over loamy-skeletal, mixed Andic Humicryods.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The Kasitsna series is an example.

Taxonomic Units and Their Morphology

In this section, each taxonomic unit recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each unit. A pedon, a small three-dimensional area of soil, that represents the series or higher taxonomic unit in the survey area is described. The detailed description of each soil horizon follows standards in the “Soil Survey Manual” (USDA, 1993). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (USDA, 1999) and in “Keys to Soil Taxonomy” (USDA, 1998). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils.

Andic Cryofluvents

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour) over rapid (6.0 to 20.0 inches/hour)
Landform: Flood plains
Parent material: Alluvium

Slope range: 0 to 3 percent
Elevation: 10 to 1,000 feet
Annual precipitation: 45 to 75 inches
Annual air temperature: 36 to 39 degrees F
Frost-free period: 110 to 130 days

Taxonomic classification: Andic Cryofluvents

Typical Pedon

Andic Cryofluvents, on a slope of 1 percent, in an area of alder, willow, and Sitka spruce forest, 1,500 feet south and 1,500 feet west of the northeast corner of sec. 21, T. 10 S., R. 15 W.

Oe—2 inches to 0; mucky peat; many very fine, fine, and medium roots; extremely acid (pH 4.2); abrupt smooth boundary.

A—0 to 8 inches; dark brown (10YR 3/3) and dark yellowish brown (10YR 3/4) very fine sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, and medium roots; thin strata of loamy fine sand; strongly acid (pH 5.5); abrupt smooth boundary.

2C—8 to 60 inches; dark grayish brown (10YR 4/2) very gravelly sand; single grain; loose, nonsticky and nonplastic; many very fine, fine, and medium roots; 40 percent gravel; very strongly acid (pH 5.0).

Range in Characteristics

Thickness of the solum: 7 to 14 inches
Content of rock fragments in the control section: 35 to 65 percent

O horizon:
Thickness—1 to 4 inches
Texture—peat or mucky peat

A horizon:
Hue—10YR
Value—3 or 4
Chroma—3 or 4
Texture—very fine sandy loam or silt loam
Reaction—pH 5.1 to 5.5

C horizon:
Hue—10YR
Value—3 to 5
Chroma—1 to 3
Texture—loamy sand or sand
Content of rock fragments—35 to 60 percent, including 30 to 50 percent gravel and 0 to 10 percent cobbles
Reaction—pH 5.6 to 6.0

Chenega Series

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained
Permeability: Moderate or moderately rapid (0.6 inch to 6.0 inches/hour) over rapid (6.0 to 20.0 inches/hour)
Landform: Flood plains, stream terraces, and alluvial fans
Parent material: Alluvium
Slope range: 0 to 8 percent
Elevation: 0 to 1,000 feet
Annual precipitation: 70 to 100 inches
Annual air temperature: 37 to 39 degrees F
Frost-free period: 100 to 130 days

Taxonomic classification: Sandy-skeletal, mixed Typic Cryofluvents

Typical Pedon

Chenega silt loam, on a slope of 1 percent, in an area of alder, willow, and Sitka spruce forest, 2,500 feet south and 100 feet west of the northeast corner of sec. 23, T. 10 S., R. 13 W.

Oi—3 inches to 1 inch; peat; abrupt smooth boundary.

Oe—1 inch to 0; mucky peat; extremely acid (pH 4.2); abrupt smooth boundary.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, medium, and coarse roots; very strongly acid (pH 4.5); abrupt smooth boundary.

C1—3 to 9 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam; single grain; loose, nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; 40 percent gravel; very strongly acid (pH 5.0); clear smooth boundary.

C2—9 to 36 inches; dark gray (10YR 4/1) very gravelly sand; single grain; loose, nonsticky and nonplastic; 35 percent gravel, 10 percent cobbles; very strongly acid (pH 5.0); clear smooth boundary.

C3—36 to 52 inches; dark brown (10YR 3/3) gravelly silt loam; single grain; loose, nonsticky and nonplastic; 20 percent gravel; very strongly acid (pH 5.0); clear smooth boundary.

C4—52 to 60 inches; variegated extremely gravelly sand; single grain; loose, nonsticky and nonplastic; 45 percent gravel and 10 percent cobbles.

Range in Characteristics

Thickness of the solum: 2 to 4 inches
Content of rock fragments in the control section: 35 to 55 percent

O horizon:
Thickness—1 to 5 inches
Texture—peat or mucky peat

A horizon:
Hue—2.5Y or 10YR
Value—3 to 5
Chroma—1 or 2
Texture—silt loam or sandy loam
Reaction—pH 4.5 to 6.0

C horizon:
Hue—5Y to 10YR
Value—3 to 5
Chroma—1 to 3
Texture—loamy sand or sand
Content of rock fragments—35 to 55 percent, including 30 to 50 percent gravel and 0 to 10 percent cobbles
Reaction—pH 4.5 to 6.0

Cryods

Depth class: Moderately deep and deep
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Mountain summits and cirques
Parent material: Glacial till, colluvium, and residuum
Slope range: 5 to 120 percent
Elevation: 1,500 to 3,000 feet
Annual precipitation: 75 to 100 inches
Annual air temperature: 32 to 42 degrees F
Frost-free period: 60 to 100 days

Taxonomic classification: Cryods

Typical Pedon

Cryods, on a slope of 20 percent, in an area of alpine tundra vegetation, 315 feet east and 1,400 feet north of the southwest corner of sec. 6, T. 10 S., R. 14 W.

Oe—1 inch to 0; black (5YR 2/1) mucky peat; many very fine and fine roots; abrupt smooth boundary.
E—0 to 4 inches; light brownish gray (10YR 6/2) gravelly sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; many very fine and fine roots; strongly acid (pH 5.3); abrupt wavy boundary.
Bs—4 to 14 inches; dark reddish brown (5YR 3/4) very gravelly fine sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine and fine roots; strongly acid (pH 5.3); abrupt wavy boundary.
C—14 to 60 inches; dark brown (10YR 3/3) very gravelly fine sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; few fine roots; 35 percent gravel and 10 percent cobbles; strongly acid (pH 5.3).

Range in Characteristics

Thickness of the solum: 4 to 24 inches
Content of rock fragments in the control section: 40 to 65 percent

O horizon:
Thickness—1 to 3 inches
Texture—peat, mucky peat, or muck

E horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 or 3
Texture—gravelly silt loam, gravelly sandy loam, or silt loam
Reaction—pH 5.1 to 5.5

Bs horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—2 to 4
Texture—very gravelly very fine sandy loam or very gravelly sandy loam
Content of rock fragments—0 to 30 percent gravel
Reaction—pH 4.5 to 5.5

C horizon:
Hue—2.5Y or 10YR
Value—3 to 6
Chroma—2 to 4
Texture—very gravelly very fine sandy loam or very gravelly sandy loam
Content of rock fragments—55 to 65 percent, including 20 to 45 percent gravel and 0 to 30 percent cobbles
Reaction—pH 5.1 to 5.5

Cryorthents

Depth class: Shallow and moderately deep
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour) over rapid (6.0 to 20.0 inches/hour)
Landform: Mountain summits and talus slopes
Parent material: Glacial till, colluvium, and residuum
Slope range: 5 to 120 percent
Elevation: 1,500 to 3,000 feet
Annual precipitation: 75 to 100 inches
Annual air temperature: 32 to 42 degrees F
Frost-free period: 60 to 100 days

Taxonomic classification: Cryorthents

Typical Pedon

Cryorthents, on a south-facing slope of 40 percent, in an area of sparse alpine tundra vegetation, 400 feet east and 1,600 feet north of the southwest corner of sec. 30, T. 10 S., R. 15 W.

A—0 to 13 inches; brown (10YR 4/3) very gravelly sandy loam; moderate fine granular structure; very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; 30 percent gravel and 10 percent cobbles; strongly acid (pH 5.2); gradual wavy boundary.

C1—13 to 24 inches; olive brown (2.5Y 4/4) very gravelly loamy sand; single grain; loose, nonsticky and nonplastic; common very fine, fine, and medium roots; 40 percent gravel and 10 percent cobbles; strongly acid (pH 5.5); gradual wavy boundary.

C2—24 to 40 inches; olive brown (2.5Y 4/4) extremely gravelly sand; single grain; loose, nonsticky and nonplastic; 60 percent gravel, 20 percent cobbles, and 10 percent stones; strongly acid (pH 5.5).

R—40 inches; weathered bedrock.

Range in Characteristics

Thickness of the solum: 4 to 15 inches

Content of rock fragments in the control section: 40 to 65 percent

O horizon:
- Thickness—0 to 3 inches
- Texture—peat, mucky peat, or muck

A horizon:
- Hue—2.5Y or 10YR
- Value—4
- Chroma—2 or 3
- Texture—very gravelly sandy loam or very gravelly very fine sandy loam
- Reaction—pH 5.1 to 8.4

C1 horizon:
- Hue—2.5Y or 10YR
- Value—3 to 6
- Chroma—2 to 4
- Texture—very gravelly loamy sand
- Content of rock fragments—40 to 65 percent, including 20 to 45 percent gravel and 0 to 10 percent cobbles
- Reaction—pH 5.1 to 8.4

C2 horizon:
- Hue—2.5Y or 10YR
- Value—4 to 6
- Chroma—2 to 4
- Texture—extremely gravelly sand
- Content of rock fragments—75 to 90 percent, including 50 to 65 percent gravel, 15 to 35 percent cobbles, and 0 to 10 percent stones
- Reaction—pH 5.1 to 8.4

Ismailof Series

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained and well drained
Permeability: Moderately rapid or rapid (2.0 to 20.0 inches/hour) over rapid (6.0 to 20.0 inches/hour)
Landform: Marine terraces and spits
Parent material: Marine sediments
Slope range: 0 to 3 percent
Elevation: 0 to 20 feet
Annual precipitation: 65 to 75 inches
Annual air temperature: 38 to 40 degrees F
Frost-free period: 110 to 140 days

Taxonomic classification: Sandy-skeletal, mixed Typic Haplocryods

Typical Pedon

Ismailof sandy loam, on a slope of 1 percent, in an area of Sitka spruce forest, 1,400 feet north and 1,450 feet east of the southwest corner of sec. 6, T. 11 S., R. 15 W.

Oi—3 to 2 inches; peat; abrupt smooth boundary.

Oa—2 inches to 0; black (10YR 2/1) muck; many very fine, fine, and medium roots; extremely acid (pH 4.2); abrupt smooth boundary.

E—0 to 1 inch; dark grayish brown (10YR 4/2) sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, and medium roots; strongly acid (pH 5.5); abrupt smooth boundary.

Bhs—1 to 5 inches; dark reddish brown (5YR 3/2) gravelly very fine sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; strongly acid (pH 5.5); abrupt smooth boundary.

C1—5 to 24 inches; variegated extremely gravelly sand; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; 65 percent gravel and 5 percent cobbles; neutral (pH 6.6); gradual smooth boundary.

C2—24 to 30 inches; variegated extremely gravelly sand; single grain; loose, nonsticky and nonplastic; 65 percent gravel and 10 percent cobbles; mildly alkaline (pH 7.8); gradual smooth boundary.

C3—30 to 60 inches; variegated extremely gravelly sand; single grain; loose, nonsticky and nonplastic;

65 percent gravel and 10 percent cobbles; moderately alkaline (pH 8.0).

Range in Characteristics

Thickness of the solum: 4 to 12 inches
Content of rock fragments in the control section: 40 to 70 percent

O horizon:
Thickness—1 to 6 inches
Texture—peat, mucky peat, or muck

E and Eb horizons:
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—very fine sandy loam, sandy loam, or loamy sand
Reaction—pH 5.1 to 5.5

Bhs and Bs horizons:
Hue—5YR
Value—3
Chroma—3 or 4
Texture—sandy loam or fine sandy loam
Content of rock fragments—0 to 70 percent gravel
Reaction—pH 5.1 to 5.5

C horizon:
Colors—variegated
Texture—sand
Content of rock fragments—40 to 70 percent, including 30 to 55 percent gravel and 10 to 20 percent cobbles
Reaction—pH 6.6 to 8.4

Jakolof Series

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour) over rapid (6.0 to 20.0 inches/hour)
Landform: Alluvial fans and stream terraces
Parent material: Volcanic ash over alluvium
Slope range: 0 to 15 percent
Elevation: 10 to 1,000 feet
Annual precipitation: 65 to 75 inches
Annual air temperature: 34 to 39 degrees F
Frost-free period: 100 to 130 days

Taxonomic classification: Sandy-skeletal, mixed Typic Humicryods

Typical Pedon

Jakolof silt loam, on a slope of 1 percent, in an area of grass and forbs, 1,850 feet south and 1,050 feet west of the northeast corner of sec. 13, T. 10 S., R. 13 W.

Oe—2 inches to 0; mucky peat; many very fine, fine, medium, and coarse roots; abrupt smooth boundary.
E—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, medium, and coarse roots; very strongly acid (pH 4.5); abrupt smooth boundary.
Bhs—2 to 4 inches; dark reddish brown (5YR 3/2) silt loam; weak fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; many very fine, fine, medium, and coarse roots; strongly acid (pH 5.5); abrupt wavy boundary.
Bs—4 to 6 inches; dark brown (7.5YR 4/4) silt loam; weak fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; many very fine, fine, medium, and coarse roots; very strongly acid (pH 5.0); abrupt wavy boundary.
Eb—6 to 7 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; common very fine, fine, medium, and coarse roots; very strongly acid (pH 5.0); abrupt wavy boundary.
2Bhs—7 to 15 inches; dark reddish brown (5YR 2/2) very gravelly sand; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; 30 percent gravel and 10 percent cobbles; very strongly acid (pH 5.0); clear wavy boundary.
2C—15 to 60 inches; variegated very gravelly sand; single grain; loose, nonsticky and nonplastic; 35 percent gravel and 10 percent cobbles; very strongly acid (pH 5.0).

Range in Characteristics

Thickness of the solum: 11 to 25 inches
Content of rock fragments in the control section: 40 to 65 percent

O horizon:
Thickness—1 to 6 inches
Texture—peat, mucky peat, or muck

E and Eb horizons:
Hue—2.5Y or 10YR
Value—4
Chroma—2 to 4
Texture—silt loam or very fine sandy loam
Reaction—pH 4.5 to 5.0

Bs horizon:
Hue—7.5YR or 5YR

Value—3 or 4
Chroma—2 to 4
Texture—silt loam or very fine sandy loam
Content of rock fragments—0 to 30 percent gravel
Reaction—pH 4.5 to 5.5

Bhs horizon:
Hue—2.5YR, 5YR, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—silt loam or very fine sandy loam
Content of rock fragments—0 to 30 percent, including 0 to 25 percent gravel and 0 to 10 percent cobbles
Reaction—pH 4.5 to 5.5

2Bhs horizon:
Hue—2.5YR, 5YR, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—sand or loamy sand
Content of rock fragments—35 to 60 percent, including 25 to 45 percent gravel and 10 to 15 percent cobbles
Reaction—pH 4.5 to 5.5

2C horizon:
Colors—variegated
Texture—sand
Content of rock fragments—40 to 65 percent, including 30 to 45 percent gravel and 10 to 20 percent cobbles
Reaction—pH 4.5 to 6.0

Kasitsna Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour) over moderately slow or moderate (0.2 inch to 2.0 inches/hour)
Landform: Moraines, mountain side slopes
Parent material: Volcanic ash over glacial till
Slope range: 8 to 120 percent
Elevation: 20 to 1,500 feet
Annual precipitation: 65 to 85 inches
Annual air temperature: 34 to 39 degrees F
Frost-free period: 80 to 130 days

Taxonomic classification: Medial over loamy-skeletal, mixed Andic Humicryods

Typical Pedon

Kasitsna silt loam, on a northeast-facing slope of 26 percent, in an area of Sitka spruce forest, 1,600 feet north and 200 feet west of the southeast corner of sec. 19, T. 10 S., R. 15 W.

Oe—3 inches to 0; very dark brown (10YR 2/2) mucky peat; common very fine, fine, medium, and coarse roots; extremely acid (pH 4.0); abrupt wavy boundary.

E—0 to 2 inches; dark grayish brown (2.5Y 4/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; common very fine, fine, medium, and coarse roots; strongly acid (pH 5.5); abrupt wavy boundary.

Bhs—2 to 4 inches; dark brown (7.5YR 3/4) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; common very fine, fine, medium, and coarse roots; medium acid (pH 5.8); abrupt wavy boundary.

Eb1—4 to 5 inches; light olive brown (2.5Y 5/4) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; common very fine, fine, medium, and coarse roots; medium acid (pH 5.8); abrupt wavy boundary.

Eb2—5 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; common very fine, fine, medium, and coarse roots; strongly acid (pH 5.5); abrupt wavy boundary.

B´hs—8 to 18 inches; dark reddish brown (5YR 2.5/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; common very fine, fine, medium, and coarse roots; very strongly acid (pH 4.8); abrupt wavy boundary.

2Bhsb—18 to 31 inches; dark brown (7.5YR 3/4) loam; moderate medium platy structure; very friable, slightly sticky and slightly plastic, moderately smeary; few fine and medium roots; 10 percent gravel; very strongly acid (pH 5.0); abrupt wavy boundary.

2C—31 to 60 inches; grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/6) very gravelly loam; massive; firm, nonsticky and nonplastic, weakly smeary; 40 percent gravel and 10 percent cobbles; medium acid (pH 5.8).

Range in Characteristics

Depth to glacial till: 15 to 26 inches
Content of rock fragments in the lower part of the control section: 35 to 60 percent

O horizon:
Thickness—1 to 6 inches

Texture—peat, mucky peat, or muck

E and Eb horizons:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 to 4
Texture—silt loam or very fine sandy loam
Reaction—pH 4.5 to 6.0
Other characteristics—weakly smeary

Bs and Bsb horizons:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—3 or 4
Texture—silt loam or very fine sandy loam
Content of rock fragments—0 to 30 percent gravel
Reaction—pH 4.5 to 6.0
Other characteristics—moderately smeary

Bhs and Bhsb horizons:
Hue—2.5YR or 5YR
Value—2.5 or 3
Chroma—1 to 3
Texture—silt loam or very fine sandy loam
Content of rock fragments—0 to 30 percent, including 0 to 30 percent gravel and 0 to 10 percent cobbles
Reaction—pH 4.5 to 6.0
Other characteristics—moderately smeary

2Bsb horizon (if it occurs):
Hue—7.5YR
Value—3 or 4
Chroma—4
Texture—loam, sandy loam, or very fine sandy loam
Content of rock fragments—10 to 50 percent, including 10 to 35 percent gravel and 0 to 15 percent cobbles
Reaction—pH 4.5 to 5.0

2C horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 to 6
Texture—loam or sandy loam
Content of rock fragments—35 to 60 percent, including 25 to 45 percent gravel and 0 to 20 percent cobbles
Reaction—pH 5.6 to 6.0

Koyuktolik Series

Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Permeability: Rapid (6.0 to 20.0 inches/hour) in the organic material and slow (0.06 to 0.2 inch) in the glacial till
Landform: Seepage slopes and depressions
Parent material: Organic material over glacial till
Slope range: 0 to 25 percent
Elevation: 10 to 1,000 feet
Annual precipitation: 65 to 75 inches
Annual air temperature: 37 to 39 degrees F
Frost-free period: 100 to 130 days

Taxonomic classification: Euic Typic Cryohemists

Typical Pedon

Koyuktolik peat, on a slope of 1 percent, in an area of sphagnum moss, sedge, and dwarf shrubs, 1,000 feet north and 50 feet west of the southeast corner of sec. 32, T. 9 S., R. 15 W.

