UNITED STATES DEPARTMENT
OF AGRICULTURE

SOIL SURVEY
MATANUSKA VALLEY

# CONVENTIONAL SIGNS

## WORKS AND STRUCTURES

Highways and roads
- Good motor
- Poor motor
- Trail

Highway marker, state

Railroad, single track

Buildings
- School
- Church

Mines and Quarries

Pits, gravel or other

Cemetery

## BOUNDARIES

National or state

County

Project area

Land division corners

Reservation

Land grant

Small park, cemetery, airport

## DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Unclassified

Canals and ditches — CANAL

Lakes and ponds
- Perennial — water, w
- Intermittent

Wells, water — flowing

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

## RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions, unclassified — Large, Small

## SOIL SURVEY DATA

Soil boundary and symbol — Dx

Gravel

Stony, very stony

Rock outcrops

Chert fragments

Clay spot

Sand spot

Gumbo or scabby spot

Made land

Severely eroded spot

Blowout, wind erosion

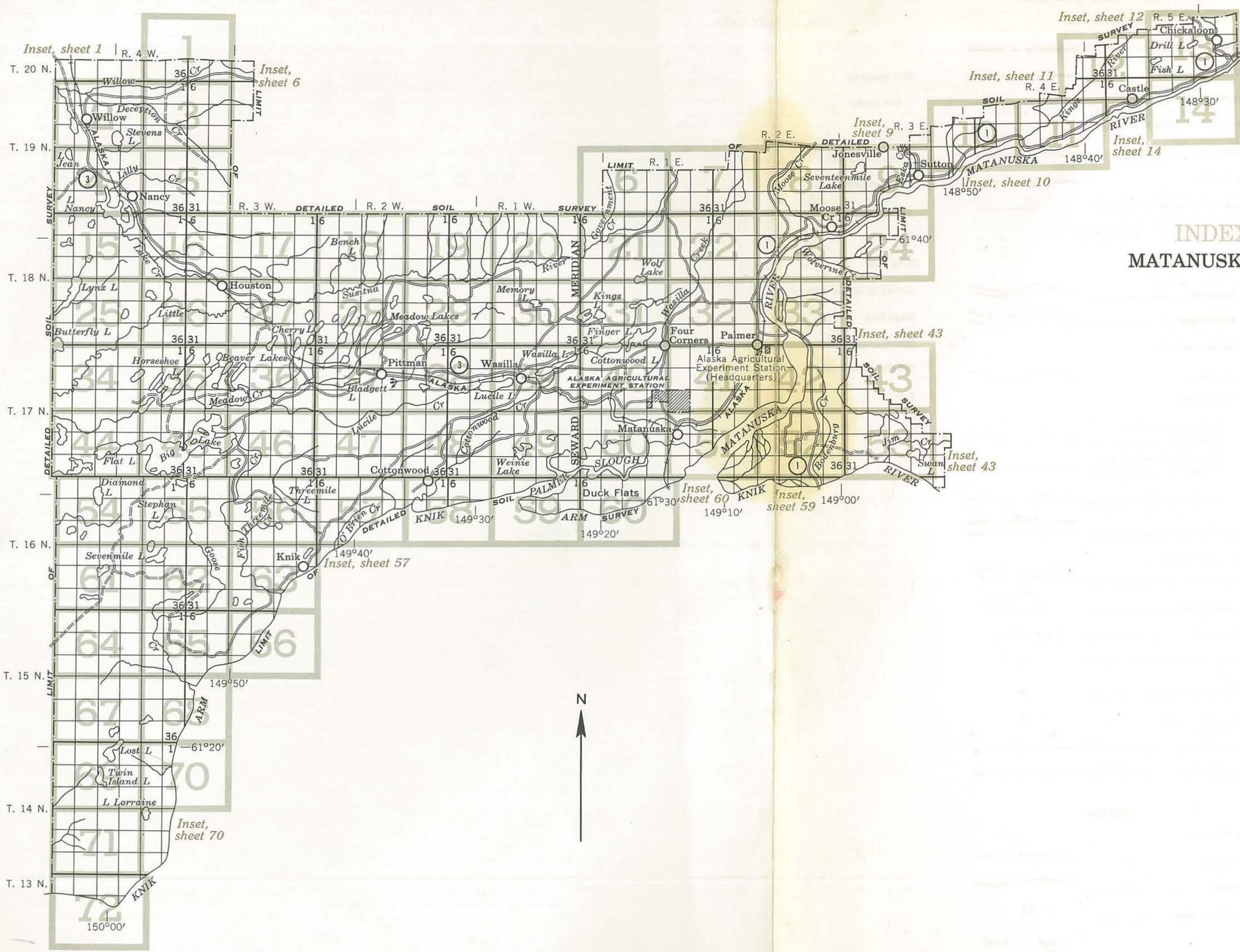
Gully

# SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Most symbols without a slope letter are those of nearly level soils or land types, but some are for land types that have a considerable range in slope.

| SYMBOL | NAME |
|---|---|
| AcC | Anchorage sand, undulating to rolling |
| AcE | Anchorage sand, hilly to steep |
| AhA | Anchorage silt loam, nearly level |
| AnB | Anchorage very fine sandy loam, undulating |
| AnC | Anchorage very fine sandy loam, rolling |
| AnD | Anchorage very fine sandy loam, hilly |
| AnE | Anchorage very fine sandy loam, moderately steep |
| BbA | Bodenburg silt loam, nearly level |
| BbB | Bodenburg silt loam, undulating |
| BbC | Bodenburg silt loam, rolling |
| BbD | Bodenburg silt loam, hilly |
| BdA | Bodenburg very fine sandy loam, nearly level |
| BdB | Bodenburg very fine sandy loam, undulating |
| BdC | Bodenburg very fine sandy loam, rolling |
| BdD | Bodenburg very fine sandy loam, hilly |
| BdE | Bodenburg very fine sandy loam, moderately steep |
| BkF | Bodenburg and Knik silt loams, steep |
| Cl | Clunie peat |
| Co | Coal Creek silt loam |
| Cs | Coal Creek stony silt loam |
| Ct | Chena silt loam |
| DeA | Doone silt loam, nearly level |
| DeB | Doone silt loam, undulating |
| DeC | Doone silt loam, rolling |
| DkD | Doone and Knik silt loams, hilly |
| DkE | Doone and Knik silt loams, moderately steep |
| DkF | Doone and Knik silt loams, steep |
| FhA | Flat Horn silt loam, nearly level |
| FhB | Flat Horn silt loam, undulating |
| FhC | Flat Horn silt loam, rolling |
| FhE | Flat Horn silt loam, hilly to steep |
| Ga | Gravelly alluvial land |
| Gp | Gravel pits and Strip mines |
| HoA | Homestead silt loam, nearly level |
| HoB | Homestead silt loam, undulating |
| HoC | Homestead silt loam, rolling |
| HoD | Homestead silt loam, hilly |
| HoE | Homestead silt loam, moderately steep |
| HoF | Homestead silt loam, steep |
| HsA | Homestead silt loam, very shallow, nearly level |
| HsB | Homestead silt loam, very shallow, undulating |
| HsC | Homestead silt loam, very shallow, rolling |
| HsD | Homestead silt loam, very shallow, hilly |
| HsE | Homestead silt loam, very shallow, moderately steep |
| HsF | Homestead silt loam, very shallow, steep |
| JaA | Jacobsen very stony silt loam, nearly level |
| JaB | Jacobsen very stony silt loam, gently sloping |
| JbD | Jim and Bodenburg silt loams, hilly |
| JbF | Jim and Bodenburg silt loams, steep |
| KaA | Kalifonsky silt loam, nearly level |
| KaC | Kalifonsky silt loam, gently to moderately sloping |
| KaE | Kalifonsky silt loam, strongly sloping to steep |
| KeB | Kenai silt loam, undulating |
| KnA | Knik silt loam, nearly level |
| KnB | Knik silt loam, undulating |
| KnC | Knik silt loam, rolling |
| KnD | Knik silt loam, hilly |
| KnE | Knik silt loam, moderately steep |
| KnF | Knik silt loam, steep |
| Ma | Matanuska silt loam |
| Ml | Mixed alluvial land |
| Mr | Moose River silt loam |
| NaA | Nancy silt loam, nearly level |
| NaB | Nancy silt loam, undulating |
| NaC | Nancy silt loam, rolling |
| NaD | Nancy silt loam, hilly |
| NaE | Nancy silt loam, moderately steep |
| NpA | Naptowne silt loam, nearly level |
| NpB | Naptowne silt loam, undulating |
| NpC | Naptowne silt loam, rolling |
| NpD | Naptowne silt loam, hilly |
| NpE | Naptowne silt loam, moderately steep |
| NpF | Naptowne silt loam, steep |
| Ns | Niklason silt loam |
| Nv | Niklason very fine sand |
| Re | Reedy silt loam |
| Rm | Rough mountainous land |
| Sa | Salamatof peat |
| Sf | Salamatof peat, ever frozen variant |
| ShA | Schrock silt loam, nearly level |
| ShB | Schrock silt loam, undulating |
| Sl | Sea cliffs |
| Sm | Slikok mucky silt loam |
| Sn | Slikok stony mucky silt loam |
| SpA | Spenard silt loam, nearly level |
| SpB | Spenard silt loam, gently sloping |
| Su | Susitna silt loam |
| Sv | Susitna very fine sand |
| SwA | Susitna and Niklason very fine sands, overflow, 0 to 3 percent slopes |
| TaE | Talkeetna silt loam, moderately steep to steep |
| Te | Terrace escarpments |
| Tf | Tidal flats |
| Tm | Tidal marsh |
| ToA | Torpedo Lake silt loam, nearly level |
| ToB | Torpedo Lake silt loam, gently sloping |
| ToC | Torpedo Lake silt loam, moderately sloping |
| ToD | Torpedo Lake silt loam, strongly sloping |
| TpB | Torpedo Lake–Homestead silt loams, undulating |
| TpC | Torpedo Lake–Homestead silt loams, rolling |
| TpD | Torpedo Lake–Homestead silt loams, hilly |
| TpE | Torpedo Lake–Homestead silt loams, moderately steep |
| Wa | Wasilla silt loam |