Oi—0 to 3 inches; peat, dark brown (7.5YR 3/2) broken face, rubbed, and pressed; 95 percent fiber, 85 percent rubbed; dominantly moss fibers; many very fine, fine, medium, and coarse roots; 5 percent mineral content; very strongly acid (pH 5.2); clear smooth boundary.

Oe1—3 to 8 inches; mucky peat, dark brown (7.5YR 3/2) broken face and rubbed, dark brown (7.5YR 4/4) pressed; 50 percent fiber, 25 percent rubbed; weak thick platy structure; admixture of sedge and moss fibers; many very fine and fine roots; 5 percent mineral content; very strongly acid (pH 5.2); clear smooth boundary.

Oe2—8 to 55 inches; mucky peat, dark brown (7.5YR 3/3) broken face, rubbed, and pressed; 75 percent fiber, 35 percent rubbed; weak thick platy structure; admixture of sedge and moss fibers; few very fine and fine roots; 5 percent mineral content; very strongly acid (pH 5.2); clear smooth boundary.

C—55 to 60 inches; dark grayish brown (2.5Y 4/2) very gravelly sandy loam; massive; friable, nonsticky, nonplastic; 35 percent gravel and 10 percent cobbles.

Range in Characteristics

Thickness of the organic material: 16 to 51 inches

Oi horizon:
Thickness—2 to 21 inches
Texture—peat
Reaction—pH 4.5 to 5.5

Oe horizon:
Thickness—more than 49 inches
Texture—mucky peat
Reaction—pH 4.5 to 5.5

C horizon:
Hue—2.5Y or 5Y
Value—2 to 5
Chroma—2 to 4
Texture—gravelly loam, very gravelly loam, or very gravelly sandy loam
Reaction—pH 5.1 to 5.5

Nanwalek Series

Depth class: Deep and very deep (40 inches to more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Mountain side slopes
Parent material: Reworked glacial till and colluvium
Slope range: 25 to 120 percent
Elevation: 20 to 2,000 feet
Annual precipitation: 65 to 85 inches
Annual air temperature: 34 to 42 degrees F
Frost-free period: 90 to 130 days

Taxonomic classification: Medial-skeletal, mixed Andic Humicryods

Typical Pedon

Nanwalek silt loam, on a south-facing slope of 60 percent, in an area of bluejoint reedgrass, 500 feet north and 1,750 feet west of the southeast corner of sec. 21, T. 9 S., R. 15 W.

Oe—2 inches to 0; very dark brown (10YR 2/2) mucky peat; many very fine, fine, medium, and common coarse roots; very strongly acid (pH 4.5); abrupt smooth boundary.
E—0 to 1 inch; dark brown (10YR 4/3) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, and medium roots; very strongly acid (pH 4.5); abrupt wavy boundary.
Bhs—1 to 3 inches; dark brown (7.5YR 3/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; many very fine, fine, and medium roots; very strongly acid (pH 4.5); abrupt wavy boundary.
Eb—3 to 4 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, and medium roots; 2 percent gravel; very strongly acid (pH 5.0); abrupt wavy boundary.
2Bhsb—4 to 34 inches; dark reddish brown (5YR 2.5/2) very gravelly silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; many very fine, fine, and medium and few coarse roots; 40 percent gravel and 10 percent cobbles; strongly acid (pH 5.5); clear wavy boundary.
2BC—34 to 60 inches; dark brown (10YR 4/3) very gravelly very fine sandy loam; massive; friable, nonsticky and nonplastic; 50 percent gravel and 10 percent cobbles; medium acid (pH 5.8).

Range in Characteristics

Thickness of the solum: 32 to more than 60 inches
Content of rock fragments: 35 to 75 percent

O horizon:
Thickness—1 to 6 inches
Texture—peat, mucky peat, or muck

E and Eb horizons:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or very fine sandy loam
Reaction—pH 4.5 to 5.0
Other characteristics—weakly smeary

Bhsb horizon (if it occurs):
Hue—2.5YR to 7.5YR
Value—2.5 or 3
Chroma—1 to 3
Texture—silt loam or very fine sandy loam
Content of rock fragments—0 to 14 percent gravel
Reaction—pH 4.5 to 5.0
Other characteristics—moderately smeary

2Bsb horizon (if it occurs) and 2Bhsb horizon:
Hue—7.5YR or 5YR
Value—2.5 to 4
Chroma—2 to 4
Texture—silt loam or very fine sandy loam
Content of rock fragments—35 to 75 percent, including 10 to 50 percent gravel, 0 to 50 percent cobbles, and 0 to 10 percent stones
Reaction—pH 5.1 to 5.5
Other characteristics—moderately smeary

2BC horizon:
Hue—2.5Y or 10YR
Value—3 to 5
Chroma—2 to 4
Texture—silt loam, very fine sandy loam, or loam
Content of rock fragments—35 to 75 percent, including 20 to 70 percent gravel, 0 to 15 percent cobbles, and 0 to 10 percent stones
Reaction—pH 5.6 to 6.0

2C horizon (if it occurs):
Hue—2.5Y or 10YR
Value—4 or 5

Chroma—2 to 4
Texture—loam, sandy loam, or very fine sandy loam
Content of rock fragments—50 to 85 percent, including 35 to 75 percent gravel, 10 to 20 percent cobbles, and 0 to 10 percent stones
Reaction—pH 5.6 to 6.0

Nuka Series

Depth class: Very deep (more than 60 inches)
Drainage class: Very poorly drained
Permeability: Rapid (6.0 to 20.0 inches/hour) in the organic material and slow (0.06 to 0.2 inch) in the glacial till
Landform: Seepage slopes and depressions
Parent material: Organic material over glacial till
Slope range: 0 to 25 percent
Elevation: 10 to 1,000 feet
Annual precipitation: 65 to 75 inches
Annual air temperature: 37 to 39 degrees F
Frost-free period: 100 to 130 days

Taxonomic classification: Loamy-skeletal, mixed, euic Terric Cryohemists

Typical Pedon

Nuka peat, on a slope of 1 percent, in an area of sphagnum moss, sedge, and dwarf shrubs, 2,550 feet west of the northeast corner of sec. 11, T. 10 S., R. 15 W.

Oi1—0 to 3 inches; peat, dark brown (7.5YR 3/2 and 3/4) broken face, rubbed, and pressed; 95 percent fiber, 80 percent rubbed; dominantly moss fibers; many very fine, fine, and medium roots; 5 percent mineral content; very strongly acid (pH 5.0); clear smooth boundary.
Oi2—3 to 9 inches; peat, strong brown (7.5YR 5/8) broken face, reddish yellow (7.5YR 6/6) rubbed and pressed; 95 percent fiber, 80 percent rubbed; dominantly moss fibers; many very fine, fine, and medium roots; 5 percent mineral content; very strongly acid (pH 5.2); clear smooth boundary.
Oe1—9 to 26 inches; mucky peat, dark brown (7.5YR 3/2) broken face and rubbed, dark brown (7.5YR 4/4) pressed; 95 percent fiber, 80 percent rubbed; dominantly moss fibers; many very fine, fine, and medium roots; 5 percent mineral content; very strongly acid (pH 5.0); clear smooth boundary.
Oe2—26 to 47 inches; mucky peat, dark brown (7.5YR 3/3) broken face, rubbed, and pressed; 75 percent fiber, 35 percent rubbed; admixture of sedge and moss fibers; few very fine, fine, and medium roots; 5 percent mineral content; very strongly acid (pH 5.0); abrupt smooth boundary.
C—47 to 60 inches; dark grayish brown (2.5Y 4/2) very gravelly loam; massive; friable, nonsticky and nonplastic; 35 percent gravel and 5 percent cobbles.

Range in Characteristics

Thickness of the organic material: 16 to 51 inches

Oi horizon:
Thickness—8 to 15 inches
Texture—peat
Reaction—pH 4.5 to 5.5

Oe horizon:
Thickness—36 to 43 inches
Texture—mucky peat
Reaction—pH 4.5 to 5.5

C horizon:
Hue—2.5Y or 5Y
Value—2 to 5
Chroma—2 to 4
Texture—very gravelly loam or very gravelly sandy loam
Reaction—pH 5.1 to 5.5

Petrof Series

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained and somewhat poorly drained
Permeability: Moderate (0.6 inch to 2.0 inches/hour)
Landform: Alluvial plains, low stream terraces
Parent material: Alluvium
Slope range: 0 to 3 percent
Elevation: 20 to 150 feet
Annual precipitation: 65 to 75 inches
Annual air temperature: 38 to 40 degrees F
Frost-free period: 100 to 130 days

Taxonomic classification: Coarse-loamy, mixed, superactive, nonacid Typic Cryofluvents

Typical Pedon

Petrof silt loam, on a slope of 1 percent, in an area of Sitka spruce, cottonwood, bluejoint grass, and forbs, 530 feet south and 50 feet west of the northeast corner of sec. 22, T. 10 S., R. 13 W.

Oe—1 inch to 0; very dark brown (10YR 2/2) mucky peat; extremely acid (pH 6.0); abrupt smooth boundary.
A—0 to 7 inches; dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) silt loam;

moderate thin platy structure; very friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; thin strata of fine sandy loam; strongly acid (pH 5.2); gradual wavy boundary.

C—7 to 26 inches; dark brown (10YR 3/3), stratified fine sand and fine sandy loam; single grain or weak thin platy structure; loose and very friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; medium acid (pH 5.8); clear smooth boundary.

Cg1—26 to 54 inches; olive gray (5Y 4/2), stratified fine sand and fine sandy loam; massive; very friable, nonsticky and nonplastic; neutral (pH 7.0); clear smooth boundary.

Cg2—54 to 60 inches; very dark gray (5Y 3/1), stratified sandy loam and loamy sand; massive or single grain; very friable and loose, nonsticky and nonplastic; mildly alkaline (pH 7.5).

Range in Characteristics

Thickness of the solum: 5 to 13 inches
Content of rock fragments in the control section: 0 to 5 percent

O horizon:
Thickness—0 to 3 inches
Texture—peat or mucky peat

A horizon:
Hue—10YR
Value—3 or 4
Chroma—2 to 4
Texture—silt loam or very fine sandy loam
Reaction—pH 5.2 to 6.5

C horizon:
Hue—10YR or 2.5Y
Value—3 or 4
Chroma—2 or 3
Texture—stratified silt loam, fine sandy loam, or loamy sand
Reaction—pH 5.8 to 7.5

Cg horizon:
Hue—2.5Y or 5Y
Value—3 or 4
Chroma—1 or 2
Texture—stratified silt loam, fine sandy loam, or loamy sand; the underlying material is very gravelly or extremely gravelly sand or loamy sand.
Reaction—pH 5.8 to 7.5

Portdick Series

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained and somewhat poorly drained
Permeability: Moderate or moderately rapid (0.6 inch to 6.0 inches/hour) over rapid (6.0 to 20.0 inches/hour)
Landform: Alluvial plains, low stream terraces
Parent material: Alluvium
Slope range: 0 to 3 percent
Elevation: 20 to 150 feet
Annual precipitation: 65 to 75 inches
Annual air temperature: 38 to 40 degrees F
Frost-free period: 100 to 130 days

Taxonomic classification: Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, nonacid Typic Cryofluvents

Typical Pedon

Portdick silt loam, on a slope of 1 percent, in an area of Sitka spruce, cottonwood, bluejoint grass, and forbs, 1,500 feet north and 1,580 feet east of the southwest corner of sec. 23, T. 10 S., R. 13 W.

A1—0 to 19 inches; dark yellowish brown (10YR 3/4) silt loam; weak medium platy structure; very friable, nonsticky and nonplastic; common very fine and fine and few medium roots; thin strata of fine sandy loam; slightly acid (pH 6.5); gradual wavy boundary.

A2—19 to 27 inches; dark brown (10YR 3/3), stratified silt loam and fine sandy loam; weak thick platy structure parting to moderate fine granular; very friable, nonsticky and nonplastic; few very fine and fine roots; slightly acid (pH 6.5); abrupt smooth boundary.

2C—27 to 60 inches; dark brown (10YR 4/3) very gravelly loamy sand; single grain; loose, nonsticky and nonplastic; 45 percent gravel and 5 percent cobbles; neutral (pH 7.0).

Range in Characteristics

Thickness of the solum: 10 to 27 inches
Content of rock fragments in the control section: 0 percent in the A horizon and 40 to 70 percent in the 2C horizon

O horizon (if it occurs):
Thickness—0 to 3 inches
Texture—peat or mucky peat

A horizon:
Hue—10YR or 7.5YR
Value—3 or 4
Chroma—2 to 4
Texture—silt loam or sandy loam
Reaction—pH 5.8 to 6.8

2C horizon:
Hue—10YR
Value—3 or 4
Chroma—1 to 3
Texture—loamy sand or sand
Content of rock fragments—40 to 70 percent, including 35 to 70 percent gravel and 0 to 5 percent cobbles
Reaction—pH 6.5 to 7.6

Portgraham Series

Depth class: Moderately deep (22 to 34 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills, mountain side slopes
Parent material: Volcanic ash over glacial till
Slope range: 15 to 45
Elevation: 20 to 1,000 feet
Annual precipitation: 65 to 75 inches
Annual air temperature: 36 to 39 degrees F
Frost-free period: 100 to 130 days

Taxonomic classification: Medial, mixed Andic Humicryods

Typical Pedon

Portgraham silt loam, on a northeast-facing slope of 32 percent, in an area of Sitka spruce forest, 500 feet north and 1,400 feet east of the southwest corner of sec. 32, T. 9 S., R. 15 W.

Oi—2 inches to 0; very dark brown (10YR 2/2) peat; many very fine and fine and few medium and coarse roots; extremely acid (pH 4.2); abrupt smooth boundary.

E—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, medium, and coarse roots; very strongly acid (pH 4.5); abrupt smooth boundary.

Bhs—2 to 6 inches; dark brown (7.5YR 3/3) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; many very fine, fine, medium, and coarse roots; strongly acid (pH 5.5); abrupt smooth boundary.

Eb/Bhsb—6 to 9 inches; grayish brown (10YR 5/2) and black (5YR 2.5/1) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, medium, and coarse roots; strongly acid (pH 5.2); abrupt wavy boundary.

Bhsb—9 to 25 inches; dark reddish brown (5YR 2.5/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; common very fine, fine, and medium roots; 10 percent gravel; very strongly acid (pH 4.5).

R—25 inches; bedrock.

Range in Characteristics

Thickness of the solum: 19 to 34 inches
Content of rock fragments in the control section: 10 to 34 percent

O horizon:
Thickness—1 to 6 inches
Texture—peat, mucky peat, or muck

E and Eb horizons:
Hue—2.5Y, 10YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or very fine sandy loam
Reaction—pH 4.5 to 5.0
Other characteristics—weakly smeary

Bs and Bsb horizons (if they occur):
Hue—7.5YR and 5YR
Value—3 or 4
Chroma—3 or 4
Texture—silt loam or very fine sandy loam
Content of rock fragments—0 to 14 percent gravel
Reaction—pH 4.5 to 6.0
Other characteristics—moderately smeary

Bhs and Bhsb horizons:
Hue—2.5YR or 5YR
Value—2.5 or 3
Chroma—1 to 3
Texture—silt loam or very fine sandy loam
Content of rock fragments—10 to 34 percent, including 10 to 34 percent gravel and 0 to 10 percent cobbles
Reaction—pH 4.5 to 5.5

Seldovia Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)

over moderately slow or moderate (0.2 inch to 2.0 inches/hour)
Landform: Moraines, mountain side slopes
Parent material: Volcanic ash over glacial till
Slope range: 8 to 65 percent
Elevation: 20 to 1,500 feet
Annual precipitation: 65 to 75 inches
Annual air temperature: 35 to 39 degrees F
Frost-free period: 100 to 130 days

Taxonomic classification: Medial, mixed Andic Humicryods

Typical Pedon

Seldovia silt loam, on a south-facing slope of 47 percent, in an area of Sitka spruce forest, 1,360 feet south and 100 feet east of the northwest corner of sec. 27, T. 10 S., R. 16 W.

Oe—2 inches to 0; very dark brown (10YR 2/2) mucky peat; many very fine, fine, medium, and coarse roots; extremely acid (pH 4.2); abrupt smooth boundary.
E—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, and medium and common coarse roots; very strongly acid (pH 4.5); abrupt wavy boundary.
Bs—2 to 4 inches; dark brown (7.5YR 4/4) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; many very fine, fine, and medium and common coarse roots; very strongly acid (pH 4.5); abrupt wavy boundary.
Eb—4 to 5 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, and medium and common coarse roots; 2 percent gravel; very strongly acid (pH 5.0); abrupt wavy boundary.
Bsb—5 to 9 inches; dark reddish brown (5YR 3/4) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; many very fine, fine, and medium and common coarse roots; 2 percent gravel; strongly acid (pH 5.5); clear wavy boundary.
Bhsb1—9 to 19 inches; dark reddish brown (5YR 3/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; common very fine, fine, and medium roots; strongly acid (pH 5.5); clear wavy boundary.
Bhsb2—19 to 29 inches; dark reddish brown (5YR 3/3) silt loam; moderate fine granular structure; very friable, slightly sticky and slightly plastic, moderately smeary; few very fine and fine roots; medium acid (pH 5.8); clear wavy boundary.
2Bsb—29 to 46 inches; dark reddish brown (5YR 3/4) very gravelly silt loam; weak medium subangular blocky structure; very friable, nonsticky and nonplastic, moderately smeary; few fine and medium roots; 30 percent gravel and 10 percent cobbles; very strongly acid (pH 5.8); clear wavy boundary.
2C—46 to 60 inches; light olive brown (2.5Y 5/4) and grayish brown (2.5Y 5/2) very gravelly loam; massive; friable, nonsticky and nonplastic; 45 percent gravel and 15 percent cobbles; medium acid (pH 5.8).

Range in Characteristics

Thickness of the solum: 40 to 50 inches
Content of rock fragments in the lower part of the control section: 15 to 45 percent

O horizon:
Thickness—1 to 6 inches
Texture—peat, mucky peat, or muck

E and Eb horizons:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 or 3
Texture—silt loam or very fine sandy loam
Reaction—pH 4.5 to 6.0
Other characteristics—weakly smeary

Bs and Bsb horizons:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—3 or 4
Texture—silt loam or very fine sandy loam
Content of rock fragments—0 to 14 percent gravel
Reaction—pH 4.5 to 6.0
Other characteristics—moderately smeary

Bhs horizon (if it occurs) and Bhsb horizon:
Hue—2.5YR or 5YR
Value—2.5 or 3
Chroma—1 to 3
Texture—silt loam or very fine sandy loam
Content of rock fragments—0 to 14 percent
Reaction—pH 4.5 to 6.0
Other characteristics—moderately smeary

2Bsb horizon:
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—3 or 4
Texture—silt loam or very fine sandy loam
Content of rock fragments—15 to 45 percent,

including 10 to 30 percent gravel and 0 to 15 percent cobbles
Reaction—pH 5.6 to 6.0

2C horizon:
Hue—2.5Y or 10YR
Value—4 to 6
Chroma—2 to 4
Texture—loam or sandy loam
Content of rock fragments—35 to 60 percent, including 25 to 45 percent gravel and 10 to 20 percent cobbles
Reaction—pH 5.6 to 6.0

Taluwik Series

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained and moderately well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour) over rapid (6.0 to 20.0 inches/hour)
Landform: Alluvial fans and mountain toeslopes
Parent material: Volcanic ash over very gravelly alluvium
Slope range: 0 to 15 percent
Elevation: 200 to 1,200 feet
Annual precipitation: 65 to 75 inches
Annual air temperature: 36 to 39 degrees F
Frost-free period: 100 to 130 days

Taxonomic classification: Medial over sandy or sandy-skeletal, mixed Alfic Haplocryands

Typical Pedon

Taluwik very fine sandy loam, on a slope of 8 percent, in an area of bluejoint reedgrass and forbs, 1,480 feet south and 1,320 feet west of the northeast corner of sec. 35, T. 10 S., R. 15 W.

Oe—1 inch to 0; mucky peat; abrupt smooth boundary.
A—0 to 4 inches; very dark brown (10YR 2/2) very fine sandy loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, and medium roots; neutral (pH 6.8); abrupt smooth boundary.
Bw—4 to 17 inches; dark yellowish brown (10YR 3/4) very fine sandy loam; moderate fine granular structure; loose, nonsticky and nonplastic, weakly smeary; common very fine, fine, and medium roots; slightly acid (pH 6.2); abrupt smooth boundary.
2C—17 to 19 inches; very dark grayish brown (2.5Y 3/2) and olive brown (2.5Y 4/4) fine sandy loam; massive; friable, nonsticky and nonplastic; few very fine and fine roots; slightly acid (pH 6.2); abrupt smooth boundary.
2Bwb—19 to 38 inches; dark brown (7.5YR 3/2) and dark yellowish brown (10YR 3/4) very fine sandy loam; moderate fine granular structure; very friable, nonsticky and nonplastic, slightly smeary; few very fine and fine roots; medium acid (pH 5.8); abrupt smooth boundary.
3C—38 to 60 inches; variegated very gravelly sand; single grain; loose, nonsticky and nonplastic; 45 percent gravel and 10 percent cobbles.

Range in Characteristics

Thickness of the solum: 21 to 38 inches

O horizon:
Thickness—0 to 3 inches
Texture—peat or mucky peat

A horizon:
Hue—10YR
Value—2 or 3
Chroma—2 to 4
Texture—silt loam or very fine sandy loam
Reaction—pH 5.8 to 6.8

Bw horizon:
Hue—10YR or 7.5YR
Value—3
Chroma—2 to 4
Texture—sandy loam, very fine sandy loam, or silt loam
Reaction—pH 5.8 to 6.8

2C horizon:
Hue—2.5Y
Value—3 or 4
Chroma—2 to 4
Texture—fine sandy loam, loamy sand, or sand
Content of rock fragments—0 to 65 percent, including 0 to 55 percent gravel and 0 to 15 percent cobbles
Reaction—pH 5.0 to 5.8

Tutka Series

Depth class: Very shallow and shallow (6 to 20 inches)
Drainage class: Well drained
Permeability: Moderately rapid (2.0 to 6.0 inches/hour)
Landform: Hills, mountain side slopes
Parent material: Volcanic ash over glacial till
Slope range: 8 to 120 percent
Elevation: 20 to 1,500 feet
Annual precipitation: 65 to 75 inches

Annual air temperature: 35 to 39 degrees F
Frost-free period: 100 to 130 days

Taxonomic classification: Medial, mixed Lithic Humicryods

Typical Pedon

Tutka silt loam, on an east-facing slope of 73 percent, in an area of Sitka spruce forest, 400 feet south and 100 feet east of the northwest corner of sec. 11, T. 10 S., R. 16 W.

Oe1—7 to 5 inches; dark brown (10YR 3/2) mucky peat; many very fine and fine roots; abrupt smooth boundary.
Oe2—5 inches to 0; decaying log; few very fine, fine, and medium roots; extremely acid (pH 4.5); abrupt smooth boundary.
E—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, medium, and coarse roots; extremely acid (pH 4.5); abrupt smooth boundary.
Bhs—2 to 4 inches; dark brown (7.5YR 3/3) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; many very fine, fine, medium, and coarse roots; strongly acid (pH 5.5); abrupt smooth boundary.
Eb—4 to 6 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, weakly smeary; many very fine, fine, medium, and coarse roots; strongly acid (pH 5.2); abrupt wavy boundary.
2Bhsb—6 to 14 inches; dark reddish brown (5YR 3/2) very gravelly silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic, moderately smeary; common very fine, fine, and medium roots; 40 percent gravel and 10 percent cobbles; very strongly acid (pH 5.0).
3R—14 inches; bedrock.

Range in Characteristics

Depth to bedrock: 6 to 20 inches
Content of rock fragments in the control section: 20 to 30 percent

O horizon:
Thickness—1 to 7 inches
Texture—peat, mucky peat, or muck

E and Eb horizons:
Hue—2.5Y or 10YR
Value—3 to 6
Chroma—2 to 4
Texture—silt loam or very fine sandy loam
Reaction—pH 4.5 to 5.5
Other characteristics—weakly smeary

Bhs horizon and Bs horizon (if it occurs):
Hue—7.5YR or 5YR
Value—3 or 4
Chroma—2 to 4
Texture—silt loam or very fine sandy loam
Content of rock fragments—0 to 14 percent gravel
Reaction—pH 4.5 to 5.5
Other characteristics—moderately smeary

2Bhsb horizon:
Hue—2.5YR, 5YR, or neutral
Value—3 or 4
Chroma—0 to 3
Texture—silt loam or very fine sandy loam
Content of rock fragments—15 to 50 percent, including 10 to 40 percent gravel and 0 to 15 percent cobbles
Reaction—pH 4.5 to 5.5

Typic Cryaquents

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained and very poorly drained
Permeability: Moderate (0.6 inch to 2.0 inches/hour) over rapid (6.0 to 20.0 inches/hour)
Landform: Flood plains, river deltas, and estuaries
Parent material: Alluvium and tidal sediments
Slope range: 0 to 3 percent
Elevation: 0 to 1,000 feet
Annual precipitation: 65 to 75 inches
Annual air temperature: 36 to 40 degrees F
Frost-free period: 110 to 140 days

Taxonomic classification: Typic Cryaquents

Typical Pedon

Typic Cryaquents, on a slope of 1 percent, in an area of willow and grass, 1,000 feet south and 1,800 feet west of the northeast corner of sec. 21, T. 10 S., R. 15 W.

Oe—3 inches to 0; mucky peat; many very fine, fine, and medium roots; extremely acid (pH 4.2); abrupt smooth boundary.
C1—0 to 21 inches; dark olive gray (5Y 3/2) very fine sandy loam; common large prominent dark brown (7.5YR 3/4) mottles; massive; very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; thin strata of loamy fine sand; strongly acid (pH 5.5); clear smooth boundary.

2C2—21 to 60 inches; olive gray (5YR 4/2) very gravelly loamy sand; single grain; loose, nonsticky and nonplastic; 45 percent gravel and 5 percent cobbles; medium acid (pH 5.8).

Range in Characteristics

Content of rock fragments in the lower part of the control section: 35 to 60 percent

O horizon:
Thickness—0 to 4 inches
Texture—peat or mucky peat

C horizon:
Hue—5Y, 2.5Y, or 10YR
Value—3 or 4
Chroma—1 to 3
Texture—sandy loam, very fine sandy loam, or silt loam
Reaction—pH 5.1 to 5.5

2C horizon:
Hue—5Y, 2.5Y, or 10YR
Value—3 or 4
Chroma—1 to 3
Texture—loamy sand or sand
Content of rock fragments—35 to 60 percent, including 30 to 50 percent gravel and 0 to 10 percent cobbles
Reaction—pH 5.6 to 8.4

Formation of the Soils

Soil is a natural, three dimensional body on the earth's surface. It has properties that result from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over a period of time (Jenny, 1941).

Although there are many different soils, each soil is the result of the interaction of the same five factors. These factors are the physical and chemical composition of the parent material; the effect of climate on the parent material; the kinds of plants and other organisms living in or on the soil; relief, or topography; and the length of time during which the soils have been forming.

The combination of these factors varies within relatively short distances. Consequently, the soils that form differ in fertility, productivity, and physical and chemical characteristics. In the following paragraphs the factors of soil formation are related to the soils in the survey area.

Climate

Climate, an active force in the formation of soils, is determined mainly by temperature and precipitation. The climate in the survey area is maritime and is directly affected by the warm Japanese current. Winters are relatively mild, and summers are cool and moist. Erosion and alternating periods of freezing and thawing break down rocks into material in which soils form. The weathered material is further broken down by chemical reactions, such as solution and hydration. Soils also form in wind-deposited material, such as volcanic ash and glacial loess. This material is also subject to weathering processes.

Precipitation and temperature affect the kind and amount of vegetation that grows on the soil. Vegetation decays to produce organic matter in the soil. Different types of vegetation influence the types of horizons that develop in the soils. Aspect has a strong effect on the micro-climate of a site. Soils on south slopes warm up in mid May and produce new growth of bluejoint reedgrass. Soils on north slopes that are vegetated by Sitka spruce have snowpacks that linger well into June.

The average annual precipitation in the survey area ranges from about 45 to 100 inches. The average annual temperature ranges from 32 to 42 degrees F. The wide range of temperature and precipitation can be attributed to variances in elevation. Elevations in the survey area range from sea level to 3,500 feet. In general, air temperature decreases about 3.5 degrees F for each 1,000-foot increase in elevation.

Living Organisms

Living organisms are active in the formation of soils. Plants, animals, insects, and micro-organisms affect gains or losses in organic matter, plant nutrients in the soil, and changes in porosity and structure.

Roots, rodents, worms, and insects penetrate the soil and alter its structure. Animals increase porosity by burrowing through the soil and leaving open channels for the movement of water and air. Common burrowing animals in the area include ground squirrels and marmot. Soils are churned when trees are blown over with their root systems intact. Leaves, roots, and entire plants that remain in the surface layer are changed to humus by micro-organisms, chemicals in the soil, and insects. Fungi and algae also contribute to the decomposition of bedrock.

Topography

Topography, or relief, is determined by glaciation and the age and resistance of geologic formations to erosion by wind and water. It influences soil development through its effect on drainage, runoff, and colluvial action. Runoff is channeled into deeply incised stream channels that are carved on the steep walls of U-shaped valleys. Soils that form on metastable portions of these steep surfaces have an overthickened solum and have rock fragments incorporated in a matrix of volcanic ash. Nanwalek soils are examples (fig. 11).

Glaciation also had a dominant effect on the formation of soils on valley bottoms. In some areas glaciers scoured resistant bedrock formations and left a thin veneer of till over bedrock. The shallow Tutka soils are in these areas (fig. 12). In other areas thick deposits of till with complex morainal topography were

left by the glaciers. The well drained Kasitsna (fig. 13), Portgraham (fig. 14), and Seldovia (fig. 15) soils are on these moraines, and the very poorly drained Koyuktolik and Nuka soils are in the depressions. Soils on narrow to relatively broad flood plains have a seasonal water table near the surface. Jakolof, Petrof (fig. 16), and Portdick soils are on low stream terraces and flood plains.

In most areas the uplands are truncated by steep rocky cliffs at the sea coast. These short escarpments can be impractical to illustrate on the soil maps.

Parent Material

Parent material is the unconsolidated and chemically weathered mineral or organic material in which a soil formed. Most of the mineral soils in the survey area formed in a mantle of volcanic ash mixed with small amounts of glacial loess over glacial till, colluvium, or alluvium. Taluwik soils formed in thick deposits of volcanic ash that have accumulated on alluvial fans (fig. 17). The organic Koyuktolik and Nuka soils formed in layers of sedge and moss peat that contains some woody debris.

In mineral soils the active zone of soil development is near the surface in the ashy mantle. This zone is where most soil horizons have developed. The composition of the underlying material and bedrock has not been a major factor affecting the type of soils and vegetation that occur, since the material is young, slightly weathered, and below the root zone of most plants. Notable exceptions are the Cryorthents in map unit 104. These soils formed in ultramafic rocks like those of Red Mountain.

The vegetation is very sparse, and horizon development is minimal because of nutrient imbalances and possible concentrations of heavy metals.

It has been generalized that Wisconsinan glacial drift covers the part of Alaska included in the survey area (Péwé, 1975). It is likely that Holocene glacial drift also occurs, because active glaciers are within 7 miles to the east of the survey area. The bedrock geology of the area has been mapped and is described as being very complex (Bradley and Kusky, 1992; Bradley and others).

Time

The changes that take place in a soil over long periods of time are referred to as soil genesis. Distinct horizons, or layers, develop in the soils as a result of these changes. The length of time that parent materials have been in place and exposed to climate and living organisms is generally reflected in the degree to which the soil profile has developed. The kinds and arrangement of layers are called the soil morphology, and they are described in terms of color, texture, structure, consistence, thickness, permeability, and chemistry.

Soils are classified as young to mature. The relative age of a soil can be determined by the thickness of its horizons, the types of minerals that have developed, and the depth to which soluble material is leached.

In terms of geologic time, all of the surfaces in the survey area are young, having been recently glaciated and then mantled by eolian deposits. Erosional processes have redistributed some of the glacial till and eolian deposits on active landforms, such as alluvial fans and flood plains. The youngest soils on these landforms, such as Chenega soils (fig. 18), show very little profile development other than the accumulation of organic matter in the surface horizon. In contrast, Jakolof soils, which are on the adjacent low stream terraces that are mantled by volcanic ash deposits, have horizons that are strongly leached by organic acids. Minerals and organic matter have been translocated to the lower horizons by the podzolization process. Podzolization is the dominant soil-forming process in the survey area. It occurs relatively rapidly in this environment.

Figure 11.—Profile of Nanwalek silt loam. Nanwalek soils have rock fragments throughout the profile. The matrix is volcanic ash that is rich in organic matter.

Figure 12.—Profile of Tutka silt loam. Tutka soils are less than 50 cm deep to bedrock.

Figure 13.—Profile of Kasitsna silt loam. Kasitsna soils formed over glacial till that is compact in some areas.

Figure 14.—Profile of Portgraham silt loam. Portgraham soils are 50 to 100 centimeters deep over bedrock.

Figure 15.—Profile of Seldovia silt loam. The solum in the Seldovia soils is more than 100 cm in thickness.

Figure 16.—Profile of Petrof silt loam. Petrof soils are relatively young and undeveloped. They are on flood plains.

Figure 17.—Profile of Taluwik silt loam. Taluwik soils formed under grasses and have a high content of organic matter throughout.

Figure 18.—Profile of Chenega silt loam. Chenega soils formed in coarse, stratified alluvium.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Beach ridge. An essentially continuous mound of beach material behind the beach that has been heaped up by wave action or other action.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Board foot. A unit of measure of the wood in lumber, logs, or trees. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick before finishing.

Boss. A smooth and rounded mound, hillock, or other mass of resistant bedrock, typically bare of soil or vegetation.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To

reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channeled. Refers to a drainage area in which natural meandering or repeated branching and convergence of a streambed have created deeply incised cuts, either active or abandoned, in alluvial material.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Cirque. A semicircular, concave, bowllike area that has steep faces primarily resulting from glacial ice and snow abrasion.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clayey soil. Silty clay, sandy clay, or clay.

Clearcut. A method of forest harvesting that removes the entire stand of trees in one cutting. Reproduction is achieved artificially or by natural seeding from adjacent stands.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Closed depression. A low area completely surrounded by higher ground and having no natural outlet.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Codominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above but comparatively little from the sides.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial forest. Forestland capable of producing 20 cubic feet or more per acre per year at the culmination of the mean annual increment.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the “Soil Survey Manual.”

Control section. The part of the soil on which

classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Dominant trees. Trees whose crowns form the general level of the forest canopy and that receive full light from above and from the sides.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained*. These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Drainageway. An area of ground at a lower elevation than the surrounding ground and in which water collects and is drained to a closed depression or lake or to a drainageway at a lower elevation. A drainageway may or may not have distinctly incised channels at its upper reaches or throughout its course.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Estuaries. Drainage channels adjacent to the sea in which the tide ebbs and flows.

Even aged. Refers to a stand of trees in which only small differences in age occur between the individuals. A range of 20 years is allowed.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3

days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foothills. A region of relatively low, rounded hills at the base of a mountain range.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciated uplands. Land areas that were previously covered by continental or alpine glaciers and that are at a higher elevation than the flood plain.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Heavy metal. Inorganic substances that are solid at ordinary temperatures and are not soluble in water. They form oxides and hydroxides that are basic. Examples are copper, iron, cadmium, zinc, manganese, lead, and arsenic.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation

of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy soil. Coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, loam, silt loam, silt, clay loam, sandy clay loam, or silty clay loam.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Mean annual increment (MAI). The average annual increase in volume of a tree during the entire life of the tree.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Merchantable trees. Trees that are of sufficient size to be economically processed into wood products.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minor component. A component of limited extent that may or not occur in an individual map unit delineation.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine. An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Muskeg. A bog, generally a sphagnum bog, commonly with grassy tussocks, growing in wet, poorly drained boreal regions, often in areas of permafrost.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Overstory. The trees in a forest that form the upper crown cover.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Permafrost. Layers of soil, or even bedrock, occurring in arctic or subarctic regions, in which a temperature below freezing has existed continuously for a long time.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Recessional moraine. A moraine formed during a temporary but significant halt in the retreat of a glacier.

Regeneration. The new growth of a natural plant community, developing from seed.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Roche moutonnée. A glacially abraded bedrock boss.

Rock fragments. Rock or mineral fragments having a

diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rock outcrop. Exposures of bare bedrock other than lava flows and rock-lined pits.

Root zone. The part of the soil that can be penetrated by plant roots.

Rubble land. Areas in which more than 90 percent of the surface is covered by stones or boulders. Voids contain no soil material and virtually no vegetation other than lichens. The areas commonly are at the base of mountain slopes, but some are on mountain slopes as deposits of cobbles, stones, and boulders left by Pleistocene glaciation or by periglacial phenomena.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy soil. Sand or loamy sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sawlogs. Logs of suitable size and quality for the production of lumber.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Scribner's log rule. A method of estimating the number of board feet that can be cut from a log of a given diameter and length.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shelterwood system. A forest management system requiring the removal of a stand in a series of cuts so that regeneration occurs under a partial canopy. After regeneration, a final cut removes the shelterwood and allows the stand to develop in the open as an even-aged stand. The system is well suited to sites where shelter is needed for regeneration, and it can aid regeneration of the more intolerant tree species in a stand.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site class. A grouping of site indexes into five to seven production capability levels. Each level can be represented by a site curve.