Soil map constructed 1966 by Cartographic Division, Soil Conservation Service, USDA, from 1958 aerial photographs. Controlled mosaic on universal transverse Mercator projection based upon Clarke 1866 spheroid, 1927 North American datum.




# INDEX TO MAP SHEETS

## MATANUSKA VALLEY AREA, ALASKA

SCALE IN MILES

1 0 1 2 3 4 5

# Contents







NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued June 1968

## EXPLANATION

### Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

- Series 1957, No. 23, Las Vegas and Eldorado Valleys Area, Nev.
- Series 1958, No. 34, Grand Traverse County, Mich.
- Series 1959, No. 42, Judith Basin Area, Mont.
- Series 1960, No. 31, Elbert County, Colo. (Eastern Part)
- Series 1961, No. 42, Camden County, N.J.
- Series 1962, No. 13, Chicot County, Ark.
- Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

# SOIL SURVEY OF MATANUSKA VALLEY AREA, ALASKA

BY DALE B. SCHOEPHORSTER

FIELDWORK BY DALE B. SCHOEPHORSTER, JAMES A. DEMENT, JOHN A. FERWERDA, ROBBIE L. FLOWERS, ORVILLE L. HASZEL, JAMES H. LEE, WILFRED J. SHEEHAN, AND CHARLES M. THOMPSON, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE ALASKA AGRICULTURAL EXPERIMENT STATION

THE MATANUSKA VALLEY AREA is a part of the Cook Inlet-Susitna Lowland of south-central Alaska (fig. 1). The Area includes approximately 700 square miles of land within the Palmer and Wasilla Soil Conservation Subdistricts. It is bounded on the north by the Talkeetna Mountains, on the east by the Chugach Mountains, and on the south by waters of the Knik River, Knik Arm, and Cook Inlet. On the west it borders the Susitna Valley Area.

The principal centers of population are the city of Palmer and the villages of Wasilla, Willow, and Sutton. Numerous cabins, business establishments, and homes are concentrated around Big Lake and several of the other larger lakes. The rural population is generally located near roads and highways. Several fairly large tracts in the southwestern and western parts of the Area are almost roadless and very sparsely settled. According to the U.S. Census, the total population of the Matanuska Valley Area in 1960 was about 5,138.

## General Nature of the Area

Two large glacier-fed streams, the Matanuska River and the Knik River, flow from the east and empty into tidal water at the head of Knik Arm. In the northeastern extension of the survey Area, the Matanuska River flows through a narrow valley bordered on each side by steep mountains. Between the braided flood plains of the river and the mountain foot slopes are a series of terraces interrupted by steep escarpments, V-shaped valleys, and hilly moraines. To the south and west, the valley opens to a broad lowland that makes up the major part of the survey Area. Although most of this lowland lies between 150 and 500 feet above sea level, extreme elevations in the Area range from sea level at the tidal flats along Knik Arm to about 2,000 feet on mountain foot slopes.

Broad, nearly level alluvial plans border the braided flood plains of the lower Matanuska River and the Knik River. Rising above these low-lying tracts are a series of broad, nearly level terraces that extend to rolling and hilly glacial moraines and outwash plains, which dominate the central and western parts of the Area. Poorly drained muskegs, lakes, and small streams are also features of the landscape in most sections of the Area. Broad, nearly level tidal plains border much of Knik Arm and Cook Inlet.

### Geology

The entire Matanuska Valley Area has been glaciated several times (*5*).[1] As a result, most of the bedrock is buried beneath thick deposits of glacial drift and alluvial sediments. These deposits are made up largely of loose, coarse, sandy and gravelly material.

Near Goose Bay and southeast of Houston, however, there is a belt of rolling moraines that consist mostly of moderately firm and firm glacial till. Weathered shale underlies a thin deposit of firm till on a few benchlike ridges near Houston. Thick beds of sand and gravel deposited by glacial rivers and streams form broad nearly level and undulating terraces in the eastern part of the Area. Bordering the Matanuska and Knik Rivers there are nearly level alluvial plains that consist largely of silty and fine sandy sediments underlain by thick deposits of gravel and stones. Less extensive tracts of alluvial soils also border most of the smaller rivers and streams. The tidal plains along Knik Arm consist of silty and clayey sediments.

Almost the entire Matanuska Valley Area is covered with a mantle of loess derived from the barren flood plains of glacier-fed streams (*11*, *13*). Large amounts of windblown material like that in figure 2 are still being deposited in places along the Matanuska and Knik Rivers. Adjacent to these streams are dunelike bluffs where wind-laid material is dominantly sandy and as much as 50 feet thick. Within short distances from the source, however, the mantle thins out rapidly and is dominantly silty. Within a mile or two of the source, the loess mantle is about 30 inches thick. Westward, it gradually thins out to about 10 inches. Near the western boundary of the Area, however, the loess mantle again is thicker and evidently consists of older deposits that probably were derived from the flood plains of the Susitna River and its major tributaries.

#### *Geological deposits*

Large deposits of gravel and sand, suitable for road construction and for concrete, occur throughout most of the Area. Bituminous coal is being mined near Sutton, and explorations for oil have recently been made in several parts of the Area. A deposit of marl near Wasilla is

[1] Italic numbers in parentheses refer to Literature Cited, p. 66.