Site curve (100-year). A set of related curves on a graph that shows the average height of dominant or dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant or dominant and

codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Skid trails. Pathways along which logs are dragged to a common site for loading onto a logging truck.

Slash. The branches, bark, treetops, reject logs, and broken or uprooted trees left on the ground after logging.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

Nearly level	0 to 2 percent
Gently sloping	2 to 4 percent
Moderately sloping	4 to 8 percent
Strongly sloping	8 to 15 percent
Moderately steep	15 to 25 percent
Steep	25 to 45 percent
Very steep	More than 45 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Species. A single, distinct kind of plant or animal having certain distinguishing characteristics.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strath terrace. A surface cut formed by the erosion of hard or semiconsolidated bedrock and thinly mantled with stream deposits.

Stream channel. The hollow bed where a natural stream of surface water flows or may flow; the deepest or central part of the bed, formed by the main current and covered more or less continuously by water.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel. It originally formed near the level of the stream and is the dissected remnants of an abandoned flood plain, streambed, or valley floor that were produced during a former stage of erosion or deposition.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the E horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Talus. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Trafficability. The degree to which a soil is capable of supporting vehicular traffic across a wide range in soil moisture conditions.

Understory. Any plants in a forest community that grow to a height of less than 5 feet.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley. An elongated depressional area primarily developed by stream action.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1979-98 at Tutka Bay Lagoon, Alaska)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	29.8	20.8	25.3	43	-8	0	7.95	2.87	12.17	10	15.0
February---	30.9	21.1	26.0	43	-5	0	5.36	2.98	8.17	10	13.4
March------	35.9	24.6	30.3	47	2	0	4.67	1.46	7.28	8	13.0
April------	43.3	29.2	36.2	57	15	6	5.76	2.59	8.48	11	4.1
May--------	53.8	34.3	44.0	70	26	136	3.67	1.46	5.54	8	.1
June-------	61.7	41.2	51.5	75	32	336	1.86	1.09	2.55	4	.0
July-------	65.2	46.4	55.8	76	29	462	1.70	.92	2.39	4	.0
August-----	64.0	45.4	54.7	75	36	436	3.99	1.67	5.95	7	.0
September--	54.5	40.1	47.3	66	26	221	9.16	4.69	13.07	12	.0
October----	42.1	31.7	36.9	53	16	30	8.20	3.72	12.05	11	2.8
November---	34.1	25.0	29.5	47	6	3	7.29	2.77	11.08	10	10.8
December---	31.1	21.6	26.4	42	0	0	8.58	4.49	12.16	12	24.7
Yearly:											
Average---	45.5	31.8	38.7	---	---	---	---	---	---	---	---
Extreme---	81	-18	---	78	-8	---	---	---	---	---	---
Total-----	---	---	---	---	---	1,630	68.20	43.38	70.83	107	84.0

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1979-98 at Tutka Bay Lagoon, Alaska)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 6	May 19	June 18
2 years in 10 later than--	Apr. 29	May 12	June 11
5 years in 10 later than--	Apr. 16	Apr. 28	May 29
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 8	Sept. 30	Sept. 8
2 years in 10 earlier than--	Oct. 12	Oct. 3	Sept. 13
5 years in 10 earlier than--	Oct. 21	Oct. 8	Sept. 22

Table 3.--Growing Season

(Recorded in the period 1979-98 at Tutka Bay Lagoon, Alaska)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	169	141	101
8 years in 10	176	148	108
5 years in 10	190	161	120
2 years in 10	203	174	132
1 year in 10	210	181	139

Table 4.--Snowpack Depth and Snow Water Equivalent

(Recorded in the period 1980-90 at Red Mountain, Alaska, and 1981-90 at Tutka Lagoon, Tutka Bay, Alaska; all are incomplete records. Depths are in inches. The abbreviation SWE means snow water equivalent, which is given as a percentage)

	Month							
	February		March		April		May	
	Depth	SWE	Depth	SWE	Depth	SWE	Depth	SWE
RED MOUNTAIN (elev. 980 feet):	38	12.6	50	17.8	59	21.3	54	22.1
TUTKA LAGOON (elev. 650 feet):	39	13.4	54	19.5	61	22.9	54	23.3
TUTKA BAY (elev. 1,300 feet):	49	17.0	69	25.6	82	31.3	81	34.6

Table 5.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
101	Beaches, gravelly	111	*
102	Chenega silt loam, 0 to 3 percent slopes	1,214	0.6
103	Chenega silt loam, 3 to 8 percent slopes	314	0.1
104	Cryods-Cryorthents-Rock outcrop complex, 5 to 120 percent slopes	44,649	21.2
105	Ismailof sandy loam, 0 to 3 percent slopes	447	0.2
106	Ismailof sandy loam, 0 to 3 percent slopes, tide flats	580	0.3
107	Jakolof silt loam, 0 to 3 percent slopes	523	0.2
108	Jakolof silt loam, 3 to 8 percent slopes	1,319	0.6
109	Jakolof, cool-Taluwik complex, 0 to 15 percent slopes	296	0.1
110	Jakolof-Typic Cryaquents complex, 0 to 8 percent slopes	722	0.3
111	Kasitsna silt loam, 15 to 25 percent slopes, cool	4,644	2.2
112	Kasitsna silt loam, rolling to steep	3,494	1.7
113	Kasitsna silt loam, hilly to very steep	1,253	0.6
114	Kasitsna-Kasitsna, cool-Seldovia complex, 45 to 65 percent slopes	3,307	1.6
115	Kasitsna-Nuka complex, nearly level to hilly	11,173	5.3
116	Kasitsna-Nuka-Tutka complex, nearly level to hilly	4,895	2.3
117	Kasitsna-Seldovia complex, 25 to 45 percent slopes	2,879	1.4
118	Kasitsna-Seldovia-Portgraham complex, rolling to steep	1,879	0.9
119	Kasitsna-Seldovia-Portgraham complex, hilly to very steep	2,255	1.1
120	Kasitsna-Tutka complex, 45 to 65 percent slopes	7,567	3.6
121	Kasitsna-Tutka complex, 65 to 120 percent slopes	2,032	1.0
122	Kasitsna-Tutka complex, rolling to steep	8,006	3.8
123	Kasitsna-Tutka complex, hilly to very steep	13,090	6.2
124	Koyuktolik and Nuka peats, 0 to 8 percent slopes	1,070	0.5
125	Nanwalek silt loam, 25 to 65 percent slopes, warm	2,750	1.3
126	Nanwalek-Kasitsna, cool, complex, 25 to 65 percent slopes	12,422	5.9
127	Nanwalek-Kasitsna, cool, complex, 65 to 120 percent slopes	3,403	1.6
128	Nanwalek-Rock outcrop complex, 65 to 120 percent slopes	43,213	20.5
129	Nanwalek silt loam, 25 to 65 percent slopes	11,332	5.4
130	Petrof-Portdick complex, occasionally flooded	1,181	0.6
131	Rock outcrop, sea cliffs	561	0.3
132	Rock outcrop-Cryorthents, very steep	5,384	2.6
133	Rubble land	146	*
134	Seldovia silt loam, 8 to 15 percent slopes	1,059	0.5
135	Seldovia silt loam, 25 to 45 percent slopes	166	*
136	Taluwik silt loam, 0 to 3 percent slopes	232	0.1
137	Taluwik silt loam, 3 to 8 percent slopes	936	0.4
138	Tutka silt loam, 45 to 65 percent slopes	459	0.2
139	Tutka silt loam, rolling to steep	1,154	0.5
140	Tutka silt loam, hilly to very steep	1,926	0.9
141	Typic Cryaquents, salt marsh	569	0.3
142	Typic Cryaquents-Andic Cryofluvents complex, 0 to 3 percent slopes	925	0.4
143	Urban land	113	*
144	Water, fresh	5,329	2.5
145	Water, saline	**	**
	Total	210,979	100.0

* Less than 0.1 percent.
** Areas of ocean are not included in the total acreage.

Table 6.--Chemical and Physical Test Data for Selected Soils

(A blank indicates that a determination was not made. LL means liquid limit, PL means plastic limit, PI means plasticity index, and NP means nonplastic)

Soil name, sample number, and location	Horizon	Depth	pH (H_2O 1:1)	Organic carbon	Total nitrogen	Acid oxalate Al	Acid oxalate Fe	Optical density (oxalate extract)	Phosphorus retention	Bulk density (1/3 bar)	Water content 1/3 bar	Water content 15 bar	Atterberg limits (moist) LL	Atterberg limits (moist) PL	Atterberg limits (moist) PI
		In		Pct	Pct	Pct	Pct		Pct	g/cc	--Pct(wt)--		Pct	Pct	Pct
Kasitsna (map unit 112):	E	0-1	4.1	5.4	0.279	0.2	0.2	0.9	48			13.3			
lat. 59°27'40" N.	Bhs	1-3	3.9	16.0	0.978	1.2	1.2	2.0	94	0.44	90.9	38.3	125	99	26
long. 151°40'51" W.	Eb	3-7	4.2	3.8	0.112	0.2	0.1	0.2	44	0.65	61.3	9.3			
(S83AK-639-005)	Bhsb	7-13	4.3	12.3	0.586	2.0	5.7	2.0	98	0.38	128.5	37.8	143	121	22
	Bsb	13-19	4.4	12.5	0.497	2.8	6.5	2.0	99			37.4	158	144	14
	BC	19-23	4.8	5.4	0.222	2.0	2.8	1.7	99			18.8	87	68	19
	2C1	23-30	5.2	0.8	0.034	0.7	0.3	0.2	66			4.2			
Cryods (map unit 104):	E	0-4	4.9	4.5	0.191	0.1	0.1	0.2	38			11.7			
lat. 59°20'10" N.	Bs	4-14	4.6	6.4	0.301	1.6	0.7	1.7	98			17.2			
long. 151°42'50" W.	C	14-31	5.1	1.2		0.7	0.2	0.2	74			5.3		NP	
(S83AK-639-007)															
Nanwalek (map unit 128):	E	0-4	4.3	6.8	0.537	0.2	0.2	0.3	46			24.1			
lat. 59°19'52" N.	Bhs1	4-8	4.1	15.1	0.961	2.1	5.4	2.0	97			41.6		NP	
long. 151°42'56" W.	Bhs2	8-24	4.7	8.5	0.544	3.5	4.0	1.3	99			32.8			
(S83AK-639-003)	Bs	24-32	4.7	3.8	0.222	2.0	1.2	0.9	98			15.8			
	BC	32-40	4.8	3.4	0.178	1.9	0.6	0.6	98			17.3			

Table 7.--Vegetation Cover Types

(See text for descriptions of the cover types listed in this table)

Map symbol and soil name	Common cover types
101:	
Beaches	Beach wildrye grassland
102:	
Chenega	Black cottonwood forest
	Sitka spruce-black cottonwood forest
	Sitka spruce/mixed shrub forest
103:	
Chenega	Sitka spruce/moss forest
	Sitka spruce/mixed shrub forest
	Sitka spruce/devil's club forest
104:	
Cryods	Alpine scrub
Cryorthents	Alpine scrub
Rock outcrop.	
105:	
Ismailof	Sitka spruce/moss forest
	Sitka spruce/mixed shrub forest
106:	
Ismailof	Beach wildrye grassland
107:	
Jakolof	Sitka spruce/devil's club forest
108:	
Jakolof	Sitka spruce/moss forest
	Sitka spruce/mixed shrub forest
	Sitka spruce/bluejoint reedgrass forest
109:	
Jakolof, cool	Bluejoint reedgrass-forb meadow
Taluwik	Bluejoint reedgrass-forb meadow
110:	
Jakolof	Bluejoint reedgrass-forb meadow
	Sitka spruce/devil's club forest
	Sitka spruce/moss forest
Typic Cryaquents	Low willow scrub
	Black cottonwood forest

Table 7.--Vegetation Cover Types--Continued

Map symbol and soil name	Common cover types
111:	
Kasitsna, cool	Tall Sitka alder scrub
	Bluejoint reedgrass-forb meadow
112:	
Kasitsna	Sitka spruce/devil's club forest
	Tall Sitka alder-salmonberry scrub
113:	
Kasitsna	Sitka spruce/devil's club forest
	Sitka spruce/moss forest
114:	
Kasitsna	Sitka spruce/devil's club forest
	Sitka spruce/moss forest
Kasitsna, cool	Sitka spruce/devil's club forest
Seldovia	Sitka spruce/devil's club forest
	Sitka spruce/mixed shrub forest
115:	
Kasitsna	Sitka spruce/mixed shrub forest
	Sitka spruce/devil's club forest
Nuka	Sedge-moss bog meadow
116:	
Kasitsna	Sitka spruce/mixed shrub forest
Nuka	Sedge-moss bog meadow
Tutka	Sitka spruce/devil's club forest
	Sitka spruce/mixed shrub forest
	Sitka spruce/moss forest
117:	
Kasitsna	Sitka spruce/devil's club forest
Seldovia	Sitka spruce/devil's club forest
	Sitka spruce/mixed shrub forest
118:	
Kasitsna	Sitka spruce/devil's club forest
	Sitka spruce/moss forest
Seldovia	Sitka spruce/devil's club forest
	Sitka spruce/mixed shrub forest
Portgraham	Sitka spruce/mixed shrub forest
119:	
Kasitsna	Sitka spruce/devil's club forest
Seldovia	Tall Sitka alder-devil's club scrub
	Sitka spruce/devil's club forest
Portgraham	Sitka spruce/devil's club forest

Table 7.--Vegetation Cover Types--Continued

Map symbol and soil name	Common cover types
120:	
Kasitsna	Sitka spruce/devil's club forest
	Sitka spruce/moss forest
Tutka	Sitka spruce/devil's club forest
	Sitka spruce/moss forest
	Sitka spruce/black crowberry forest
121:	
Kasitsna	Sitka spruce/devil's club forest
Tutka	Sitka spruce/moss forest
122:	
Kasitsna	Sitka spruce/devil's club forest
	Sitka spruce/mixed shrub forest
Tutka	Sitka spruce/devil's club forest
	Sitka spruce/moss forest
123:	
Kasitsna	Sitka spruce/devil's club forest
	Sitka spruce/mixed shrub forest
	Sitka spruce/moss forest
Tutka	Sitka spruce/devil's club forest
124:	
Koyuktolik	Sedge-moss bog meadow
Nuka	Sedge-moss bog meadow
125:	
Nanwalek, warm	Tall Sitka alder-salmonberry scrub
126:	
Nanwalek	Tall Sitka alder scrub
	Tall Sitka alder-salmonberry scrub
Kasitsna, cool	Sitka spruce/moss forest
	Sitka spruce/mixed shrub forest
127:	
Nanwalek	Tall Sitka alder scrub
	Tall Sitka alder-salmonberry scrub
Kasitsna, cool	Tall Sitka alder-salmonberry scrub
	Tall Sitka alder scrub
	Bluejoint reedgrass-forb grassland
128:	
Nanwalek	Tall Sitka alder scrub
Rock outcrop.	
129:	
Nanwalek	Bluejoint reedgrass-forb grassland
	Tall Sitka alder-salmonberry scrub

Table 7.--Vegetation Cover Types--Continued

Map symbol and soil name	Common cover types
130:	
Petrof	Sitka spruce/mixed shrub forest Sitka spruce-black cottonwood forest
Portdick	Sitka spruce/mixed shrub forest Sitka spruce-black cottonwood forest
131:	
Rock outcrop.	
132:	
Rock outcrop.	
Cryorthents	Alpine herbland Alpine scrub
133:	
Rubble land.	
134:	
Seldovia	Sitka spruce/devil's club forest
135:	
Seldovia	Sitka spruce/moss forest
136:	
Taluwik	Bluejoint reedgrass-forb meadow
137:	
Taluwik	Bluejoint reedgrass-forb meadow
138:	
Tutka	Sitka spruce/devil's club forest
139:	
Tutka	Sitka spruce/moss forest Sitka spruce/devil's club forest Sitka spruce/black crowberry forest
140:	
Tutka	Sitka spruce/moss forest
141:	
Typic Cryaquents	Beach wildrye grassland Halophytic wet meadow
142:	
Typic Cryaquents	Low willow scrub Black cottonwood forest
Andic Cryofluvents	Sitka spruce-black cottonwood forest Low willow scrub
143:	
Urban land.	
144:	
Water, fresh.	
145:	
Water, saline.	

Table 8.--Scientific Names of Plants Mentioned in the Text

(Scientific nomenclature follows Hultén, 1968, and Pojar and MacKinnon, 1994)

Common name	Scientific name
TREES	
Sitka spruce	Picea sitchensis (Bong.) Carr.
black cottonwood	Populus balsamifera ssp. trichocarpa (Torr. & Gray ex Hook.) Brayshaw
SHRUBS	
Aleutian mountain-heath	Phyllodoce aleutica (Spreng.) Heller
Barclay's willow	Salix barclayi Anderss.
Sitka alder	Alnus viridis ssp. sinuata (Regel) A.& D. Love
Sitka willow	Salix sitchensis Sanson ex Bong.
arctic willow	Salix arctica Pallas
black crowberry	Empetrum nigrum L.
bog blueberry	Vaccinium uliginosum L.
devil's club	Oplopanax horridus (Sm.) Torr. & Gray ex Miq.
highbush cranberry	Viburnum edule (Michx.) Raf.
luetkea	Luetkea pectinata (Pursh) Kuntze
nootka rose	Rosa nutkana K. Presl
oval-leaf blueberry	Vaccinium ovalifolium Sm.
red elderberry	Sambucus racemosa L.
rusty menziesia	Menziesia ferruginea Sm.
salmonberry	Rubus spectabilis Pursh
shrub birch	Betula nana L.
small cranberry	Vaccinium oxycoccos L.
starry mountain-heath	Cassiope stelleriana (Pallas) DC.
willow	Salix L.
FORBS	
Canadian burnet	Sanguisorba canadensis L.
Pacific hemlock-parsley	Conioselinum chinense (L.) BSP.
arctic starflower	Trientalis europaea L.
beach lovage	Ligusticum scothicum L.
boreal yarrow	Achillea borealis Bong.
bunchberry dogwood	Cornus canadensis L.
caltha-leaf avens	Geum calthifolium Menzies ex Sm.
cloudberry	Rubus chamaemorus L.
common fireweed	Epilobium angustifolium L.
cow-parsnip	Heracleum lanatum Michx.
five-leaf bramble	Rubus pedatus Sm.
green false hellebore	Veratrum viride Ait.
mountain goldenrod	Solidago multiradiata Ait.
northern blackberry	Rubus arcticus L.
northern geranium	Geranium erianthum DC.
orache	Atriplex alaskensis S. Wats.
round-leaf sundew	Drosera rotundifolia L.
scurvy-grass	Cochlearia groenlandica L.
sea plantain	Plantago maritima L.
sea thrift	Armeria maritima (P. Mill.) Willd.
sea-milkwort	Glaux maritima ssp. obtusifolia (Fern.) Boivin
subalpine fleabane	Erigeron peregrinus (Banks ex Pursh) Greene
FERNS	
beech fern	Thelypteris phegopteris (L.) Slosson
lady fern	Athyrium filix-femina (L.) Roth
oak fern	Gymnocarpium dryopteris (L.) Newman
shield fern	Dryopteris expansa (K. Presl) Fraser-Jenkins & Jermy
HORSETAILS	
horsetail	Equisetum L.
CLUBMOSSES	
stiff clubmoss	Lycopodium annotinum L.

Table 8.--Scientific Names of Plants Mentioned in the Text--Continued

Common name	Scientific name
GRASSES	
alkali grass	Puccinellia Parl.
beach wildrye	Elymus arenarius ssp. mollis (Trin.) Hultén
bluejoint reedgrass	Calamagrostis canadensis (Michx.) Beauv.
SEDGES AND RUSHES	
Lyngby's sedge	Carex lyngbyei Hornem.
cottonsedge	Eriophorum L.
sedge	Carex L.

Table 9.--Forestland Productivity

(Only map units with forested soils are listed. Absence of an entry indicates that data were not available)

Map symbol and soil name	Common trees	Productivity class
102:		
Chenega	Sitka spruce	5
105:		
Ismailof	Sitka spruce	4
107:		
Jakolof	Sitka spruce	5
	Balsam poplar	---
108:		
Jakolof	Sitka spruce	5
	Balsam poplar	---
110:		
Jakolof	Sitka spruce	5
	Balsam poplar	---
Typic Cryaquents.		
112, 113:		
Kasitsna	Sitka spruce	7
114:		
Kasitsna	Sitka spruce	7
Kasitsna, cool	Sitka spruce	4
Seldovia	Sitka spruce	6
115:		
Kasitsna	Sitka spruce	7
Nuka.		
116:		
Kasitsna	Sitka spruce	7
Nuka.		
Tutka	Sitka spruce	5
117:		
Kasitsna	Sitka spruce	7
Seldovia	Sitka spruce	6
118, 119:		
Kasitsna	Sitka spruce	7
Seldovia	Sitka spruce	6
Portgraham	Sitka spruce	6
120, 121, 122, 123:		
Kasitsna	Sitka spruce	7
Tutka	Sitka spruce	5

Table 9.--Forestland Productivity--Continued

Map symbol and soil name	Common trees	Productivity class
126:		
Nanwalek.		
Kasitsna, cool	Sitka spruce	4
130:		
Petrof	Sitka spruce	6
Portdick	Sitka spruce	6
	Balsam poplar	---
134, 135:		
Seldovia	Sitka spruce	6
138, 139, 140:		
Tutka	Sitka spruce	5

Table 10.--Forestland Management

(Only map units with soils suitable for production of commercial trees are listed. Absence of an entry indicates that data were not available)

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition
102:						
Chenega	5W	Slight	Slight	Slight	Moderate	Moderate
105:						
Ismailof	4A	Slight	Slight	Slight	Moderate	Moderate
107:						
Jakolof	5W*	Slight	Severe	Slight	Moderate	Moderate
108:						
Jakolof	5W*	Slight	Severe	Slight	Moderate	Moderate
110:						
Jakolof	5W*	Slight	Severe	Slight	Moderate	Moderate
Typic Cryaquents.						
112:						
Kasitsna	7W*	Moderate	Severe	Slight	Moderate	Moderate
113:						
Kasitsna	7R	Severe	Severe	Slight	Moderate	Moderate
114:						
Kasitsna	7R	Severe	Severe	Slight	Moderate	Moderate
Kasitsna, cool	4R	Severe	Severe	Moderate	Moderate	Moderate
Seldovia	6R	Severe	Severe	Slight	Moderate	Moderate
115:						
Kasitsna	7W*	Moderate	Severe	Slight	Moderate	Moderate
Nuka.						
116:						
Kasitsna	7W*	Moderate	Severe	Slight	Moderate	Moderate
Nuka.						
Tutka	5W*	Moderate	Severe	Slight	Moderate	Moderate
117:						
Kasitsna	7R	Severe	Severe	Slight	Moderate	Moderate
Seldovia	6R	Severe	Severe	Slight	Moderate	Moderate
118:						
Kasitsna	7W*	Moderate	Severe	Slight	Moderate	Moderate
Seldovia	6W*	Moderate	Severe	Slight	Moderate	Moderate
Portgraham	6W*	Moderate	Severe	Slight	Moderate	Moderate
119:						
Kasitsna	7R	Moderate	Severe	Slight	Moderate	Moderate
Seldovia	6R	Moderate	Severe	Slight	Moderate	Moderate

See footnote at end of table.

Table 10.--Forestland Management--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Plant competition
119:						
Portgraham	6R	Moderate	Severe	Slight	Moderate	Moderate
120, 121:						
Kasitsna	7R	Severe	Severe	Slight	Moderate	Moderate
Tutka	5R	Severe	Severe	Slight	Moderate	Moderate
122:						
Kasitsna	7W*	Moderate	Severe	Slight	Moderate	Moderate
Tutka	5W*	Moderate	Severe	Slight	Moderate	Moderate
123:						
Kasitsna	7R	Severe	Severe	Slight	Moderate	Moderate
Tutka	5R	Severe	Severe	Slight	Moderate	Moderate
126:						
Nanwalek.						
Kasitsna, cool	4R	Severe	Severe	Moderate	Moderate	Moderate
130:						
Petrof	6W	Slight	Moderate	Slight	Moderate	Moderate
Portdick	6W	Slight	Moderate	Slight	Moderate	Moderate
134:						
Seldovia	6W*	Slight	Severe	Slight	Moderate	Moderate
135:						
Seldovia	6R	Severe	Severe	Slight	Moderate	Moderate
138:						
Tutka	5R	Severe	Severe	Slight	Moderate	Moderate
139:						
Tutka	5W*	Moderate	Severe	Slight	Moderate	Moderate
140:						
Tutka	5R	Severe	Severe	Slight	Moderate	Moderate

* Indicates soils that formed in volcanic ash. The load-bearing capacity is significantly reduced in these areas when the soils are wet.

Table 11.--Soil Limitations and Hazards for Unsurfaced Roads

(See text for descriptions of the limitations and hazards listed in this table)

Map symbol and soil name	Limitations and hazards
101:	
Beaches.	
102:	
Chenega	Dusty when dry Flooding Slippery when wet
103:	
Chenega	Dusty when dry Flooding Slippery when wet
104:	
Cryods	Areas of rock outcrop Very steep slope
Cryorthents	Areas of rock outcrop Very steep slope
Rock outcrop.	
105:	
Ismailof	Slippery when wet
106:	
Ismailof	Flooding Slippery when wet
107, 108:	
Jakolof	Dusty when dry Slippery when wet
109:	
Jakolof, cool	Dusty when dry Moderate slope Slippery when wet
Taluwik	Dusty when dry Low strength when wet Moderate slope Slippery when wet
110:	
Jakolof	Dusty when dry Slippery when wet
Typic Cryaquents	Dusty when dry Flooding Low strength when wet Slippery when wet Wetness
111:	
Kasitsna, cool	Dusty when dry Moderate slope Slippery when wet

Table 11.--Soil Limitations and Hazards for Unsurfaced Roads--Continued

Map symbol and soil name	Limitations and hazards
112:	
Kasitsna	Dusty when dry Moderate slope Slippery when wet
113:	
Kasitsna	Dusty when dry Slippery when wet Steep slope
114:	
Kasitsna	Very steep slope
Kasitsna, cool	Very steep slope
Seldovia	Very steep slope
115:	
Kasitsna	Dusty when dry Moderate slope Slippery when wet
Nuka	Wetness
116:	
Kasitsna	Dusty when dry Moderate slope Slippery when wet
Nuka	Wetness
Tutka	Dusty when dry Moderate slope Slippery when wet
117:	
Kasitsna	Dusty when dry Slippery when wet Steep slope
Seldovia	Dusty when dry Slippery when wet Steep slope
118:	
Kasitsna	Dusty when dry Moderate slope Slippery when wet
Seldovia	Dusty when dry Moderate slope Slippery when wet
Portgraham	Dusty when dry Moderate slope Slippery when wet
119:	
Kasitsna	Dusty when dry Slippery when wet Steep slope

Table 11.--Soil Limitations and Hazards for Unsurfaced Roads--Continued

Map symbol and soil name	Limitations and hazards
119:	
Seldovia	Dusty when dry Slippery when wet Steep slope
Portgraham	Dusty when dry Slippery when wet Steep slope
120, 121:	
Kasitsna	Very steep slope
Tutka	Very steep slope
122:	
Kasitsna	Dusty when dry Moderate slope Slippery when wet
Tutka	Dusty when dry Moderate slope Slippery when wet
123:	
Kasitsna	Very steep slope
Tutka	Very steep slope
124:	
Koyuktolik	Wetness
Nuka	Wetness
125:	
Nanwalek, warm	Very steep slope
126, 127:	
Nanwalek	Very steep slope
Kasitsna, cool	Very steep slope
128:	
Nanwalek	Areas of rock outcrop Very steep slope
Rock outcrop.	
129:	
Nanwalek	Very steep slope
130:	
Petrof	Dusty when dry Flooding Low strength when wet Slippery when wet
Portdick	Dusty when dry Flooding Low strength when wet Slippery when wet

Table 11.--Soil Limitations and Hazards for Unsurfaced Roads--Continued

Map symbol and soil name	Limitations and hazards
131:	
Rock outcrop.	
132:	
Rock outcrop.	
Cryorthents	Areas of rock outcrop Very steep slope
133:	
Rubble land.	
134:	
Seldovia	Dusty when dry Moderate slope Slippery when wet
135:	
Seldovia	Dusty when dry Slippery when wet Steep slope
136, 137:	
Taluwik	Dusty when dry Low strength when wet Slippery when wet
138:	
Tutka	Very steep slope
139:	
Tutka	Dusty when dry Moderate slope Slippery when wet
140:	
Tutka	Dusty when dry Slippery when wet Steep slope
141:	
Typic Cryaquents	Dusty when dry Flooding Low strength when wet Slippery when wet Wetness
142:	
Typic Cryaquents	Dusty when dry Flooding Low strength when wet Slippery when wet Wetness
Andic Cryofluvents	Dusty when dry Flooding Slippery when wet
143:	
Urban land.	

Table 11.--Soil Limitations and Hazards for Unsurfaced Roads--Continued

Map symbol and soil name	Limitations and hazards
144:	
Water, fresh.	
145:	
Water, saline.	

Table 12.--Recreational Development

(See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Camp areas	Paths and trails
101:		
Beaches.		
102, 103:		
Chenega	Severe: flooding.	Moderate: flooding.
104:		
Cryods	Severe: slope.	Severe: slope.
Cryorthents	Severe: slope, small stones, depth to rock.	Severe: slope.
Rock outcrop.		
105:		
Ismailof	Severe: flooding.	Slight.
106:		
Ismailof	Severe: flooding.	Moderate: flooding.
107, 108:		
Jakolof	Severe: flooding.	Severe: erodes easily.
109:		
Jakolof, cool	Slight	Severe: erodes easily.
Taluwik	Slight	Severe: erodes easily.
110:		
Jakolof	Severe: flooding.	Severe: erodes easily.
Typic Cryaquents	Severe: flooding, wetness.	Moderate: wetness, flooding.
111:		
Kasitsna, cool	Severe: slope.	Severe: erodes easily.
112:		
Kasitsna	Severe: slope.	Severe: erodes easily.
113:		
Kasitsna	Severe: slope.	Severe: slope, erodes easily.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Paths and trails
114:		
Kasitsna	Severe: slope.	Severe: slope, erodes easily.
Kasitsna, cool	Severe: slope.	Severe: slope, erodes easily.
Seldovia	Severe: slope.	Severe: slope, erodes easily.
115:		
Kasitsna	Severe: slope.	Severe: erodes easily.
Nuka	Severe: wetness, excess humus.	Severe: wetness, excess humus.
116:		
Kasitsna	Severe: slope.	Severe: erodes easily.
Nuka	Severe: wetness, excess humus.	Severe: wetness, excess humus.
Tutka	Severe: slope, depth to rock.	Severe: erodes easily.
117:		
Kasitsna	Severe: slope.	Severe: slope, erodes easily.
Seldovia	Severe: slope.	Severe: slope, erodes easily.
118:		
Kasitsna	Severe: slope.	Severe: erodes easily.
Seldovia	Severe: slope.	Severe: erodes easily.
Portgraham	Severe: slope.	Severe: erodes easily.
119:		
Kasitsna	Severe: slope.	Severe: slope, erodes easily.
Seldovia	Severe: slope.	Severe: slope, erodes easily.
Portgraham	Severe: slope.	Severe: slope, erodes easily.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Paths and trails
120, 121:		
Kasitsna	Severe: slope.	Severe: slope, erodes easily.
Tutka	Severe: slope, depth to rock.	Severe: slope, erodes easily.
122:		
Kasitsna	Severe: slope.	Severe: erodes easily.
Tutka	Severe: slope, depth to rock.	Severe: erodes easily.
123:		
Kasitsna	Severe: slope.	Severe: slope, erodes easily.
Tutka	Severe: slope, depth to rock.	Severe: slope, erodes easily.
124:		
Koyuktolik	Severe: wetness, excess humus.	Severe: wetness, excess humus.
Nuka	Severe: wetness, excess humus.	Severe: wetness, excess humus.
125:		
Nanwalek, warm	Severe: slope.	Severe: slope, erodes easily.
126, 127:		
Nanwalek	Severe: slope.	Severe: slope, erodes easily.
Kasitsna, cool	Severe: slope.	Severe: slope, erodes easily.
128:		
Nanwalek	Severe: slope.	Severe: slope, erodes easily.
Rock outcrop.		
129:		
Nanwalek	Severe: slope.	Severe: slope, erodes easily.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Paths and trails
130:		
Petrof	Severe: flooding.	Slight.
Portdick	Severe: flooding.	Slight.
131:		
Rock outcrop.		
132:		
Rock outcrop.		
Cryorthents	Severe: slope, small stones, depth to rock.	Severe: slope.
133:		
Rubble land.		
134:		
Seldovia	Moderate: slope.	Severe: erodes easily.
135:		
Seldovia	Severe: slope.	Severe: slope, erodes easily.
136, 137:		
Taluwik	Slight	Severe: erodes easily.
138:		
Tutka	Severe: slope, depth to rock.	Severe: slope, erodes easily.
139:		
Tutka	Severe: slope, depth to rock.	Severe: erodes easily.
140:		
Tutka	Severe: slope, depth to rock.	Severe: slope, erodes easily.
141:		
Typic Cryaquents	Severe: flooding, wetness.	Severe: wetness.
142:		
Typic Cryaquents	Severe: flooding, wetness.	Moderate: wetness, flooding.
Andic Cryofluvents	Severe: flooding.	Moderate: wetness.

Table 12.--Recreational Development--Continued

Map symbol and soil name	Camp areas	Paths and trails
143: Urban land.		
144: Water, fresh.		
145: Water, saline.		

Table 13.--Suitability Ratings for Habitat Elements for Moose, Black Bear, and Mountain Goat

(See text for descriptions of the cover types, habitat elements, and rating criteria)

Map symbol and soil name	Vegetation cover type	Moose			Black bear			Mountain goat	
		Summer range	Winter range	Reproduction range	Spring-summer range	Summer-fall range	Den sites	Spring range	Summer range
101:									
Beaches	Beach wildrye grassland	None	None	None	High	None	None	None	None.
102:									
Chenega	Black cottonwood forest	Medium	Some	Some	High	Medium	High	None	None.
	Sitka spruce-black cottonwood forest	Some	Medium	None	High	Medium	High	None	None.
	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
103:									
Chenega	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.
	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
104:									
Cryods	Alpine scrub	Some	None	None	Some	High	Some	Some	High.
Cryorthents	Alpine scrub	Some	None	None	Some	High	Some	Some	High.
Rock outcrop.									
105:									
Ismailof	Sitka spruce/moss forest	None	Some	None	None	Medium	Some	None	None.
	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	Some	None	None.
106:									
Ismailof	Beach wildrye grassland	None	None	None	High	None	None	None	None.
107:									
Jakolof	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
108:									
Jakolof	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.
	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
	Sitka spruce/bluejoint reedgrass forest	None	None	None	High	Medium	Medium	None	None.
109:									
Jakolof, cool	Bluejoint reedgrass-forb meadow	Some	None	None	High	None	None	Medium	None.
Taluwik	Bluejoint reedgrass-forb meadow	Some	None	None	High	None	None	Medium	None.
110:									
Jakolof	Bluejoint reedgrass-forb meadow	Some	None	None	High	None	None	Medium	None.
	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.
Typic Cryaquents	Low willow scrub	Medium	Medium	Some	Medium	Some	Some	Medium	None.
	Black cottonwood forest	Medium	Some	Some	High	Medium	High	None	None.

Table 13.--Suitability Ratings for Habitat Elements for Moose, Black Bear, and Mountain Goat--Continued

Map symbol and soil name	Vegetation cover type	Moose			Black bear			Mountain goat	
		Summer range	Winter range	Reproduction range	Spring-summer range	Summer-fall range	Den sites	Spring range	Summer range
111:									
Kasitsna, cool	Tall Sitka alder scrub	Some	None	None	Some	Medium	Some	Medium	None.
	Bluejoint reedgrass-forb meadow	Some	None	None	High	None	None	Medium	None.
112:									
Kasitsna	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Tall Sitka alder-salmonberry scrub	Some	None	None	High	Some	Some	High	None.
113:									
Kasitsna	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.
114:									
Kasitsna	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/moss forest	None	Some	None	None	Medium	High	None	None.
Kasitsna, cool	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
Seldovia	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
115:									
Kasitsna	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
Nuka	Sedge-moss bog meadow	Some	Medium	None	High	Medium	None	Some	None.
116:									
Kasitsna	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
Nuka	Sedge-moss bog meadow	Some	Medium	None	High	Medium	None	Some	None.
Tutka	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.
117:									
Kasitsna	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
Seldovia	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
118:									
Kasitsna	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.

Table 13.--Suitability Ratings for Habitat Elements for Moose, Black Bear, and Mountain Goat--Continued

Map symbol and soil name	Vegetation cover type	Moose			Black bear			Mountain goat	
		Summer range	Winter range	Repro-duction range	Spring-summer range	Summer-fall range	Den sites	Spring range	Summer range
118:									
Seldovia	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
Portgraham	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
119:									
Kasitsna	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
Seldovia	Tall Sitka alder-devil's club scrub	Some	High	None	Medium	High	High	None	None.
	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
Portgraham	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
120:									
Kasitsna	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.
Tutka	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.
	Sitka spruce/black crowberry forest	None	Medium	None	Some	High	High	None	None.
121:									
Kasitsna	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
Tutka	Sitka spruce/moss forest	None	Some	None	None	Medium	High	None	None.
122:									
Kasitsna	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
Tutka	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.
123:									
Kasitsna	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.
Tutka	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
124:									
Koyuktolik	Sedge-moss bog meadow	Some	Medium	None	High	Medium	None	Some	None.
Nuka	Sedge-moss bog meadow	Some	Medium	None	High	Medium	None	Some	None.