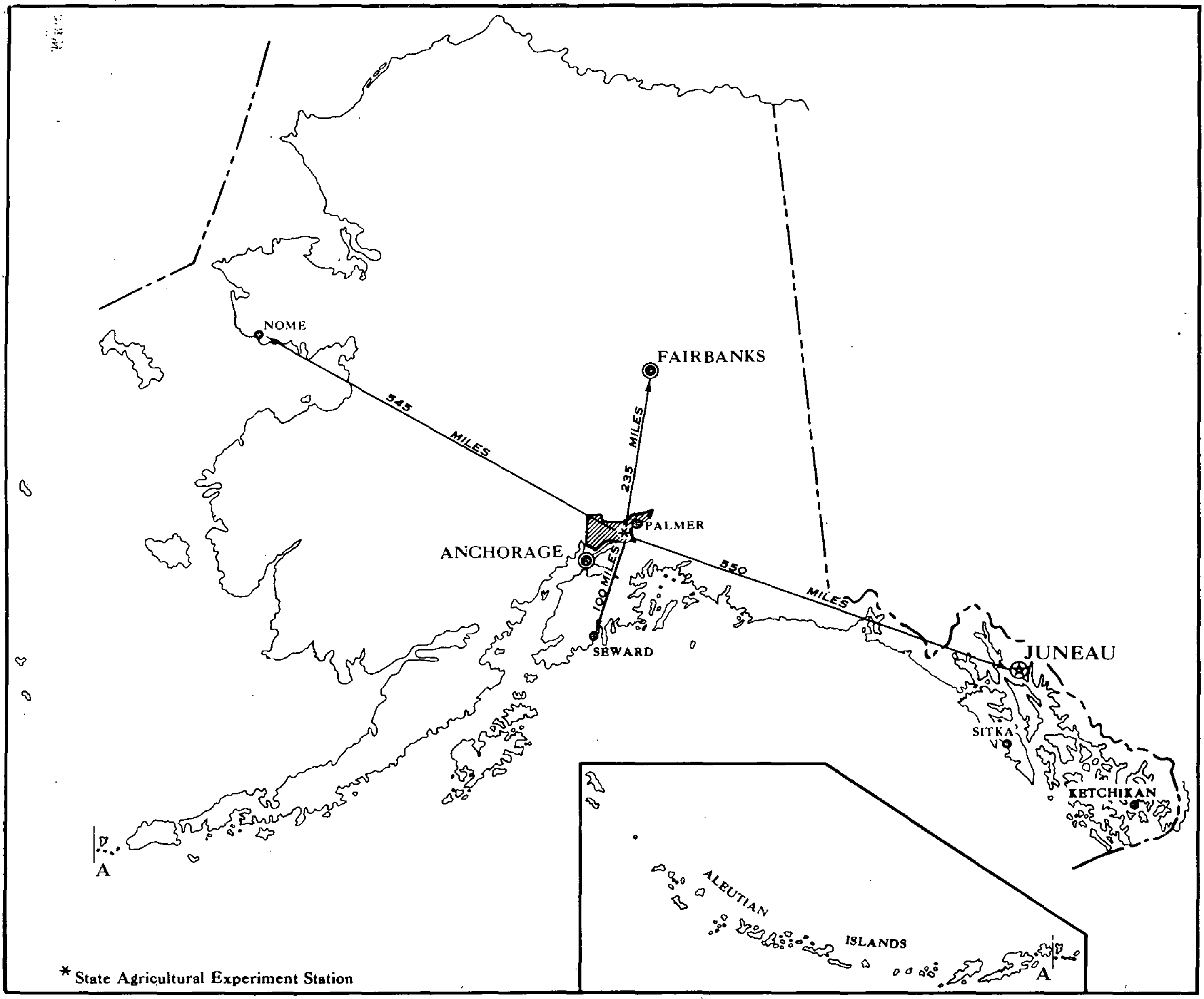



*Figure 1.*—**Location of Matanuska Valley Area in Alaska.**

used on a small scale for agricultural purposes. Large peat deposits are common in muskegs, but thus far these have not been utilized on a commercial scale. Several gold mines are located nearby in the Talkeetna Mountains, but at present these mines are inactive.

## Climate in Relation to Soil Use [2]

The climate of the Matanuska Valley Area reflects the combined influence of latitude, nearness to the ocean, and the presence of nearby mountains. Climatic data from four weather stations in the Matanuska Valley Area are shown in table 1.

[2] This section was prepared by C. E. WATSON, regional climatologist, U.S. Weather Bureau, Anchorage, Alaska.

### *Precipitation*

The Chugach Mountains to the east have the strongest influence on climate in that part of the Area. They are an effective shelter against moist air moving in from the east and southeast, and most of the precipitation carried by easterly winds falls on the windward slopes of these mountains. Apart from the sheltering effects, the mountains influence the development of showers and, sometimes, thunderstorms during the growing season. Although such showers are generally limited to the mountainous areas, they affect the amount of rain received by the foothills and nearby areas. It is not uncommon for some local areas to receive an abundant supply of precipitation in showers while nearby areas suffer from a deficiency of moisture.

*Figure 2.*—Small amounts of loess originating on the flood plains of the Knik and Matanuska Rivers are deposited annually on Bodenburg and Knik soils.

To the west, toward the flatlands of the lower Susitna Valley, the sheltering effect of the mountains diminishes rapidly. The western edge of the Area may receive precipitation from almost any inland movement of air up Cook Inlet, and the southerly winds bring abundant rainfall. Consequently, precipitation in the west is heavier and more uniform throughout the year than in the eastern part of the Area.

Precipitation in the Area is seldom excessive for crop needs. In the eastern part of the Area, which is the major farming section, the average annual precipitation is only about 16 inches. Precipitation is especially light in the early part of the growing season. This is partly offset by moisture in the soil from thawing and from melting snow, but a moderate to severe moisture deficiency may develop in June and July. During this period sprinkler irrigation generally improves crop yields. Precipitation is heaviest in late summer and early autumn. Artificial driers are needed for hay and grain harvested during this time of year.

### *Temperature*

Cold air drainage down steep mountain slopes and through canyons affects the temperature of the Matanuska Valley, especially the eastern part. This downslope movement of air, however, does not always result in colder temperature. While cold air drainage brings freezing temperature to some areas, it prevents local radiation in other areas from driving the temperature below freezing. The areas most exposed to cold air drainage, especially to canyon drainage, escape the freezes that occur in spring and fall in other areas where the air is calm and heat leaves the soil through radiation. Table 2 shows, for four weather stations, the average dates for the beginning and the end of periods during which temperature is equal to or above 24, 28, or 32° F. These data indicate that, as a rule, the shortest freeze-free seasons occur in areas farthest from the mountains, such as the Susitna station in the west, or at higher elevations, such as the Chickaloon station in the extreme northeast.

The probability of having seasons of various lengths in which the temperatures will not fall below stated limits is shown in figures 3 and 4. The probabilities in figure 3 are based on records from 1921 through 1963. Those in figure 4 are based on records from 1942 through 1963. This information is useful to farmers and others operating outdoor enterprises. For example, in 5 out of 10 years, or 50 percent of the time, one can expect a season of 108 days in which the temperature will not drop below 32 degrees at the Matanuska Agricultural Experiment Station; however, a season of 125 days in which the temperature does not drop below 32 degrees can be expected in only 1 year out of 10, or 10 percent of the time.

TABLE 1.—*Temperature and precipitation*

| Month | Matanuska Agricultural Experiment Station [1] (elevation—150 feet) | | | | | Palmer 1 North [2] (elevation—220 feet) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Temperature | | | Precipitation | | Temperature | | | Precipitation | |
| | Average | Average maximum | Average minimum | Average | Average snowfall | Average | Average maximum | Average minimum | Average | Average snowfall |
| | °F. | °F. | °F. | Inches | Inches | °F. | °F. | °F. | Inches | Inches |
| January | 12.1 | 21.0 | 3.1 | 0.90 | 9.0 | 14.6 | 21.6 | 7.5 | 1.09 | 12.9 |
| February | 18.8 | 27.7 | 9.8 | .73 | 8.6 | 18.7 | 27.7 | 11.7 | .68 | 11.1 |
| March | 24.6 | 34.0 | 15.2 | .43 | 6.4 | 24.4 | 33.8 | 15.0 | .57 | 9.2 |
| April | 37.1 | 46.7 | 27.5 | .39 | 2.3 | 36.4 | 46.2 | 26.5 | .51 | 3.3 |
| May | 47.2 | 58.0 | 36.3 | .74 | .2 | 47.5 | 58.6 | 36.4 | .64 | .6 |
| June | 55.4 | 66.7 | 44.0 | 1.30 | 0 | 54.7 | 65.9 | 43.5 | 1.58 | 0 |
| July | 57.7 | 68.8 | 46.5 | 2.24 | 0 | 57.4 | 67.4 | 47.3 | 2.41 | 0 |
| August | 55.4 | 66.0 | 44.8 | 2.90 | 0 | 55.2 | 64.9 | 45.5 | 3.31 | 0 |
| September | 47.7 | 56.9 | 38.5 | 2.39 | .2 | 47.7 | 56.7 | 38.6 | 2.56 | .2 |
| October | 35.6 | 43.8 | 27.4 | 1.59 | 3.6 | 35.2 | 42.7 | 27.7 | 1.39 | 6.2 |
| November | 21.9 | 29.5 | 14.3 | 1.01 | 7.4 | 20.9 | 27.7 | 14.0 | .83 | 9.6 |
| December | 13.2 | 21.5 | 4.9 | .92 | 9.7 | 13.5 | 20.6 | 6.4 | .85 | 11.2 |
| Annual | 35.5 | 45.0 | 25.9 | 15.54 | 47.4 | 35.6 | 44.5 | 26.6 | 16.42 | 64.3 |

[1] Precipitation and temperature are based on 30 years of record, 1931–1960, inclusive; snowfall is based on 36 years of record through 1962.

[2] Precipitation is based on 20 years of record through 1963; snowfall on 18 years through 1963; and temperature on 21 years through 1963.

TABLE 2.—*Average dates for beginning and end of seasons during which temperature is equal to or above that specified*

| Temperature | Matanuska Agricultural Experiment Station (42-year record) | | | Palmer 1 North (21-year record) | | | Susitna [1] (11-year record) | | | Chickaloon [2] (8-year record) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Beginning date | Ending date | Number of days | Beginning date | Ending date | Number of days | Beginning date | Ending date | Number of days | Beginning date | Ending date | Number of days |
| °F | | | | | | | | | | | | |
| 24 | April 22 | Oct. 3 | 164 | April 21 | Oct. 7 | 169 | May 17 | Sept. 22 | 128 | May 8 | Sept. 22 | 137 |
| 28 | May 6 | Sept. 18 | 135 | April 30 | Sept. 26 | 149 | June 1 | Sept. 11 | 102 | May 28 | Sept. 11 | 106 |
| 32 | May 25 | Sept. 10 | 108 | May 12 | Sept. 13 | 124 | June 9 | Aug. 23 | 75 | June 23 | Aug. 28 | 66 |

[1] The Susitna station was closed July 1933.

[2] The Chickaloon station was closed July 1947.

Similar probabilities for seasons at the Palmer station are shown in figure 4.

### *Winds*

The rugged terrain surrounding the Matanuska Valley affects wind movement as well as precipitation, especially in the eastern part near Palmer. The strongest winds are those moving out of the canyons of the Knik and Matanuska Rivers. They are seasonal, and most pronounced from late in February to April. The seasonal characteristics are caused largely by the high-pressure systems that develop in, or move into, western and northwestern Alaska.

The winds have several important effects upon agriculture. Winter winds, moving down the Matanuska Valley, may remove the snow cover from unprotected cultivated fields and may carry away much of the surface soil, even when it is frozen. Strong winds, locally referred to as Matanuska and Knik winds, may come early in spring after cultivating and early planting have started, when the soil is extremely vulnerable to blowing. At times they remove early seedings almost completely, and replanting becomes necessary. Windbreaks are needed to control this blowing.

Downslope winds normally are low in humidity and have a pronounced drying effect on exposed fields. Early in spring, winds that are channeled downslope rapidly dry out some areas but leave less exposed areas too wet for cultivation.

*in the Matanuska Valley Area, Alaska*

| Chickaloon [3] (elevation—929 feet) | | | | | Susitna [4] (elevation—50 feet) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Temperature | | | Precipitation | | Temperature | | | Precipitation | |
| Average | Average maximum | Average minimum | Average | Average snowfall | Average | Average maximum | Average minimum | Average | Average snowfall |
| *°F.* | *°F.* | *°F.* | *Inches* | *Inches* | *°F.* | *°F.* | *°F.* | *Inches* | *Inches* |
| 8. 1 | 17. 0 | 0. 9 | 0. 87 | 11. 2 | 12. 6 | 22. 8 | 2. 4 | 1. 38 | 14. 5 |
| 13. 6 | 23. 5 | 3. 7 | 1. 03 | 12. 6 | 22. 1 | 31. 2 | 13. 0 | 1. 28 | 10. 1 |
| 19. 8 | 30. 3 | 9. 2 | 1. 19 | 13. 4 | 23. 3 | 34. 9 | 11. 7 | 1. 16 | 9. 8 |
| 31. 1 | 42. 2 | 19. 9 | . 41 | 3. 0 | 36. 1 | 48. 0 | 24. 2 | . 88 | 2. 3 |
| 44. 7 | 57. 0 | 32. 3 | . 38 | (5) | 45. 8 | 59. 6 | 32. 1 | 1. 45 | . 6 |
| 53. 3 | 66. 6 | 39. 9 | 1. 06 | (5) | 55. 4 | 69. 4 | 41. 4 | 1. 69 | 0 |
| 56. 2 | 68. 0 | 44. 3 | 1. 73 | 0 | 58. 1 | 70. 1 | 46. 2 | 2. 55 | 0 |
| 54. 1 | 65. 3 | 42. 8 | 1. 91 | 0 | 55. 3 | 65. 7 | 45. 0 | 5. 51 | 0 |
| 45. 4 | 56. 2 | 34. 5 | 2. 32 | . 1 | 47. 1 | 56. 6 | 37. 6 | 5. 07 | 0 |
| 33. 2 | 41. 5 | 24. 8 | 1. 18 | 5. 4 | 36. 2 | 44. 2 | 28. 2 | 3. 46 | 3. 8 |
| 19. 2 | 26. 8 | 11. 5 | . 77 | 7. 6 | 22. 1 | 31. 0 | 13. 2 | 1. 82 | 10. 4 |
| 10. 8 | 18. 7 | 2. 9 | . 94 | 15. 4 | 14. 6 | 24. 3 | 4. 9 | 1. 71 | 12. 3 |
| 32. 5 | 42. 8 | 22. 1 | 13. 79 | 68. 7 | 35. 7 | 46. 5 | 24. 9 | 27. 96 | 63. 8 |

[3] Precipitation and snowfall are based on 11 years of record through 1933; temperature is based on 13 years of record through 1933; station closed July 1933.

[4] The Susitna station is on the Susitna River about 15 miles west of the survey Area. Precipitation and snowfall are based on 14 years of record through 1947; temperature is based on 12 years of record through 1947; station closed July 1947.

[5] Trace.

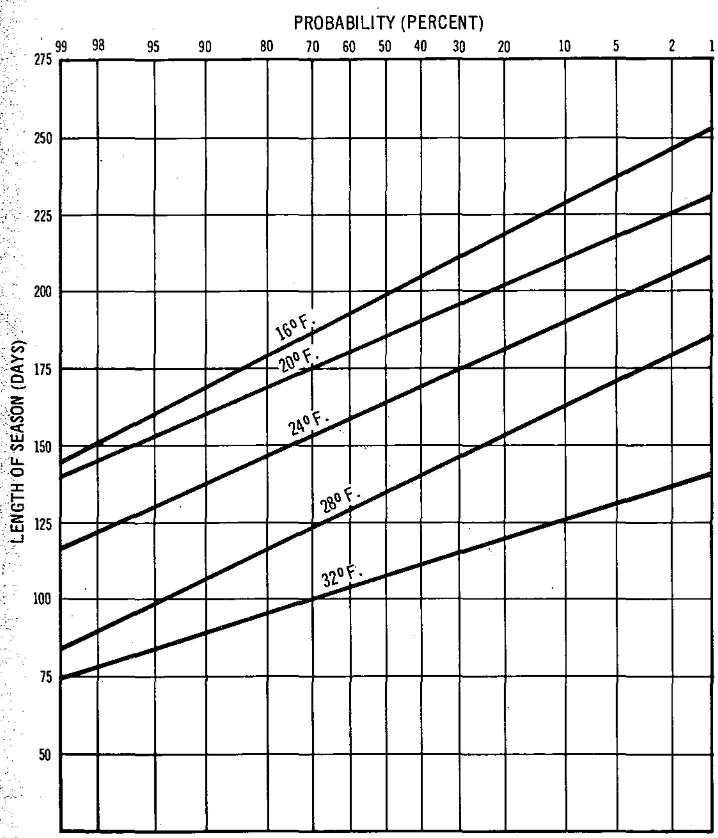



*Figure 3.*—**Probable number of days per year that temperature will not drop below specified degrees at Matanuska Agricultural Experiment Station, Matanuska, Alaska.**

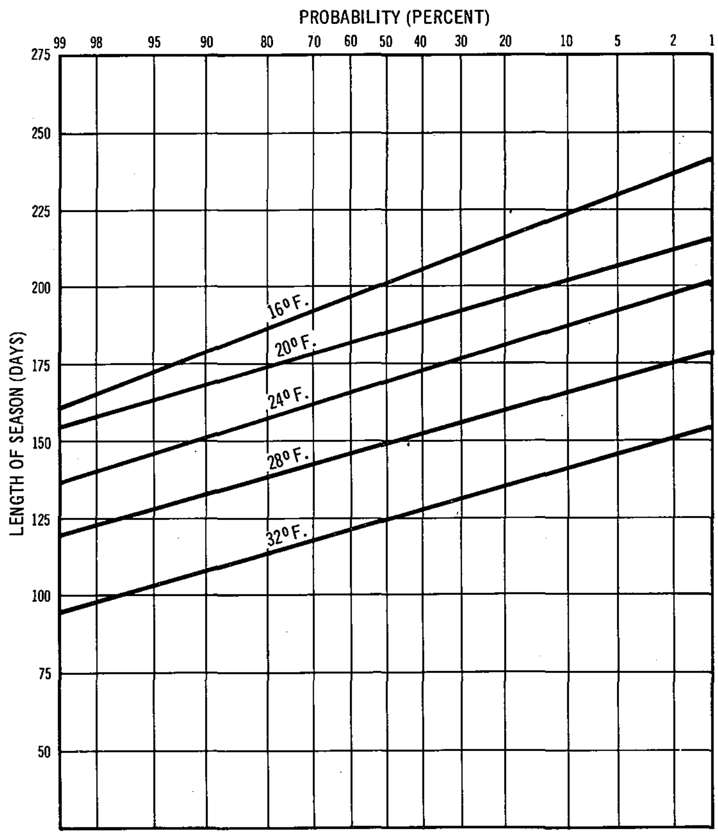



*Figure 4.*—**Probable number of days per year that temperature will not drop below specified degrees at Palmer, Alaska.**

## Vegetation [3]

Most of the Matanuska Valley Area is forested. The type of forest, the age and density of stands, and the rate of growth vary depending upon such factors as forest fire history, soil characteristics, topography, and cutting practices.

### *Vegetation in forested areas*

Paper birch, white spruce, and quaking aspen are the dominant trees on well-drained uplands. Cottonwood (balsam poplar) is common on alluvial plains and terraces along rivers and streams. Black spruce grows on some muskegs and other poorly drained sites and on a few upland areas that have been severely burned.

The climax forest on well-drained uplands is the white spruce type. Once established, it is believed to be self perpetuating and to remain unchanged unless destroyed by fire or cutting. In the oldest stands of white spruce, the largest trees seldom exceed a height of 85 to 100 feet and a diameter of 20 to 24 inches at breast height. In stands of white spruce that are 160 to 180 years old, the average height is generally 50 to 60 feet and the diameter 8 to 12 inches. These stands generally have from 300 to 500 trees per acre and yield 3,900 cubic feet or 15,500 board feet per acre .