Table 13.--Suitability Ratings for Habitat Elements for Moose, Black Bear, and Mountain Goat--Continued

Map symbol and soil name	Vegetation cover type	Moose			Black bear			Mountain goat	
		Summer range	Winter range	Reproduction range	Spring-summer range	Summer-fall range	Den sites	Spring range	Summer range
125:									
Nanwalek, warm	Tall Sitka alder-salmonberry scrub	Some	None	None	High	High	Some	Medium	None.
126:									
Nanwalek	Tall Sitka alder scrub	Some	None	None	Some	Medium	Some	Medium	None.
	Tall Sitka alder-salmonberry scrub	Some	None	None	High	Some	Some	High	None.
Kasitsna, cool	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.
	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	High	None	None.
127:									
Nanwalek	Tall Sitka alder scrub	Some	Some	None	Medium	Medium	Some	High	None.
	Tall Sitka alder-salmonberry scrub	Some	None	None	High	High	Some	Medium	None.
Kasitsna, cool	Tall Sitka alder-salmonberry scrub	Some	None	None	High	Some	Some	High	None.
	Tall Sitka alder scrub	Some	None	None	Some	Medium	Some	Medium	None.
	Bluejoint reedgrass-forb grassland	None	None	None	High	Some	Some	High	None.
128:									
Nanwalek	Tall Sitka alder scrub	Some	Some	None	Medium	Medium	Some	High	None.
Rock outcrop.									
129:									
Nanwalek	Bluejoint reedgrass-forb grassland	None	None	None	High	Some	Some	High	None.
	Tall Sitka alder-salmonberry scrub	Some	None	None	High	High	Some	Medium	None.
130:									
Petrof	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	Some	None	None.
	Sitka spruce-black cottonwood forest	Some	Medium	None	High	Medium	Some	None	None.
Portdick	Sitka spruce/mixed shrub forest	Some	High	None	Medium	High	Some	None	None.
	Sitka spruce-black cottonwood forest	Some	Medium	None	High	Medium	Some	None	None.
131:									
Rock outcrop.									
132:									
Rock outcrop.									
Cryorthents	Alpine herbland	None	None	None	Some	None	None	None	High.
	Alpine scrub	Some	None	None	Some	High	Some	Some	High.
133:									
Rubble land.									
134:									
Seldovia	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.

Table 13.--Suitability Ratings for Habitat Elements for Moose, Black Bear, and Mountain Goat--Continued

Map symbol and soil name	Vegetation cover type	Moose			Black bear			Mountain goat	
		Summer range	Winter range	Repro-duction range	Spring-summer range	Summer-fall range	Den sites	Spring range	Summer range
135: Seldovia	Sitka spruce/moss forest	None	Some	None	None	Medium	High	None	None.
136, 137: Taluwik	Bluejoint reedgrass-forb meadow	Some	None	None	High	None	None	Medium	None.
138: Tutka	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
139: Tutka	Sitka spruce/moss forest	None	Some	None	Medium	High	High	None	None.
	Sitka spruce/devil's club forest	None	Medium	None	Medium	Medium	High	None	None.
	Sitka spruce/black crowberry forest	None	Medium	None	Some	High	High	None	None.
140: Tutka	Sitka spruce/moss forest	None	Some	None	None	Medium	High	None	None.
141: Typic Cryaquents	Beach wildrye grassland	None	None	None	High	None	None	None	None.
	Halophytic wet meadow	None	None	None	High	None	None	None	None.
142: Typic Cryaquents	Low willow scrub	Medium	Medium	Some	Medium	Some	Some	Medium	None.
	Black cottonwood forest	Medium	Some	Some	High	Medium	High	None	None.
Andic Cryofluvents	Sitka spruce-black cottonwood forest	Some	Medium	None	High	Medium	High	None	None.
	Low willow scrub	Medium	Medium	Some	Medium	Some	Some	Medium	None.
143: Urban land.									
144: Water, fresh.									
145: Water, saline.									

Table 14.--Suitability Ratings for Habitat Elements for Selected Small Mammals and Birds

(See text for descriptions of the cover types, habitat elements, and rating criteria)

Map symbol and soil name	Vegetation cover type	Snowshoe hare habitat	Porcupine habitat	Spruce grouse food value	Ptarmigan food value	Goshawk nesting	Bald eagle nesting	Marbled murrelet nesting
101:								
Beaches	Beach wildrye grassland	None	None	None	None	None	None	None.
102:								
Chenega	Black cottonwood forest	High	Medium	Medium	None	High	High	None.
	Sitka spruce-black cottonwood forest	High	High	Medium	None	High	High	None.
	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
103:								
Chenega	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.
	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
104:								
Cryods	Alpine scrub	Some	None	Some	High	None	None	None.
Cryorthents	Alpine scrub	Some	None	Some	High	None	None	None.
Rock outcrop.								
105:								
Ismailof	Sitka spruce/moss forest	High	High	Medium	None	Some	High	Some.
	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
106:								
Ismailof	Beach wildrye grassland	None	None	None	None	None	None	None.
107:								
Jakolof	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
108:								
Jakolof	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.
	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
	Sitka spruce/bluejoint reedgrass forest	High	High	Medium	None	None	Some	Some.
109:								
Jakolof, cool	Bluejoint reedgrass-forb meadow	Medium	Some	None	Some	Some	High	None.
Taluwik	Bluejoint reedgrass-forb meadow	Medium	Some	None	Some	Some	High	None.
110:								
Jakolof	Bluejoint reedgrass-forb meadow	Medium	Some	None	Some	Some	High	None.
	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.
Typic Cryaquents	Low willow scrub	High	Medium	Some	None	Medium	High	None.
	Black cottonwood forest	High	Medium	Medium	None	High	High	None.

Table 14.--Suitability Ratings for Habitat Elements for Selected Small Mammals and Birds--Continued

Map symbol and soil name	Vegetation cover type	Snowshoe hare habitat	Porcupine habitat	Spruce grouse food value	Ptarmigan food value	Goshawk nesting	Bald eagle nesting	Marbled murrelet nesting
111:								
Kasitsna, cool	Tall Sitka alder scrub	Medium	None	Some	Some	None	Some	None.
	Bluejoint reedgrass-forb meadow	Medium	Some	None	Some	Some	High	None.
112:								
Kasitsna	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	None.
	Tall Sitka alder-salmonberry scrub	Medium	None	Some	Medium	None	Some	None.
113:								
Kasitsna	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.
114:								
Kasitsna	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/moss forest	High	High	Medium	None	Some	High	Some.
Kasitsna, cool	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
Seldovia	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
115:								
Kasitsna	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
Nuka	Sedge-moss bog meadow	High	Medium	Medium	Some	None	Medium	None.
116:								
Kasitsna	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
Nuka	Sedge-moss bog meadow	High	Medium	Medium	Some	None	Medium	None.
Tutka	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.
117:								
Kasitsna	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
Seldovia	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
118:								
Kasitsna	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.

Table 14.--Suitability Ratings for Habitat Elements for Selected Small Mammals and Birds--Continued

Map symbol and soil name	Vegetation cover type	Snowshoe hare habitat	Porcupine habitat	Spruce grouse food value	Ptarmigan food value	Goshawk nesting	Bald eagle nesting	Marbled murrelet nesting
118:								
Seldovia	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
Portgraham	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
119:								
Kasitsna	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
Seldovia	Tall Sitka alder-devil's club scrub	High	High	High	None	Some	Medium	Some.
	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
Portgraham	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
120:								
Kasitsna	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.
Tutka	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.
	Sitka spruce/black crowberry forest	High	High	High	None	None	High	Some.
121:								
Kasitsna	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
Tutka	Sitka spruce/moss forest	High	High	Medium	None	Some	High	Some.
122:								
Kasitsna	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
Tutka	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.
123:								
Kasitsna	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.
Tutka	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
124:								
Koyuktolik	Sedge-moss bog meadow	High	Medium	Medium	Some	None	Medium	None.
Nuka	Sedge-moss bog meadow	High	Medium	Medium	Some	None	Medium	None.

Table 14.--Suitability Ratings for Habitat Elements for Selected Small Mammals and Birds--Continued

Map symbol and soil name	Vegetation cover type	Snowshoe hare habitat	Porcupine habitat	Spruce grouse food value	Ptarmigan food value	Goshawk nesting	Bald eagle nesting	Marbled murrelet nesting
125:								
Nanwalek, warm	Tall Sitka alder-salmonberry scrub	Medium	None	High	Some	None	Some	None.
126:								
Nanwalek	Tall Sitka alder scrub	Medium	None	Some	Some	None	Some	None.
	Tall Sitka alder-salmonberry scrub	Medium	None	Some	Medium	None	Some	None.
Kasitsna, cool	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.
	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
127:								
Nanwalek	Tall Sitka alder scrub	Medium	None	Medium	Some	None	None	None.
	Tall Sitka alder-salmonberry scrub	Medium	None	High	Some	None	Some	None.
Kasitsna, cool	Tall Sitka alder-salmonberry scrub	Medium	None	Some	Medium	None	Some	None.
	Tall Sitka alder scrub	Medium	None	Some	Some	None	Some	None.
	Bluejoint reedgrass-forb grassland	Medium	None	Some	Some	None	Some	None.
128:								
Nanwalek	Tall Sitka alder scrub	Medium	None	Medium	Some	None	None	None.
Rock outcrop.								
129:								
Nanwalek	Bluejoint reedgrass-forb grassland	Medium	None	Some	Some	None	Some	None.
	Tall Sitka alder-salmonberry scrub	Medium	None	High	Some	None	Some	None.
130:								
Petrof	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
	Sitka spruce-black cottonwood forest	High	High	Medium	None	High	High	None.
Portdick	Sitka spruce/mixed shrub forest	High	High	High	None	Some	Medium	Some.
	Sitka spruce-black cottonwood forest	High	High	Medium	None	High	High	None.
131:								
Rock outcrop.								
132:								
Rock outcrop.								
Cryorthents	Alpine herbland	None	None	None	High	None	None	None.
	Alpine scrub	Some	None	Some	High	None	None	None.
133:								
Rubble land.								
134:								
Seldovia	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
135:								
Seldovia	Sitka spruce/moss forest	High	High	Medium	None	Some	High	Some.

Table 14.--Suitability Ratings for Habitat Elements for Selected Small Mammals and Birds--Continued

Map symbol and soil name	Vegetation cover type	Snowshoe hare habitat	Porcupine habitat	Spruce grouse food value	Ptarmigan food value	Goshawk nesting	Bald eagle nesting	Marbled murrelet nesting
136, 137:								
Taluwik	Bluejoint reedgrass-forb meadow	Medium	Some	None	Some	Some	High	None.
138:								
Tutka	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
139:								
Tutka	Sitka spruce/moss forest	High	High	High	None	Some	High	Some.
	Sitka spruce/devil's club forest	High	High	Medium	None	None	Medium	Some.
	Sitka spruce/black crowberry forest	High	High	High	None	None	High	Some.
140:								
Tutka	Sitka spruce/moss forest	High	High	Medium	None	Some	High	Some.
141:								
Typic Cryaquents	Beach wildrye grassland	None	None	None	None	None	None	None.
	Halophytic wet meadow	None	None	None	None	None	None	None.
142:								
Typic Cryaquents	Low willow scrub	High	Medium	Some	None	Medium	High	None.
	Black cottonwood forest	High	Medium	Medium	None	High	High	None.
Andic Cryofluvents	Sitka spruce-black cottonwood forest	High	High	Medium	None	High	High	None.
	Low willow scrub	High	Medium	Some	None	Medium	High	None.
143:								
Urban land.								
144:								
Water, fresh.								
145:								
Water, saline.								

Table 15.--Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
101:				
Beaches.				
102, 103:				
Chenega	Good	Probable	Probable	Poor: area reclaim, small stones, too sandy.
104:				
Cryods	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Cryorthents	Poor: slope, depth to rock.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, depth to rock.
Rock outcrop.				
105:				
Ismailof	Fair: large stones.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
106:				
Ismailof	Fair: large stones, wetness.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
107, 108:				
Jakolof	Fair: large stones.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
109:				
Jakolof, cool	Fair: large stones.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
Taluwik	Good	Probable	Probable	Poor: area reclaim.
110:				
Jakolof	Fair: large stones.	Probable	Probable	Poor: area reclaim, small stones, too sandy.
Typic Cryaquents	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.

Table 15.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
111:				
Kasitsna, cool	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
112:				
Kasitsna	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
113:				
Kasitsna	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
114:				
Kasitsna	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Kasitsna, cool	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Seldovia	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
115:				
Kasitsna	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Nuka	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: area reclaim, excess humus, wetness.
116:				
Kasitsna	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Nuka	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: area reclaim, excess humus, wetness.
Tutka	Poor: low strength, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, depth to rock.

Table 15.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
117:				
Kasitsna	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Seldovia	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
118:				
Kasitsna	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Seldovia	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Portgraham	Poor: low strength, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
119:				
Kasitsna	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Seldovia	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Portgraham	Poor: low strength, slope, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
120:				
Kasitsna	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Tutka	Poor: low strength, slope, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, depth to rock.
121:				
Kasitsna	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Tutka	Poor: low strength, slope, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, depth to rock.

Table 15.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
122:				
Kasitsna	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Tutka	Poor: low strength, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, depth to rock.
123:				
Kasitsna	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Tutka	Poor: low strength, slope, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, depth to rock.
124:				
Koyuktolik	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Nuka	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: area reclaim, excess humus, wetness.
125:				
Nanwalek, warm	Poor: large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
126, 127:				
Nanwalek	Poor: large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Kasitsna, cool	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
128:				
Nanwalek	Poor: large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
Rock outcrop.				
129:				
Nanwalek	Poor: large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.

Table 15.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
130:				
Petrof	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
Portdick	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
131:				
Rock outcrop.				
132:				
Rock outcrop.				
Cryorthents	Poor: slope, depth to rock.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, depth to rock.
133:				
Rubble land.				
134:				
Seldovia	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
135:				
Seldovia	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, small stones.
136, 137:				
Taluwik	Good	Probable	Probable	Poor: area reclaim.
138:				
Tutka	Poor: low strength, slope, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, depth to rock.
139:				
Tutka	Poor: low strength, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, depth to rock.
140:				
Tutka	Poor: low strength, slope, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, depth to rock.
141:				
Typic Cryaquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.

Table 15.--Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
142:				
Typic Cryaquents	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Andic Cryofluvents	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, too sandy.
143:				
Urban land.				
144:				
Water, fresh.				
145:				
Water, saline.				

Table 16.--Engineering Index Properties

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
101. Beaches												
102, 103------ Chenega	0-3	Silt loam-----	ML	A-4	0	0	100	95-100	90-100	70-90	25-30	NP-5
	3-60	Very gravelly sand, very gravelly silt loam.	GP, GM, SP, SM	A-1	---	0-10	35-65	30-60	15-50	0-15	---	NP
104:												
Cryods-------	0-4	Gravelly silt loam.	SM, GM	A-4, A-5	0	0-15	65-85	60-80	40-70	35-50	20-100	NP-10
	4-14	Very gravelly very fine sandy loam, very gravelly sandy loam.	GM	A-2	0	15-45	40-50	35-45	30-40	20-30	---	---
	14-40	Very gravelly very fine sandy loam, very gravelly fine sandy loam.	GM	A-2	0	15-45	40-50	35-45	30-40	20-30	---	---
	40-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Cryorthents--	0-13	Very gravelly sandy loam.	GM	A-1, A-2	0	5-15	55-65	45-55	34-45	20-30	15-25	NP-5
	13-24	Variable------	GP	A1	0-5	5-15	40-50	30-40	20-30	15-20	---	NP
	24-40	Variable------	GP	A1	0-15	20-40	15-25	5-10	0-5	0	---	NP
	40-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
105, 106------ Ismailof	0-1	Sandy loam----	SM	A-2, A-4	0	0	100	90-100	60-70	25-45	0-15	NP-5
	1-5	Sandy loam, gravelly fine sandy loam, gravelly loamy sand.	SM, SC, GM, GC	A-1, A-4, A-2-4	0	0	65-95	55-90	25-75	20-45	10-20	NP-10
	5-60	Very gravelly sand, extremely gravelly sand.	GP, GP-GM, SP, SP-SM	A-1	0	15-30	50-60	40-50	10-35	0-10	---	NP
107, 108------ Jakolof	0-2	Silt loam-----	MH	A-7	0	0	90-100	85-100	80-90	75-85	90-100	10-20
	2-7	Silt loam, very fine sandy loam, gravelly silt loam.	MH, SM	A-7	0	0-5	90-100	85-100	60-80	40-70	130-160	20-30
	7-60	Very gravelly sand, extremely gravelly sand.	GP, GP-GM, SP	A-1	0	15-30	35-55	30-40	20-30	0-10	---	NP

Table 16.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
109:												
Jakolof, cool	0-2	Silt loam-----	MH	A-7	0	0	90-100	85-100	80-90	75-85	90-100	10-20
	2-7	Silt loam, very fine sandy loam, gravelly silt loam.	MH, SM	A-7	0	0-5	90-100	85-100	60-80	40-70	130-160	20-30
	7-60	Very gravelly sand, extremely gravelly sand.	GP, GP-GM, SP	A-1	0	15-30	35-55	30-40	20-30	0-10	---	NP
Taluwik------	0-4	Silt loam-----	MH	A-7	0	0	100	100	90-100	70-90	120-140	20-30
	4-38	Very fine sandy loam, silt loam, sandy loam.	MH	A-7	0	0	100	100	75-95	55-75	90-120	20-30
	38-60	Extremely gravelly loamy sand, very gravelly sand.	GP, GM, SP, SM	A-1	0	0-25	45-55	35-50	10-25	5-15	---	---
110:												
Jakolof------	0-2	Silt loam-----	MH	A-7	0	0	90-100	85-100	80-90	75-85	90-100	10-20
	2-7	Silt loam, very fine sandy loam, gravelly silt loam.	MH, SM	A-7	0	0-5	90-100	85-100	60-80	40-70	130-160	20-30
	7-60	Very gravelly sand, extremely gravelly sand.	GP, GP-GM, SP	A-1	0	15-30	35-55	30-40	20-30	0-10	---	NP
Typic Cryaquents--	0-21	Very fine sandy loam.	ML	A-4	0	0	100	100	80-90	70-80	25-35	NP-10
	21-60	Very gravelly loamy sand, very gravelly sand.	GM, SM	A-1	0	0-10	50-60	30-40	20-30	15-20	---	NP-5
111---------- Kasitsna, cool	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-18	Silt loam, very fine sandy loam, gravelly very fine sandy loam.	MH, SM, GM	A-7	0	0-5	65-100	55-100	55-90	40-70	130-160	20-30
	18-31	Loam, sandy loam, very gravelly sandy loam.	GM	A-1, A-2, A-4	0	0-15	55-65	50-60	30-45	20-40	30-40	NP-10
	31-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	45-55	45-50	30-40	20-30	10-20	NP-10