Although the white spruce type is the climax forest of the Area, only small, isolated stands remain, as most of the mature trees have been cut during the past half century. The white spruce-paper birch and white spruce-quaking aspen types are now far more common on the uplands. There are also some almost pure stands of birch and aspen. All of these forest types represent stages in the forest succession after a fire or an open cutting.

The most common forest now in the Area is a mixture of paper birch and white spruce. The proportion of each species in a stand varies. Willow and Sitka alder grow in the understory in some places; and quaking aspen also grows in many places. The plants that make up the major part of the subordinate vegetation in stands of the white spruce-paper birch type are given in the following list. Asterisks indicate the most common plants.

SUBORDINATE VEGETATION IN THE WHITE SPRUCE–PAPER BIRCH FOREST TYPE

Shrubs

| SCIENTIFIC NAME | COMMON NAME |
|---|---|
| **Cornus canadensis* | Bunchberry dogwood. |
| *Empetrum nigrum* | Crowberry. |
| *Menziesia ferruginea* | Rusty menziesia, buckbrush. |
| **Ribes triste* | American red currant. |
| **Rosa acicularis* | Prickly rose, wild rose. |
| **Rubus pedatus* | Fiveleaf bramble, trailing raspberry. |
| *Sorbus scopulina* | Greenes mountain-ash. |
| **Vaccinium vitis-idaea* | Lingenberry, lowbush cranberry. |
| **Viburnum edule* | Mooseberry viburnum, highbush cranberry. |

[3] This subsection is based largely on the work of Lutz (*8*).

Forbs

| SCIENTIFIC NAME | COMMON NAME |
|---|---|
| *Arenaria lateriflora* | Bluntleaf sandwort. |
| **Comandra livida* | Northern comandra. |
| *Dryopteris austriaca* | Spreading woodfern. |
| **Dryopteris disjuncta* | Oakfern. |
| **Epilobium angustifolium* | Fireweed. |
| **Equisetum arvense* | Field horsetail. |
| *Equisetum pratense* | Meadow horsetail. |
| **Goodyera repens var. ophioides* | Creeping rattlesnake plantain. |
| *Habenaria obtusata* | Bluntleaf habenaria. |
| **Linnaea borealis var. americana* | American twinflower. |
| **Listera cordata* | Northern listera. |
| **Lycopodium annotinum* | Bristly clubmoss. |
| **Pyrola asarifolia var. incarnata* | Alpine pyrola. |
| **Pyrola secunda* | Sidebells pyrola. |
| *Pyrola virens (syn. P. chlorantha)* | Green pyrola. |
| *Streptopus amplexifolius* | Claspleaf twistedstalk. |
| **Trientalis europaea ssp. arctica* | Arctic starflower. |

Grass

| SCIENTIFIC NAME | COMMON NAME |
|---|---|
| *Calamagrostis canadensis* | Bluejoint reedgrass. |

Mosses

*Dicranum fuscescens*
*Drepanocladus uncinatus*
**Hylocomium splendens*
**Hypnum crista-castrensis (syn. Ptilium crista-castrensis)*
**Pleurozium schreberi*
**Polytrichum commune*

Lichens

**Peltigera aphthosa var. typica*
**Peltigera menbranacea*

All of these plants and the trees have a shallow root system. Most of the roots grow in the thin mat of forest litter, mosses, lichens, and fungal mycelia on the surface of the soil. Because most of the trees have shallow roots, there is a windthrow hazard around clearings.

On the poorly drained sites that are forested, black spruce, willow, alder, and balsam poplar are the principal trees. Black spruce grows in a solid forest that covers many acres on some muskegs. Although some of these trees are more than 200 years old, they are seldom more than a few inches in diameter or more than 20 feet tall. Paper birch and some scattered white spruces also grow on some of these poorly drained sites. Tall grass and sedge, horsetail and fireweed, and shrubs such as bog birch (Betula glandulosa) and Labrador-tea (Ledum palustre, ssp. groenlandicum) form a dense ground cover, especially where the forests tend to be open. A mat of moss as much as 12 inches thick covers the surface in most poorly drained places.

### *Vegetation in unforested areas*

Most of the treeless areas are muskegs, tidal plains, and openings on mountain foot slopes. Sphagnum moss is the principal vegetation in unforested muskegs. On the moss, there is commonly a dense growth of low woody plants, chiefly Labrador-tea, bog birch, dwarf willow, crowberry, bog blueberry (*Vaccinium uliginosum*), and cloudberry (*Rubus chamaemorus*). Cottongrass (*Eriophorum angustifolium*) also occurs in places. Black spruce grows in many muskegs, either as small isolated trees or as dense clumps surrounded by open muskeg.

The vegetation in grassy openings on elevated benches and mountain foot slopes above 1,000 feet is mostly bluejoint reedgrass. Fireweed and other forbs are also common in these areas. Dense thickets of alder, devilsclub (*Oplopanax horridus*), and willow are interspersed with the patches of grass and forbs, and they are dominant along many of the small drainageways.

The vegetation on clayey soils of the tidal plains consists mostly of sedges (*Carex* spp.), forbs, and grasses. This vegetation is described in detail by Hanson (*3*). Tidal flats that are inundated regularly by high tides ordinarily have no plant cover.

## Farming

Early prospectors and settlers of the Area had practically no interest or experience in farming, but small-scale farming began about 1900, mainly in the form of gardening by villagers and roadhouse operators, who sold surplus vegetables to miners and prospectors. Some native hay was also harvested for horses that were used in hauling freight.

As mining expanded and the population increased, the demand for farm products increased. By 1914 about 300 acres of land had been cleared and a number of settlers interested primarily in farming were establishing homesteads. Potatoes and other vegetables were the major crops, and some oats were raised for horse feed.

A Matanuska Farmers' Association was organized in 1915. Farming activities expanded following the construction of the Alaska Railroad and the establishment of an experimental farm near Matanuska by the Alaska Agricultural Experiment Station. During the 1920's most of the homesteaders in the Area relied on other employment to supplement farm income, but a few of them became successful farmers. Dairy cattle and machinery were brought in, and this led to greater diversification and a more stable farm income.

The greatest single impact on farming in the Area came in 1935 with the development of the federally sponsored Matanuska Colony. In the spring of that year, 202 families numbering about 900 persons, mostly from the north-central States, were moved to the Area and began intensive farm development near Palmer. A few of these original colonists expanded their operations and formed the nucleus of what is now the most highly developed agricultural area in Alaska (*4*).

In 1963 the farm income of the Area was nearly 70 percent of the State's total farm income. Dairying and truck farming were the most important farm enterprises. More than 60 percent of the farm income was from milk. Potatoes were the most valuable cash crop. Poultry products, beef and veal, and some pork provided income for a few farmers.

The total cropland harvested in 1963 was a little more than 12,000 acres (*9*). The crops and acreage were approximately as follows: Grasses for hay and silage, 5,300 acres; oats, barley, and mixtures of small grains for hay, silage, and feed, 6,200 acres; potatoes, 400 acres; cabbage, carrots, and lettuce, 115 acres; radishes, celery, and other vegetables, 25 acres.



## History, Settlement, and Industry

Fur trading was the principal enterprise in Alaska during the period of Russian settlement, 1741 to 1867. Except for fur trading with the Athabascan Indians, the Matanuska Valley Area was virtually untouched and unexplored during this period. After the purchase of Alaska by the United States in 1867, conditions remained generally stagnant until the discovery of gold in the upper Cook Inlet Region in 1896. This marked the beginning of white settlement in the Matanuska Valley Area.

The first major center of population was located at Knik, where a trading post was established about 1900 and a post office in 1905. This village was a major point of departure for prospectors and miners. Many trails, several of them still evident, radiated from Knik to places in the interior. The best known of these was the Iditarod Trail, a 364-mile route through Rainy Pass, in the Alaska Range, to Flat, which was the center of mining activities in the Kuskokwim Mountains. Knik continued as the transportation and trading center of the Area and reached a peak population of about 700 in 1915. During this early period of settlement, a number of homesteads were established around Knik and along the radiating trails.

When the Alaska Railroad was constructed in 1916, it bypassed Knik, and the trade and population shifted to the new villages of Wasilla and Matanuska, which were along the railroad right-of-way. Also that year, a railroad siding was constructed at the present site of Palmer on a branch line to the Chickaloon coalfields. Soon afterward, a post office was established there. Mining camps and trading centers were also established at Chickaloon, Sutton, Eska, Houston, Pittman, and Willow.

In 1935 a group of families, known as the Matanuska Colony, settled on the land surrounding Palmer, and Palmer soon became the major business and population center of the Area (*4*).