Table 16.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
112, 113------	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
Kasitsna	2-18	Silt loam, very fine sandy loam, gravelly very fine sandy loam.	MH, SM, GM	A-7	0	0-5	65-100	55-100	55-90	40-70	130-160	20-30
	18-31	Loam, sandy loam, very gravelly sandy loam.	GM	A-1, A-2, A-4	0	0-15	55-65	50-60	30-45	20-40	30-40	NP-10
	31-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	45-55	45-50	30-40	20-30	10-20	NP-10
114:												
Kasitsna-----	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-18	Silt loam, very fine sandy loam, gravelly very fine sandy loam.	MH, SM, GM	A-7	0	0-5	65-100	55-100	55-90	40-70	130-160	20-30
	18-31	Loam, sandy loam, very gravelly sandy loam.	GM	A-1, A-2, A-4	0	0-15	55-65	50-60	30-45	20-40	30-40	NP-10
	31-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	45-55	45-50	30-40	20-30	10-20	NP-10
Kasitsna, cool--------	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-18	Silt loam, very fine sandy loam, gravelly very fine sandy loam.	MH, SM, GM	A-7	0	0-5	65-100	55-100	55-90	40-70	130-160	20-30
	18-31	Loam, sandy loam, very gravelly sandy loam.	GM	A-1, A-2, A-4	0	0-15	55-65	50-60	30-45	20-40	30-40	NP-10
	31-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	45-55	45-50	30-40	20-30	10-20	NP-10

Table 16.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
114:												
Seldovia-----	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-29	Silt loam, very fine sandy loam.	MH	A-7	0	0-5	90-100	90-100	70-85	60-75	130-160	20-30
	29-46	Very gravelly silt loam, very cobbly silt loam, very gravelly very fine sandy loam.	GM	A-2, A-7	0	0-15	60-65	50-60	40-55	20-50	60-80	10-20
	46-60	Very gravelly loam, very cobbly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	50-55	40-50	30-40	15-30	10-20	NP-10
115:												
Kasitsna-----	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-18	Silt loam, very fine sandy loam, gravelly very fine sandy loam.	MH, SM, GM	A-7	0	0-5	65-100	55-100	55-90	40-70	130-160	20-30
	18-31	Loam, sandy loam, very gravelly sandy loam.	GM	A-1, A-2, A-4	0	0-15	55-65	50-60	30-45	20-40	30-40	NP-10
	31-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	45-55	45-50	30-40	20-30	10-20	NP-10
Nuka---------	0-9	Peat----------	PT	A-8	0	0	---	---	---	---	---	---
	9-47	Mucky peat----	PT	A-8	0	0	---	---	---	---	---	NP
	47-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2-4	0	10-25	50-60	45-55	35-45	20-30	10-20	NP-10
116:												
Kasitsna-----	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-18	Silt loam, very fine sandy loam, gravelly very fine sandy loam.	MH, SM, GM	A-7	0	0-5	65-100	55-100	55-90	40-70	130-160	20-30
	18-31	Loam, sandy loam, very gravelly sandy loam.	GM	A-1, A-2, A-4	0	0-15	55-65	50-60	30-45	20-40	30-40	NP-10
	31-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	45-55	45-50	30-40	20-30	10-20	NP-10

Table 16.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
116:												
Nuka---------	0-9	Peat----------	PT	A-8	0	0	---	---	---	---	---	---
	9-47	Mucky peat----	PT	A-8	0	0	---	---	---	---	---	NP
	47-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2-4	0	10-25	50-60	45-55	35-45	20-30	10-20	NP-10
Tutka--------	0-6	Silt loam-----	MH	A-7	0	0	90-100	85-100	60-85	50-75	100-120	10-20
	6-14	Gravelly silt loam, gravelly very fine sandy loam, very gravelly silt loam.	GM	A-7	0	0-25	65-70	50-65	40-55	40-50	130-160	20-30
	14-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
117:												
Kasitsna-----	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-18	Silt loam, very fine sandy loam, gravelly very fine sandy loam.	MH, SM, GM	A-7	0	0-5	65-100	55-100	55-90	40-70	130-160	20-30
	18-31	Loam, sandy loam, very gravelly sandy loam.	GM	A-1, A-2, A-4	0	0-15	55-65	50-60	30-45	20-40	30-40	NP-10
	31-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	45-55	45-50	30-40	20-30	10-20	NP-10
Seldovia-----	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-29	Silt loam, very fine sandy loam.	MH	A-7	0	0-5	90-100	90-100	70-85	60-75	130-160	20-30
	29-46	Very gravelly silt loam, very cobbly silt loam, very gravelly very fine sandy loam.	GM	A-2, A-7	0	0-15	60-65	50-60	40-55	20-50	60-80	10-20
	46-60	Very gravelly loam, very cobbly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	50-55	40-50	30-40	15-30	10-20	NP-10

Table 16.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
118, 119:												
Kasitsna-----	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-18	Silt loam, very fine sandy loam, gravelly very fine sandy loam.	MH, SM, GM	A-7	0	0-5	65-100	55-100	55-90	40-70	130-160	20-30
	18-31	Loam, sandy loam, very gravelly sandy loam.	GM	A-1, A-2, A-4	0	0-15	55-65	50-60	30-45	20-40	30-40	NP-10
	31-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	45-55	45-50	30-40	20-30	10-20	NP-10
Seldovia-----	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-29	Silt loam, very fine sandy loam.	MH	A-7	0	0-5	90-100	90-100	70-85	60-75	130-160	20-30
	29-46	Very gravelly silt loam, very cobbly silt loam, very gravelly very fine sandy loam.	GM	A-2, A-7	0	0-15	60-65	50-60	40-55	20-50	60-80	10-20
	46-60	Very gravelly loam, very cobbly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	50-55	40-50	30-40	15-30	10-20	NP-10
Portgraham---	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-25	Silt loam, very fine sandy loam, gravelly silt loam.	MH, SM, GM	A-7	0	0-5	65-100	55-100	55-90	40-70	130-160	20-30
	25-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
120, 121, 122, 123:												
Kasitsna----	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-18	Silt loam, very fine sandy loam, gravelly very fine sandy loam.	MH, SM, GM	A-7	0	0-5	65-100	55-100	55-90	40-70	130-160	20-30
	18-31	Loam, sandy loam, very gravelly sandy loam.	GM	A-1, A-2, A-4	0	0-15	55-65	50-60	30-45	20-40	30-40	NP-10
	31-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	45-55	45-50	30-40	20-30	10-20	NP-10

Table 16.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
120, 121, 122, 123:												
Tutka-------	0-6	Silt loam-----	MH	A-7	0	0	90-100	85-100	60-85	50-75	100-120	10-20
	6-14	Gravelly silt loam, gravelly very fine sandy loam, very gravelly silt loam.	GM	A-7	0	0-25	65-70	50-65	40-55	40-50	130-160	20-30
	14-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
124:												
Koyuktolik---	0-3	Peat----------	PT	A-8	0	0	---	---	---	---	---	---
	3-55	Mucky peat----	PT	A-8	0	0	---	---	---	---	---	NP
	55-60	Very gravelly sandy loam.	GM, GC, SM, SC	A-1, A-2-4	0	10-25	55-65	50-60	30-50	15-35	10-20	NP-10
Nuka---------	0-9	Peat----------	PT	A-8	0	0	---	---	---	---	---	---
	9-47	Mucky peat----	PT	A-8	0	0	---	---	---	---	---	NP
	47-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2-4	0	10-25	50-60	45-55	35-45	20-30	10-20	NP-10
125---------- Nanwalek, warm	0-4	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	100-110	10-20
	4-34	Very gravelly silt loam, extremely gravelly very fine sandy loam, very cobbly very fine sandy loam.	GM	A-2-7	0-15	0-65	40-60	35-50	30-45	20-35	130-160	20-30
	34-60	Very gravelly very fine sandy loam, very gravelly sandy loam, extremely gravelly loam.	GM	A-2-7	0-15	10-25	30-50	25-45	25-35	15-30	60-80	10-20

Table 16.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
126, 127:												
Nanwalek-----	0-4	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	100-110	10-20
	4-34	Very gravelly silt loam, extremely gravelly very fine sandy loam, very cobbly very fine sandy loam.	GM	A-2-7	0-15	0-65	40-60	35-50	30-45	20-35	130-160	20-30
	34-60	Very gravelly very fine sandy loam, very gravelly sandy loam, extremely gravelly loam.	GM	A-2-7	0-15	10-25	30-50	25-45	25-35	15-30	60-80	10-20
Kasitsna, cool--------	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-18	Silt loam, very fine sandy loam, gravelly very fine sandy loam.	MH, SM, GM	A-7	0	0-5	65-100	55-100	55-90	40-70	130-160	20-30
	18-31	Loam, sandy loam, very gravelly sandy loam.	GM	A-1, A-2, A-4	0	0-15	55-65	50-60	30-45	20-40	30-40	NP-10
	31-60	Very gravelly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	45-55	45-50	30-40	20-30	10-20	NP-10
128:												
Nanwalek-----	0-4	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	100-110	10-20
	4-34	Very gravelly silt loam, extremely gravelly very fine sandy loam, very cobbly very fine sandy loam.	GM	A-2-7	0-15	0-65	40-60	35-50	30-45	20-35	130-160	20-30
	34-60	Very gravelly very fine sandy loam, very gravelly sandy loam, extremely gravelly loam.	GM	A-2-7	0-15	10-25	30-50	25-45	25-35	15-30	60-80	10-20
Rock outcrop.												

Table 16.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
129---------- Nanwalek	0-4	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	100-110	10-20
	4-34	Very gravelly silt loam, extremely gravelly very fine sandy loam, very cobbly very fine sandy loam.	GM	A-2-7	0-15	0-65	40-60	35-50	30-45	20-35	130-160	20-30
	34-60	Very gravelly very fine sandy loam, very gravelly sandy loam, extremely gravelly loam.	GM	A-2-7	0-15	10-25	30-50	25-45	25-35	15-30	60-80	10-20
130:												
Petrof-------	0-7	Silt loam-----	ML	A-4	0	0	100	100	80-90	70-80	25-35	NP-10
	7-60	Stratified silt loam to fine sand.	ML, SM	A-4, A-2	0	0	100	100	70-90	30-60	0-15	NP-5
Portdick-----	0-19	Silt loam-----	ML	A-4	0	0	100	100	80-90	70-80	25-35	NP-10
	19-27	Stratified silt loam to fine sandy loam.	ML	A-4	0	0	100	100	60-80	50-70	25-35	NP-10
	27-60	Very gravelly loamy sand.	GM	A-1, A-2	0	0-10	50-60	30-40	20-30	15-20	---	---
131. Rock outcrop												
132: Rock outcrop.												
Cryorthents--	0-13	Very gravelly sandy loam.	GM	A-1, A-2	0	5-15	55-65	45-55	34-45	20-30	15-25	NP-5
	13-24	Variable------	GP	A1	0-5	5-15	40-50	30-40	20-30	15-20	---	NP
	24-40	Variable------	GP	A1	0-15	20-40	15-25	5-10	0-5	0	---	NP
	40-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
133. Rubble land												

Table 16.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
134, 135------ Seldovia	0-2	Silt loam-----	MH	A-7	0	0	100	100	90-100	75-85	90-100	10-20
	2-29	Silt loam, very fine sandy loam.	MH	A-7	0	0-5	90-100	90-100	70-85	60-75	130-160	20-30
	29-46	Very gravelly silt loam, very cobbly silt loam, very gravelly very fine sandy loam.	GM	A-2, A-7	0	0-15	60-65	50-60	40-55	20-50	60-80	10-20
	46-60	Very gravelly loam, very cobbly loam, very gravelly sandy loam.	GM, GC	A-1, A-2	0	15-30	50-55	40-50	30-40	15-30	10-20	NP-10
136, 137------ Taluwik	0-4	Silt loam-----	MH	A-7	0	0	100	100	90-100	70-90	120-140	20-30
	4-38	Very fine sandy loam, silt loam, sandy loam.	MH	A-7	0	0	100	100	75-95	55-75	90-120	20-30
	38-60	Extremely gravelly loamy sand, very gravelly sand.	GP, GM, SP, SM	A-1	0	0-25	45-55	35-50	10-25	5-15	---	---
138, 139, 140- Tutka	0-6	Silt loam-----	MH	A-7	0	0	90-100	85-100	60-85	50-75	100-120	10-20
	6-14	Gravelly silt loam, gravelly very fine sandy loam, very gravelly silt loam.	GM	A-7	0	0-25	65-70	50-65	40-55	40-50	130-160	20-30
	14-18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
141---------- Typic Cryaquents	0-25	Silt loam-----	ML	A-4	0	0	100	100	80-100	80-100	25-35	NP-10
	25-29	Very gravelly silt loam.	GM	A-4	0	0	60-70	50-60	40-50	35-45	25-35	NP-10
	29-33	Silt loam-----	ML	A-4	0	0	100	100	80-100	80-100	25-35	NP-10
	33-60	Very gravelly loamy sand.	GM, SM	A-1	0	0-15	50-70	40-60	30-45	15-25	---	NP-5
142:												
Typic Cryaquents--	0-21	Very fine sandy loam.	ML	A-4	0	0	100	100	80-90	70-80	25-35	NP-10
	21-60	Very gravelly loamy sand, very gravelly sand.	GM, SM	A-1	0	0-10	50-60	30-40	20-30	15-20	---	NP-5
Andic Cryofluvents	0-8	Very fine sandy loam.	MH	A-7	0	0	100	100	80-90	70-80	120-140	20-30
	8-60	Very gravelly sand, very gravelly loamy sand.	GM	A-1	0	0-10	45-55	25-35	15-25	10-15	---	NP-5

Table 16.--Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
143. Urban land												
144. Water, fresh												
145. Water, saline												