Nearly all of the Matanuska Valley Area now has access to electric power, telephones, and transportation. Modern schools are located at Palmer, Wasilla, and Willow, and rural schools are in several other communities. Roads serve most of the rural communities, and major highways connect the Area with Anchorage, Fairbanks, and other cities in the State.

Although farming is the principal enterprise in the Area, coal mining and tourist trade are also important. Coal mines operate near Sutton, and various businesses that serve tourists are located throughout the Area. Until recently, forestry in the Area consisted chiefly of small logging operations and sawmills that supplied building logs, mine timbers, and some lumber to local markets. Recently a larger sawmill was established near Wasilla.

# *How This Survey Was Made*

Soil scientists made this survey to learn what kinds of soils are in the Matanuska Valley Area, where they are located, and how they can be used.

As they traveled over the Area, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in areas nearby and in places more distant. They classified and named the soils according to uniform procedures. To use this survey efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Bodenburg and Knik, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the natural undisturbed landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Bodenburg silt loam and Bodenburg very fine sandy loam are two soil types in the Bodenburg series. The difference in texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Bodenburg silt loam, rolling, is one phase of Bodenburg silt loam, a soil type that has a slope range of nearly level to hilly.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this survey was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed or occur in individual areas of such small size that it is not practical to show them separately on the map. They show such a mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Torpedo Lake-Homestead silt loams.

Another kind of mapping unit is the undifferentiated group, which consists of two or more soils that may occur together without regularity in pattern or relative proportion. The individual tracts of the component soils could be shown separately on the map, but the differences between the soils are so slight that the separation is not important for the objectives of the soil survey. An example is Doone and Knik silt loams.

Also, on most soil maps, areas are shown that are so rocky, so shallow, or so frequently worked by wind and water that they scarcely can be called soils. These areas are shown on a soil map like other maping units, but they are given descriptive names, such as Gravelly alluvial land or Terrace escarpments, and are called land types rather than soils.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized so that it will be readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey. On the basis of the yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, and then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

## General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in the Matanuska Valley Area. A soil association is a landscape that has a distinctive pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

Following are descriptions of the 12 soil associations in this Area.

### 1. *Bodenburg association*

*Gray, well-drained, silty or very fine sandy upland soils that are deep over sand and gravel*

Broad, nearly level and undulating plains, broken by a few narrow terrace escarpments, low ridges, and scattered hills, are characteristic of this soil association, which covers some 20 square miles near Palmer.

Bodenburg silt loam and Bodenburg very fine sandy loam, the major soils in this association, formed in a mantle of grayish wind-laid material 2½ to 10 feet thick over water-worked sand and gravel. Bodenburg silt loam, the most extensive soil, is mostly on the plains but also occupies a few hills and escarpments. Bodenburg very fine sandy loam commonly is nearer the Matanuska River than the silt loam.

Adjacent to flood plains of the Matanuska River are a few sandy, stabilized, dunelike hills and ridges of Anchorage sand. Also included in this association are minor areas of somewhat poorly drained Kalifonsky soils in slight depressions and a few poorly drained soils in small, scattered, low-lying sites.

This soil association is the most intensively farmed part of the Matanuska Valley Area (fig. 5). Dairying is the principal farm enterprise, but vegetable farming on a commercial scale is also important. Most of the nearly level and undulating soils are cultivated; the steeper soils are forested.

This association is in the path of strong, gusty winds that occasionally reach gale velocity as they funnel from the upper reaches of the Matanuska River and Knik River valleys. Consequently, unprotected cultivated soils are subject to blowing.

### 2. *Doone-Knik association*

*Brown to grayish-brown, well-drained, silty upland soils that are deep to shallow over sand and gravel*

This soil association is on high, nearly level to undulating terraces broken by many steep escarpments and rolling to hilly moraines. These terraces border the Bodenburg soils north of Palmer and extend northeastward up the Matanuska River valley, several miles beyond Sutton.

Doone soils, which are the most extensive, formed in 30 to 48 inches of silty wind-laid material over loose sand. Knik soils occupy about 25 percent of the association. They formed in 12 to 24 inches of silty material over loose coarse sand and gravel and are generally on higher terraces and slopes farther from the Matanuska River than the Doone soils. Homestead soils are on a few of the highest terraces and slopes. Poorly drained soils occur in scattered depressions and along minor drainageways.

Many farms are scattered on the nearly level to rolling tracts of land. They are commonly separated by ridges, ravines, or other rough terrain. Most of them are dairy farms (fig. 6), but a few are vegetable farms.

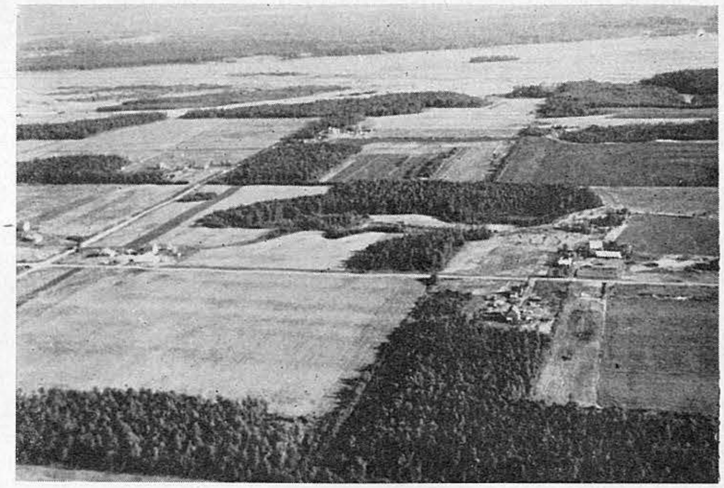


***Figure 5.*—An aerial view of farms on Bodenburg soils a few miles south of Palmer.**

The major soils in this association produce good yields if fertilized and otherwise properly managed. Cultivated fields are subject to blowing by the strong northeasterly winds.

Paper birch, quaking aspen, and white spruce are the principal forest trees. In places these trees are of merchantable size. The understory consists of many kinds of shrubs and plants useful primarily for wildlife.

### 3. *Homestead association*

*Brown, well-drained, silty upland soils that are shallow over sand and gravel*

This soil association is on a broad, nearly level outwash plain in the southwestern part of the Area. It is the largest tract of nearly level land within the survey boundary.

Homestead soils make up more than 75 percent of the association. These soils formed in a mantle of wind-laid silty material 10 to 18 inches thick over loose coarse sand and gravel. They are slightly deeper than Homestead soils in other parts of the Area.

Included in the association are small, widely scattered areas of Salamatof peat in poorly drained depressions.

Most of the association is sparsely settled, nearly roadless, and almost entirely forested, although Homestead soils are suitable for farming. The forest consists mainly of paper birch, quaking aspen, white spruce, and an understory of willows, alder, and low-growing shrubs. Merchantable stands of paper birch are fairly common.

### 4. *Homestead-Knik association*

*Brown to grayish-brown, well-drained, silty upland soils that are shallow over gravel and sand*

Hilly moraines, high terraces, and benchlike ridges bordering mountain foot slopes make up this association. It is in the eastern and northeastern parts of the Area.

Homestead soils, which are dominant, formed in a mantle of silty loess 10 to 15 inches thick over coarse gravelly material. Knik soils generally are at slightly lower elevations than Homestead soils. They formed in

*Figure 6.*—**Doone-Knik association. Dairy cattle grazing a field of bromegrass.**

a thicker mantle of loess and have a less prominent subsoil.

Included in the association are small areas of poorly drained, very shallow, stony soils on narrow flood plains and alluvial fans along small streams that flow from the mountains.

Most of the acreage is forested because much of the terrain is too steep and rough for farming. In places there are stands of merchantable paper birch and white spruce. There are a few scattered farms, mostly dairy farms, on some of the more nearly level terrain.

### 5. *Homestead-Jacobsen association*

*Brown, well-drained, silty upland soils that are shallow or very shallow over gravel and sand; and dark-gray, very poorly drained stony soils in depressions*

This association is the most extensive in the Area. It forms a broad belt that extends from the vicinity of Wasilla westward to the boundary of the Area. It is characterized by nearly level outwash plains as much as several square miles in extent, and by kames, eskers, and rolling to steep moraines. It is also dotted with lakes and muskegs.

Homestead soils, which are dominant, are on nearly level to steep, irregular hills and ridges. They formed in 5 to 15 inches of loess over gravelly material. The very stony, poorly drained Jacobsen soils are common along streams and drainageways and in low-lying sites bordering muskegs.

Salamatof peat occupies most of the muskegs. Deep, well drained to moderately well drained Schrock soils occur on narrow terraces that border some of the streams, and Mixed alluvial land is common on the low-lying flood plains. Also included are tracts of sandy Anchorage soils on stabilized dunes along Knik Arm, Fish Creek, and Big Lake.

Most of the land is in homesteads that are in early stages of development. Large tracts are too steep, too shallow, or too poorly drained for farming and are covered with forest or other native vegetation. Scattered fields and clearings are common, however, on the well-drained, nearly level to rolling soils, which are generally best suited to crops that require only shallow tillage. Perennial grasses are the chief crops, but oats and barley are also grown.