Table 17.--Physical and Chemical Properties of the Soils

(Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
101.											
Beaches											
102, 103---------	0-3	6-12	---	0.6-2.0	0.25-0.30	4.5-6.0	Low----------	0.43	5	5	1-3
Chenega	3-60	0-3	---	6.0-20	0.03-0.05	4.5-6.0	Low----------	0.10			
104:											
Cryods----------	0-4	0-5	0.80-1.30	0.6-6.0	0.12-0.32	5.1-5.5	Low----------	0.17	3	3	1-6
	4-14	0-5	0.90-1.40	2.0-20	0.08-0.14	5.1-5.5	Low----------	0.10			
	14-40	0-5	0.90-1.40	2.0-20	0.08-0.14	5.1-5.5	Low----------	0.10			
	40-60	---	---	---	---	---	----------	----			
Cryorthents-----	0-13	0-5	---	2.0-6.0	0.08-0.12	5.1-8.4	Low----------	0.32	2	7	2-4
	13-24	0-0	---	---	0.03-0.05	5.1-8.4	Low----------	----			
	24-40	0-0	---	---	0.01-0.02	5.1-8.4	Low----------	----			
	40-60	---	---	---	---	---	----------	----			
Rock outcrop.											
105----------	0-1	5-10	0.80-1.20	2.0-6.0	0.12-0.15	5.1-5.5	Low----------	0.32	5	3	2-4
Ismailof	1-5	0-5	1.20-1.60	2.0-6.0	0.10-0.14	5.1-5.5	Low----------	0.05			
	5-60	0-5	1.40-1.60	6.0-20	0.02-0.06	6.6-8.4	Low----------	0.05			
106----------	0-1	5-10	0.80-1.20	2.0-6.0	0.12-0.15	6.1-6.5	Low----------	0.32	5	3	2-4
Ismailof	1-5	0-5	1.20-1.60	2.0-6.0	0.10-0.14	6.6-7.3	Low----------	0.05			
	5-60	0-5	1.40-1.60	6.0-20	0.02-0.06	7.4-8.4	Low----------	0.05			
107, 108---------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-5.5	Low----------	0.37	5	1	4-8
Jakolof	2-7	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-5.5	Low----------	0.43			
	7-60	0-5	1.40-1.60	6.0-20	0.02-0.04	4.5-6.0	Low----------	0.05			
109:											
Jakolof, cool---	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-5.5	Low----------	0.37	5	1	4-8
	2-7	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-5.5	Low----------	0.43			
	7-60	0-5	1.40-1.60	6.0-20	0.02-0.04	4.5-6.0	Low----------	0.05			
Taluwik---------	0-4	0-10	0.50-0.70	2.0-6.0	0.30-0.34	5.6-7.3	Low----------	0.37	2	1	5-15
	4-38	0-10	0.50-0.70	2.0-6.0	0.30-0.34	5.6-7.3	Low----------	0.43			
	38-60	0-0	1.40-1.50	6.0-20	0.02-0.04	4.5-6.0	Low----------	0.05			
110:											
Jakolof---------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-5.5	Low----------	0.37	5	1	4-8
	2-7	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-5.5	Low----------	0.43			
	7-60	0-5	1.40-1.60	6.0-20	0.02-0.04	4.5-6.0	Low----------	0.05			
Typic Cryaquents	0-21	5-15	0.90-1.30	0.6-2.0	0.20-0.24	5.1-5.5	Low----------	0.37	2	2	2-5
	21-60	0-5	1.40-1.70	6.0-20	0.04-0.06	5.6-6.0	Low----------	0.05			
111----------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	5.1-6.0	Low----------	0.37	5	1	4-8
Kasitsna, cool	2-18	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.43			
	18-31	0-5	0.70-0.90	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.15			
	31-60	0-5	1.40-1.60	0.2-2.0	0.08-0.12	5.6-6.0	Low----------	0.15			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
112, 113---------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	5.1-6.0	Low----------	0.37	5	1	4-8
Kasitsna	2-18	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.43			
	18-31	0-5	0.70-0.90	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.15			
	31-60	0-5	1.40-1.60	0.2-2.0	0.08-0.12	5.6-6.0	Low----------	0.15			
114:											
Kasitsna--------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	5.1-6.0	Low----------	0.37	5	1	4-8
	2-18	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.43			
	18-31	0-5	0.70-0.90	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.15			
	31-60	0-5	1.40-1.60	0.2-2.0	0.08-0.12	5.6-6.0	Low----------	0.15			
Kasitsna, cool--	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	5.1-6.0	Low----------	0.37	5	1	4-8
	2-18	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.43			
	18-31	0-5	0.70-0.90	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.15			
	31-60	0-5	1.40-1.60	0.2-2.0	0.08-0.12	5.6-6.0	Low----------	0.15			
Seldovia--------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.37	2	1	4-8
	2-29	0-10	0.50-0.70	2.0-6.0	0.32-0.36	4.5-6.0	Low----------	0.43			
	29-46	0-5	0.70-0.90	0.6-2.0	0.20-0.24	5.6-6.0	Low----------	0.15			
	46-60	0-5	1.20-1.40	0.2-0.6	0.08-0.12	5.6-6.0	Low----------	0.15			
115:											
Kasitsna--------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	5.1-6.0	Low----------	0.37	5	1	4-8
	2-18	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.43			
	18-31	0-5	0.70-0.90	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.15			
	31-60	0-5	1.40-1.60	0.2-2.0	0.08-0.12	5.6-6.0	Low----------	0.15			
Nuka----------	0-9	0-0	0.05-0.10	6.0-20	0.30-0.34	4.5-5.5	Low----------	0.05	2	8	95-99
	9-47	---	0.07-0.18	6.0-20	0.34-0.38	4.5-5.5	Low----------	0.10			
	47-60	5-15	1.10-1.30	0.06-0.2	0.12-0.16	5.1-5.5	Low----------	0.10			
116:											
Kasitsna--------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	5.1-6.0	Low----------	0.37	5	1	4-8
	2-18	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.43			
	18-31	0-5	0.70-0.90	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.15			
	31-60	0-5	1.40-1.60	0.2-2.0	0.08-0.12	5.6-6.0	Low----------	0.15			
Nuka----------	0-9	0-0	0.05-0.10	6.0-20	0.30-0.34	4.5-5.5	Low----------	0.05	2	8	95-99
	9-47	---	0.07-0.18	6.0-20	0.34-0.38	4.5-5.5	Low----------	0.10			
	47-60	5-15	1.10-1.30	0.06-0.2	0.12-0.16	5.1-5.5	Low----------	0.10			
Tutka----------	0-6	0-5	0.50-0.70	2.0-6.0	0.32-0.36	4.5-5.5	Low----------	0.37	1	1	6-10
	6-14	0-10	0.70-0.90	2.0-6.0	0.18-0.24	4.5-5.5	Low----------	0.24			
	14-18	---	---	---	---	---	----------	----			
117:											
Kasitsna--------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	5.1-6.0	Low----------	0.37	5	1	4-8
	2-18	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.43			
	18-31	0-5	0.70-0.90	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.15			
	31-60	0-5	1.40-1.60	0.2-2.0	0.08-0.12	5.6-6.0	Low----------	0.15			
Seldovia--------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.37	2	1	4-8
	2-29	0-10	0.50-0.70	2.0-6.0	0.32-0.36	4.5-6.0	Low----------	0.43			
	29-46	0-5	0.70-0.90	0.6-2.0	0.20-0.24	5.6-6.0	Low----------	0.15			
	46-60	0-5	1.20-1.40	0.2-0.6	0.08-0.12	5.6-6.0	Low----------	0.15			
118, 119:											
Kasitsna--------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	5.1-6.0	Low----------	0.37	5	1	4-8
	2-18	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.43			
	18-31	0-5	0.70-0.90	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.15			
	31-60	0-5	1.40-1.60	0.2-2.0	0.08-0.12	5.6-6.0	Low----------	0.15			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
118, 119:											
Seldovia--------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.37	2	1	4-8
	2-29	0-10	0.50-0.70	2.0-6.0	0.32-0.36	4.5-6.0	Low----------	0.43			
	29-46	0-5	0.70-0.90	0.6-2.0	0.20-0.24	5.6-6.0	Low----------	0.15			
	46-60	0-5	1.20-1.40	0.2-0.6	0.08-0.12	5.6-6.0	Low----------	0.15			
Portgraham------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-5.0	Low----------	0.37	2	1	4-8
	2-25	0-10	0.50-0.70	2.0-6.0	0.27-0.34	4.5-6.0	Low----------	0.32			
	25-60	---	---	---	---	---	----------	----			
120, 121, 122, 123:											
Kasitsna-------	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	5.1-6.0	Low----------	0.37	5	1	4-8
	2-18	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.43			
	18-31	0-5	0.70-0.90	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.15			
	31-60	0-5	1.40-1.60	0.2-2.0	0.08-0.12	5.6-6.0	Low----------	0.15			
Tutka----------	0-6	0-5	0.50-0.70	2.0-6.0	0.32-0.36	4.5-5.5	Low----------	0.37	1	1	6-10
	6-14	0-10	0.70-0.90	2.0-6.0	0.18-0.24	4.5-5.5	Low----------	0.24			
	14-18	---	---	---	---	---	----------	----			
124:											
Koyuktolik------	0-3	0-0	0.05-0.10	6.0-20	0.30-0.34	4.5-5.5	Low----------	0.05	3	8	95-99
	3-55	---	0.07-0.18	6.0-20	0.34-0.38	4.5-5.5	Low----------	0.10			
	55-60	5-10	1.10-1.30	0.06-0.2	0.10-0.14	5.1-5.5	Low----------	0.10			
Nuka----------	0-9	0-0	0.05-0.10	6.0-20	0.30-0.34	4.5-5.5	Low----------	0.05	2	8	95-99
	9-47	---	0.07-0.18	6.0-20	0.34-0.38	4.5-5.5	Low----------	0.10			
	47-60	5-15	1.10-1.30	0.06-0.2	0.12-0.16	5.1-5.5	Low----------	0.10			
125---------- Nanwalek, warm	0-4	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-5.0	Low----------	0.37	5	1	4-8
	4-34	0-10	0.50-0.70	2.0-6.0	0.16-0.22	5.1-5.5	Low----------	0.10			
	34-60	0-10	0.70-0.95	2.0-6.0	0.12-0.18	5.6-6.0	Low----------	0.10			
126, 127:											
Nanwalek--------	0-4	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-5.0	Low----------	0.37	5	1	4-8
	4-34	0-10	0.50-0.70	2.0-6.0	0.16-0.22	5.1-5.5	Low----------	0.10			
	34-60	0-10	0.70-0.95	2.0-6.0	0.12-0.18	5.6-6.0	Low----------	0.10			
Kasitsna, cool--	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	5.1-6.0	Low----------	0.37	5	1	4-8
	2-18	0-10	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.43			
	18-31	0-5	0.70-0.90	0.6-2.0	0.20-0.24	4.5-5.5	Low----------	0.15			
	31-60	0-5	1.40-1.60	0.2-2.0	0.08-0.12	5.6-6.0	Low----------	0.15			
128:											
Nanwalek--------	0-4	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-5.0	Low----------	0.37	5	1	4-8
	4-34	0-10	0.50-0.70	2.0-6.0	0.16-0.22	5.1-5.5	Low----------	0.10			
	34-60	0-10	0.70-0.95	2.0-6.0	0.12-0.18	5.6-6.0	Low----------	0.10			
Rock outcrop.											
129---------- Nanwalek	0-4	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-5.0	Low----------	0.37	5	1	4-8
	4-34	0-10	0.50-0.70	2.0-6.0	0.16-0.22	5.1-5.5	Low----------	0.10			
	34-60	0-10	0.70-0.95	2.0-6.0	0.12-0.18	5.6-6.0	Low----------	0.10			
130:											
Petrof----------	0-7	5-15	0.90-1.30	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.37	5	1	2-5
	7-60	5-10	1.20-1.40	0.6-2.0	0.12-0.18	5.6-7.3	Low----------	0.43			
Portdick--------	0-19	5-15	0.90-1.30	0.6-2.0	0.20-0.24	6.1-6.5	Low----------	0.37	2	1	2-5
	19-27	5-10	1.00-1.30	0.6-6.0	0.18-0.22	6.1-6.5	Low----------	0.43			
	27-60	0-5	1.40-1.70	6.0-20	0.04-0.06	6.6-7.3	Low----------	0.05			

Table 17.--Physical and Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
131. Rock outcrop											
132: Rock outcrop.											
Cryorthents-----	0-13	0-5	---	2.0-6.0	0.08-0.12	5.1-8.4	Low----------	0.32	2	7	2-4
	13-24	0-0	---	---	0.03-0.05	5.1-8.4	Low----------	----			
	24-40	0-0	---	---	0.01-0.02	5.1-8.4	Low----------	----			
	40-60	---	---	---	---	---	----------	----			
133. Rubble land											
134, 135--------- Seldovia	0-2	0-5	0.50-0.70	2.0-6.0	0.30-0.34	4.5-6.0	Low----------	0.37	2	1	4-8
	2-29	0-10	0.50-0.70	2.0-6.0	0.32-0.36	4.5-6.0	Low----------	0.43			
	29-46	0-5	0.70-0.90	0.6-2.0	0.20-0.24	5.6-6.0	Low----------	0.15			
	46-60	0-5	1.20-1.40	0.2-0.6	0.08-0.12	5.6-6.0	Low----------	0.15			
136, 137--------- Taluwik	0-4	0-10	0.50-0.70	2.0-6.0	0.30-0.34	5.6-7.3	Low----------	0.37	2	1	5-15
	4-38	0-10	0.50-0.70	2.0-6.0	0.30-0.34	5.6-7.3	Low----------	0.43			
	38-60	0-0	1.40-1.50	6.0-20	0.02-0.04	4.5-6.0	Low----------	0.05			
138, 139, 140---- Tutka	0-6	0-5	0.50-0.70	2.0-6.0	0.32-0.36	4.5-5.5	Low----------	0.37	1	1	6-10
	6-14	0-10	0.70-0.90	2.0-6.0	0.18-0.24	4.5-5.5	Low----------	0.24			
	14-18	---	---	---	---	---	----------	----			
141---------- Typic Cryaquents	0-25	20-25	0.90-1.30	0.6-2.0	0.20-0.24	6.6-8.4	Low----------	0.37	2	8	2-6
	25-29	20-25	1.20-1.50	0.6-2.0	0.12-0.14	6.6-8.4	Low----------	0.17			
	29-33	2-25	0.90-1.30	0.6-2.0	0.20-0.24	7.4-8.4	Low----------	0.43			
	33-60	5-10	1.40-1.70	6.0-20	0.04-0.06	7.4-8.4	Low----------	0.05			
142: Typic Cryaquents	0-21	5-15	0.90-1.30	0.6-2.0	0.20-0.24	5.1-5.5	Low----------	0.37	2	2	2-5
	21-60	0-5	1.40-1.70	6.0-20	0.04-0.06	5.6-6.0	Low----------	0.05			
Andic Cryofluvents---	0-8	0-5	0.50-0.70	2.0-6.0	0.30-0.34	5.1-5.5	Low----------	0.37	1	1	5-10
	8-60	0-15	1.40-1.70	6.0-20	0.04-0.06	5.6-6.0	Low----------	0.05			
143. Urban land											
144. Water, fresh											
145. Water, saline											

Table 18.--Water Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
101. Beaches							
102, 103 Chenega	A	Frequent	Brief	Apr-Nov	>6.0	---	---
104:							
Cryods	B	None	---	---	>6.0	---	---
Cryorthents	C	None	---	---	>6.0	---	---
Rock outcrop.							
105 Ismailof	A	Rare	---	---	3.0-6.0	Apparent	Jan-Dec
106 Ismailof	A	Frequent	Very brief	Jan-Dec	2.5-5.0	Apparent	Jan-Dec
107, 108 Jakolof	A	Rare	---	---	3.0-4.0	Apparent	May-Nov
109:							
Jakolof, cool	A	None	---	---	3.0-4.0	Apparent	May-Nov
Taluwik	B	None	---	---	3.0-6.0	Apparent	Apr-Nov
110:							
Jakolof	A	Rare	---	---	3.0-4.0	Apparent	May-Nov
Typic Cryaquents	D	Frequent	Brief	May-Nov	1.0-2.0	Apparent	May-Nov
111 Kasitsna, cool	B	None	---	---	>6.0	---	---
112, 113 Kasitsna	B	None	---	---	>6.0	---	---
114:							
Kasitsna	B	None	---	---	>6.0	---	---
Kasitsna, cool	B	None	---	---	>6.0	---	---
Seldovia	B	None	---	---	>6.0	---	---
115:							
Kasitsna	B	None	---	---	>6.0	---	---
Nuka	D	None	---	---	0-0.5	Apparent	Jan-Dec
116:							
Kasitsna	B	None	---	---	>6.0	---	---
Nuka	D	None	---	---	0-0.5	Apparent	Jan-Dec
Tutka	D	None	---	---	>6.0	---	---

Table 18.--Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
117:							
Kasitsna	B	None	---	---	>6.0	---	---
Seldovia	B	None	---	---	>6.0	---	---
118, 119:							
Kasitsna	B	None	---	---	>6.0	---	---
Seldovia	B	None	---	---	>6.0	---	---
Portgraham	B	None	---	---	>6.0	---	---
120, 121, 122, 123:							
Kasitsna	B	None	---	---	>6.0	---	---
Tutka	D	None	---	---	>6.0	---	---
124:							
Koyuktolik	D	None	---	---	0-0.5	Apparent	Jan-Dec
Nuka	D	None	---	---	0-0.5	Apparent	Jan-Dec
125 Nanwalek, warm	B	None	---	---	>6.0	---	---
126, 127:							
Nanwalek	B	None	---	---	>6.0	---	---
Kasitsna, cool	B	None	---	---	>6.0	---	---
128:							
Nanwalek	B	None	---	---	>6.0	---	---
Rock outcrop.							
129 Nanwalek	B	None	---	---	>6.0	---	---
130:							
Petrof	B	Occasional	Brief	May-Nov	2.0-4.0	Apparent	May-Nov
Portdick	B	Occasional	Brief	May-Nov	2.0-4.0	Apparent	May-Nov
131. Rock outcrop							
132:							
Rock outcrop.							
Cryorthents	C	None	---	---	>6.0	---	---
133. Rubble land							
134, 135 Seldovia	B	None	---	---	>6.0	---	---
136, 137 Taluwik	B	None	---	---	3.0-6.0	Apparent	Apr-Nov

Table 18.--Water Features--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table		
		Frequency	Duration	Months	Depth	Kind	Months
					Ft		
138, 139, 140 Tutka	D	None	---	---	>6.0	---	---
141 Typic Cryaquents	D	Frequent	Very brief	Jan-Dec	0.5-2.0	Apparent	Jan-Dec
142:							
Typic Cryaquents	D	Frequent	Brief	May-Nov	1.0-2.0	Apparent	May-Nov
Andic Cryofluvents	C	Occasional	Brief	May-Nov	1.5-2.5	Apparent	May-Nov
143. Urban land							
144. Water, fresh							
145. Water, saline							

Table 19.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
101. Beaches							
102, 103 Chenega	>60	---	---	---	Low	Moderate	Moderate.
104:							
Cryods	40-60	Hard	---	---	Moderate	Moderate	Moderate.
Cryorthents	10-40	Hard	---	---	Moderate	High	Moderate.
Rock outcrop.							
105 Ismailof	>60	---	---	---	Low	High	High.
106 Ismailof	>60	---	---	---	Low	High	High.
107, 108 Jakolof	>60	---	---	---	Low	High	Moderate.
109:							
Jakolof, cool	>60	---	---	---	Low	High	Moderate.
Taluwik	>60	---	---	---	High	High	High.
110:							
Jakolof	>60	---	---	---	Low	High	Moderate.
Typic Cryaquents	>60	---	---	---	High	Moderate	Moderate.
111 Kasitsna, cool	>60	---	---	---	High	High	Moderate.
112, 113 Kasitsna	>60	---	---	---	High	High	Moderate.
114:							
Kasitsna	>60	---	---	---	High	High	Moderate.
Kasitsna, cool	>60	---	---	---	High	High	Moderate.
Seldovia	>60	---	---	---	High	High	Moderate.
115:							
Kasitsna	>60	---	---	---	High	High	Moderate.
Nuka	>60	---	---	---	High	High	High.
116:							
Kasitsna	>60	---	---	---	High	High	Moderate.
Nuka	>60	---	---	---	High	High	High.
Tutka	6-14	Hard	---	---	High	High	High.

Table 19.--Soil Features--Continued

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
117:							
Kasitsna	>60	---	---	---	High	High	Moderate.
Seldovia	>60	---	---	---	High	High	Moderate.
118, 119:							
Kasitsna	>60	---	---	---	High	High	Moderate.
Seldovia	>60	---	---	---	High	High	Moderate.
Portgraham	20-40	Hard	---	---	High	High	Moderate.
120, 121, 122, 123:							
Kasitsna	>60	---	---	---	High	High	Moderate.
Tutka	6-14	Hard	---	---	High	High	High.
124:							
Koyuktolik	>60	---	20-30	40-50	High	High	High.
Nuka	>60	---	---	---	High	High	High.
125 Nanwalek, warm	>60	---	---	---	High	High	Moderate.
126, 127:							
Nanwalek	>60	---	---	---	High	High	Moderate.
Kasitsna, cool	>60	---	---	---	High	High	Moderate.
128:							
Nanwalek	>60	---	---	---	High	High	Moderate.
Rock outcrop.							
129 Nanwalek	>60	---	---	---	High	High	Moderate.
130:							
Petrof	>60	---	---	---	Moderate	Moderate	Moderate.
Portdick	>60	---	---	---	Moderate	Moderate	Moderate.
131. Rock outcrop							
132:							
Rock outcrop.							
Cryorthents	10-40	Hard	---	---	Moderate	High	Moderate.
133. Rubble land							
134, 135 Seldovia	>60	---	---	---	High	High	Moderate.
136, 137 Taluwik	>60	---	---	---	High	High	High.

Table 19.--Soil Features--Continued

Map symbol and soil name	Bedrock		Subsidence		Potential frost action	Risk of corrosion	
	Depth	Hardness	Initial	Total		Uncoated steel	Concrete
	In		In	In			
138, 139, 140---------- Tutka	6-14	Hard	---	---	High----------	High----------	High.
141---------- Typic Cryaquents	>60	---	---	---	High----------	High----------	High.
142:							
Typic Cryaquents-------	>60	---	---	---	High----------	Moderate-------	Moderate.
Andic Cryofluvents-----	>60	---	---	---	Moderate-------	Moderate-------	Moderate.
143. Urban land							
144. Water, fresh							
145. Water, saline							

Table 20.--Classification of the Soils

Soil name	Family or higher taxonomic class
Andic Cryofluvents	Andic Cryofluvents
Chenega	Sandy-skeletal, mixed Typic Cryofluvents
Cryods	Cryods
Cryorthents	Cryorthents
Ismailof	Sandy-skeletal, mixed Typic Haplocryods
Jakolof	Sandy-skeletal, mixed Typic Humicryods
Kasitsna	Medial over loamy-skeletal, mixed Andic Humicryods
Koyuktolik	Euic Typic Cryohemists
Nanwalek	Medial-skeletal, mixed Andic Humicryods
Nuka	Loamy-skeletal, mixed, euic Terric Cryohemists
Petrof	Coarse-loamy, mixed, superactive, nonacid Typic Cryofluvents
Portdick	Coarse-loamy over sandy or sandy-skeletal, mixed, superactive, nonacid Typic Cryofluvents
Portgraham	Medial, mixed Andic Humicryods
Seldovia	Medial, mixed Andic Humicryods
Taluwik	Medial over sandy or sandy-skeletal, mixed Alfic Haplocryands
Tutka	Medial, mixed Lithic Humicryods
Typic Cryaquents	Typic Cryaquents