Forests in various stages of growth cover more than 60 percent of this association. The age and the dominant species of the stands depend largely upon the extent of damage done by forest fires. Paper birch, quaking aspen, and white spruce are dominant on well-drained sites.

In places the trees are merchantable. Dense forests of slow-growing black spruce are common on poorly drained sites, including some muskegs. Most of the muskegs, however, are nearly treeless and are covered with moss, sedges, and low-growing shrubs. Some of the burned-over areas support a dense growth of brushy vegetation that provides excellent browse for moose and habitats for other kinds of wildlife.

Many of the larger lakes are used for boating, camping, fishing, swimming, and other recreation.

### 6. Homestead-Nancy association

*Brown to reddish-brown, well-drained, silty upland soils that are shallow or moderately deep over gravel and sand*

This soil association is in the northwestern part of the Area. It is made up of hilly moraines, benchlike ridges, and high terraces. Many lakes, streams, and muskegs add to the complexity of the landscape.

Homestead soils and Nancy soils are almost equal in extent and have a wide range of slope. Both are well drained, and both formed in silty loess over gravelly material. Homestead soils are shallower to gravel than Nancy soils, which formed in 16 to 30 inches of silty loess and have a redder subsoil.

Among the minor soils is poorly drained Salamatof peat, which is in scattered muskegs. Other minor soils are poorly drained Slikok, Torpedo Lake, and Jacobsen soils along drainageways and streams and in depressions.

Most of this association is forested, but there are a few homesteads along the roads. The few fields are used mainly for hay or pasture. Much of the acreage is too sloping, too shallow, or too poorly drained for farming, but scattered tracts of Nancy soils are nearly level to rolling and are suitable for crops grown in the Area. The Homestead soils that are not too sloping are generally suited to crops that require only shallow tillage.

Forests in this association are in various stages of growth, depending chiefly upon their fire history. Paper birch, white spruce, and quaking aspen are the dominant trees. In places, the trees are of merchantable size. Some of the more recently burned sites support dense patches of seedlings and willows that provide excellent browse for moose and habitat for other kinds of wildlife.

### 7. Knik-Coal Creek association

*Grayish-brown, well-drained, silty upland soils that are shallow over sand and gravel; and dark-gray, poorly drained soils in depressions*

Small, gently undulating plains, hilly moraines, steep ridges, scattered lakes and depressions, and many small streams form the landscape of this association.

Knik soils are well drained and are nearly level to steep. They formed in a mantle of silty loess 15 to 24 inches thick over water-worked gravelly material. In general, these soils occupy a broad belt between the soils that formed in deep material recently deposited by wind near the Matanuska River and the soils that formed in older, thinner deposits of silty loess farther west. The poorly drained Coal Creek soils are in numerous small depressions, drainageways, and low areas bordering small streams.

Patches of poorly drained Slikok mucky silt loam are in seepage areas and drainageways, and Salamatof peat is in scattered muskegs. Somewhat poorly drained Kalifonsky soils occur in a few shallow depressions and on a few slopes shaded from direct sunlight.

Nearly all of the land in this association is privately owned. Farms and homesteads are in various stages of development. More than 50 percent of it is wooded, as much of it is too steep or too poorly drained for cultivation. Most of the cleared land is on well-drained, nearly level to rolling terraces and plains. Oats, barley, and perennial grasses are the principal crops, but potatoes and other vegetables are also grown.

Paper birch, quaking aspen, and white spruce are the dominant forest trees. The forest stands vary greatly in age, depending mainly upon their fire history. Some of the trees are merchantable, but there are large areas of seedling and saplings. These areas are brushy and are especially beneficial for wildlife.

Many cabins, summer homes, and permanent dwellings are located on the shores of the larger lakes.

### 8. Naptowne-Spenard association

*Brown and dark-gray, well-drained and somewhat poorly drained, silty upland soils that are moderately deep to very shallow over glacial till*

Glacial moraines are interspersed with low, nearly level muskegs in this association, most of which is in the southwestern part of the Area.

The well-drained Naptowne soils, which are dominant, are on undulating to moderately steep, irregular slopes. They formed in a shallow to moderately deep mantle of silty loess underlain by fairly firm gravelly glacial till. In places they are stony near the surface. The somewhat poorly drained Spenard soils are in broad drainageways and in nearly level and gently sloping areas bordering muskegs. Salamatof soils, which are fairly extensive in this association, are in the muskegs.

Most of this association has been homesteaded in recent years, but many scattered tracts are still publicly owned. More than 70 percent of it is forested, and much of it is too steep, stony, or wet for cultivation. Cleared fields are widely scattered and confined mostly to the less strongly sloping areas of Naptowne soils, which are generally suitable for crops, though stony in places. Artificial drainage is required for the Spenard soils if they are used for crops.

In general, the forests in this association are relatively mature. Paper birch, quaking aspen, and white spruce are dominant on the well-drained soils; black spruce is common on the poorly drained soils. In places, there are merchantable birch and quaking aspen, but the white spruce is widely scattered, and the black spruce is of little commercial value. The forest understory provides food and cover for many kinds of wildlife, but in general it is not so suitable for browsing as the understory in other areas where fires were more recent.

### 9. Salamatof-Jacobsen association

*Very poorly drained, deep peat soils; and stony, very poorly drained soils on flood plains*

This soil association occurs on several broad, nearly level, very poorly drained muskegs in the western part of the Area. Except for scattered patches of stunted black spruce, these muskegs are treeless. They commonly have a thick surface covering of sphagnum moss and support shrubs, sedges, and scattered clumps of grass.

Salamatof peat is the dominant soil. Under a thick surface mat of living moss, this soil consists of coarse, extremely acid, yellowish-brown peat that ranges from 30 inches to many feet in thickness. Jacobsen soils occur around muskegs or along drainageways that flow through them. They are acid and are very stony. A few small patches of poorly drained Moose River soils are also scattered in these low areas.

The soils of this association are not suitable for the crops commonly grown in the Area, and artificial drainage is not feasible. Except in isolated places, the vegetation is not suitable for grazing, but it is useful as food and cover for wildlife. Figure 7 is a view of a typical muskeg in this soil association.

### *10. Torpedo Lake-Homestead association*

*Dark-colored, poorly drained soils along drainageways; and brown, well-drained, silty soils that are shallow or very shallow over sand and gravel*

This soil association is on the foot slopes of the Talkeetna Mountains in the north-central part of the Area. It is characterized by a complex pattern of many, small, nearly level to strongly sloping drainageways and seepage spots separated by small, well-drained ridges and knolls. The elevation ranges from 500 to 1,500 feet above sea level and is higher, on the average, than that of other parts of the Area.

Torpedo Lake soils, which are poorly drained, are dominant. They have a very dark surface layer and a firm clayey subsoil. In places they are stony. Homestead soils are undulating to steep and are well drained. They formed in silty loess 5 to 15 inches thick over gravelly material.

Among the less extensive soils are the somewhat poorly drained Spenard soils on some of the gentle slopes and the Talkeetna soils on a few steep slopes above an elevation of 1,200 feet. Talkeetna soils are shallow, well-drained silt loams underlain by stony material.

Most of this soil association is uninhabited, and only a few minor tracts are suitable for cultivated crops. Forests, dominantly of paper birch, white spruce, and quaking aspen, are on the well-drained sites below an elevation of 1,000 feet. Above that elevation the forests gradually give way to dense patches of tall grass, mostly bluejoint, and thickets of alder brush. The large patches of native grass at the higher elevations are suitable for limited grazing, but the carrying capacity is low, and careful management is required.

Game animals, fur bearers, and other kinds of wildlife are common in this association, as the native vegetation provides a variety of food and cover.

***Figure 7.*—Stream meandering through a poorly drained muskeg occupied by Salamatof peat and Jacobsen very stony silt loam. In the background are forested uplands occupied mainly by Homestead soils.**

### *11. Tidal Marsh-Clunie association*

*Gray, poorly drained soils in sediments on tidal plains; and very poorly drained peat soils that are shallow or moderately deep over tidal silt and clay*

This soil association is made up of nearly level, low, almost treeless tidal plains bordering Knik Arm.

Large, poorly drained tracts of Tidal marsh are dominant. Tidal marsh consists of thick clayey tidal deposits that are occasionally inundated by very high tides. The native vegetation consists mostly of sedges and grasses. Tidal marshes are a few feet higher than the barren Tidal flats, which are inundated regularly by high tides. Clunie soils are fairly extensive in very poorly drained depressions. Under a thick mat of live moss, the Clunie soils consist of yellowish-brown peat over firm clayey sediments.

Less extensive in the association are the moderately well drained Reedy soils, which are on narrow natural levees along streams flowing through the tidal plains. These soils formed in silty and very fine sandy sediments. They support a native vegetation consisting mostly of willows, alders, and scattered clumps of cottonwood (balsam poplar).

This association has little potential for farming. Scattered tracts of Reedy soils are suitable for crops, but they are inextensive. The vegetation on some of the Tidal marsh is suitable for hay or pasture, but yields are low. The barren Tidal flats and the large tracts of Clunie peat are not suitable for farming.

Nearly all of this association is in its natural state and is excellent habitat for migratory waterfowl. Wild ducks, sandhill cranes, whistling swans, and a variety of other birds concentrate in these areas from early in spring to late in fall.

### 12. *Susitna-Niklason association*

*Dark-gray, well-drained, silty or fine sandy soils that are shallow or moderately deep over coarser sediments on alluvial plains*

Nearly level plains bordering major rivers and streams make up this soil association. Most of it is near the outlets of the Matanuska and Knik Rivers south of Palmer. Another tract is along Willow Creek in the northwestern corner of the Area.

Susitna soils formed in silty and fine sandy, water-deposited sediments underlain by gravel and coarse sand at a depth of 27 inches or more. Niklason soils formed in similar sediments but are shallower in depth to gravel. In places both the Susitna and Niklason soils are flooded occasionally for short periods.

Areas of these soils that escape flooding are suitable for cultivation, and all of the crops adapted to the Area can be grown on them. Average yields are slightly lower on the Niklason soils, which are shallower than the Susitna soils and tend to be droughty. The areas that are flooded are suited to perennial grasses.

# Descriptions of the Soils

In this section the soil series and their component mapping units in the Matanuska Valley Area are described. Each soil series is described, and then the mapping units in that series. An important part of each series description is a description of a representative profile. All the mapping units in a series are assumed to have a profile essentially like the representative profile. For this reason, it is necessary to read the description of both the mapping unit and the soil series to get full information about any mapping unit.

The profile descriptions in this survey are detailed and contain technical terms for soil drainage, texture, structure, and other characteristics. These terms are defined in the Glossary. The significance of some of these is mentioned in the following paragraphs.

*Slope* greatly affects the management of a soil. The steepness of slope, and its shape and complexity, are indicated in the terms used. Soils with simple slopes are described as *nearly level* (0 to 3 percent), *gently sloping* (3 to 7 percent), *moderately sloping* (7 to 12 percent), or *strongly sloping* (12 to 20 percent). Soils having complex, irregular slopes are described as *undulating* (3 to 7 percent), *rolling* (7 to 12 percent), or *hilly* (12 to 20 percent). Soils that have both simple and complex slopes are described as *moderately steep* (20 to 30 percent) or *steep* (30 to 45 percent).

*Drainage* of a soil affects management. A *well-drained* soil, for example, commonly retains enough moisture for plant growth, but a *poorly drained* soil is wet so much of the time that growth of field crops is prohibited in most years.

*Color* frequently indicates drainage of a soil. Many well-drained soils, for example, are shades of brown, yellow, or red throughout their profile, as opposed to the blue and gray shades that show in poorly drained soils. Soil scientists describe soil colors approximately in words, and precisely in Munsell color notations; for example, "very dark brown (10YR 2/3)."

*Texture* indicates, among other things, behavior of a soil under tillage, its capacity to hold moisture for plants, and its resistance to water erosion or soil blowing. Texture is determined by relative content of sand, silt, and clay particles in a soil. Soils that are nearly all sand or all clay are difficult to manage.

*Structure* of a soil affects its tilth. The terms used indicate how individual soil particles are arranged into larger aggregates, such as blocks, plates, or prisms. The terms show, respectively, strength, size, and shape of aggregates; for example, "weak, fine, platy structure."

The location of all the soils described in this section is shown on the detailed soil map at the back of this publication. The acreage and extent of the soils are shown in table 3. The "Guide to Mapping Units" at the back of this publication shows the management group in which each mapping unit has been placed, and the page where that group is described.

TABLE 3.—*Acreage and proportionate extent of the soils*

[Dashes indicate the soil does not occur in the subdistrict]

| Map symbol | Soil name | Palmer Soil Conservation Subdistrict | Wasilla Soil Conservation Subdistrict | Total Matanuska Valley Area | Proportionate extent |
|---|---|---|---|---|---|
| | | *Acres* | *Acres* | *Acres* | *Percent* |
| AcC | Anchorage sand, undulating to rolling | 530 | ---------- | 530 | 0.1 |
| AcE | Anchorage sand, hilly to steep | 150 | ---------- | 150 | (1) |
| AhA | Anchorage silt loam, nearly level | ---------- | 490 | 490 | .1 |
| AnB | Anchorage very fine sandy loam, undulating | ---------- | 2,430 | 2,430 | .5 |
| AnC | Anchorage very fine sandy loam, rolling | 20 | 920 | 940 | .2 |
| AnD | Anchorage very fine sandy loam, hilly | 90 | 630 | 720 | .2 |
| AnE | Anchorage very fine sandy loam, moderately steep | 200 | 200 | 400 | .1 |
| BbA | Bodenburg silt loam, nearly level | 5,420 | ---------- | 5,420 | 1.2 |
| BbB | Bodenburg silt loam, undulating | 1,340 | ---------- | 1,340 | .3 |
| BbC | Bodenburg silt loam, rolling | 470 | ---------- | 470 | .1 |
| BbD | Bodenburg silt loam, hilly | 610 | ---------- | 610 | .1 |
| BdA | Bodenburg very fine sandy loam, nearly level | 530 | ---------- | 530 | .1 |
| BdB | Bodenburg very fine sandy loam, undulating | 770 | ---------- | 770 | .2 |
| BdC | Bodenburg very fine sandy loam, rolling | 310 | ---------- | 310 | .1 |

See footnote at end of table.

TABLE 3.—*Acreage and proportionate extent of the soils*—Continued

| Map symbol | Soil name | Palmer Soil Conservation Subdistrict | Wasilla Soil Conservation Subdistrict | Total Matanuska Valley Area | Proportionate extent |
|---|---|---|---|---|---|
| | | *Acres* | *Acres* | *Acres* | *Percent* |
| BdD | Bodenburg very fine sandy loam, hilly | 360 | | 360 | .1 |
| BdE | Bodenburg very fine sandy loam, moderately steep | 280 | | 280 | .1 |
| BkF | Bodenburg and Knik silt loams, steep | 1,530 | | 1,530 | .3 |
| Ct | Chena silt loam | 4,100 | | 4,100 | .9 |
| Cl | Clunie peat | 2,570 | 7,470 | 10,040 | 2.2 |
| Co | Coal Creek silt loam | 2,160 | 2,010 | 4,170 | .9 |
| Cs | Coal Creek stony silt loam | 10 | 180 | 190 | (1) |
| DeA | Doone silt loam, nearly level | 1,560 | | 1,560 | .3 |
| DeB | Doone silt loam, undulating | 2,610 | | 2,610 | .6 |
| DeC | Doone silt loam, rolling | 1,210 | | 1,210 | .3 |
| DkD | Doone and Knik silt loams, hilly | 1,730 | | 1,730 | .4 |
| DkE | Doone and Knik silt loams, moderately steep | 540 | | 540 | .1 |
| DkF | Doone and Knik silt loams, steep | 3,840 | | 3,840 | .8 |
| FhA | Flat Horn silt loam, nearly level | | 1,700 | 1,700 | .4 |
| FhB | Flat Horn silt loam, undulating | | 1,340 | 1,340 | .3 |
| FhC | Flat Horn silt loam, rolling | | 630 | 630 | .1 |
| FhE | Flat Horn silt loam, hilly to steep | | 360 | 360 | .1 |
| Ga | Gravelly alluvial land | 3,660 | 20 | 3,680 | .8 |
| Gp | Gravel pits and Strip mines | 160 | 150 | 310 | .1 |
| HoA | Homestead silt loam, nearly level | 1,370 | 19,000 | 20,370 | 4.5 |
| HoB | Homestead silt loam, undulating | 1,520 | 14,590 | 16,110 | 3.6 |
| HoC | Homestead silt loam, rolling | 990 | 7,870 | 8,860 | 2.0 |
| HoD | Homestead silt loam, hilly | 2,190 | 3,770 | 5,960 | 1.3 |
| HoE | Homestead silt loam, moderately steep | 300 | 4,340 | 4,640 | 1.0 |
| HoF | Homestead silt loam, steep | 3,370 | 1,870 | 5,240 | 1.2 |
| HsA | Homestead silt loam, very shallow, nearly level | 100 | 19,430 | 19,530 | 4.3 |
| HsB | Homestead silt loam, very shallow, undulating | 1,090 | 20,040 | 21,130 | 4.7 |
| HsC | Homestead silt loam, very shallow, rolling | 1,750 | 9,740 | 11,490 | 2.5 |
| HsD | Homestead silt loam, very shallow, hilly | 1,390 | 8,690 | 10,080 | 2.2 |
| HsE | Homestead silt loam, very shallow, moderately steep | 1,640 | 9,660 | 11,300 | 2.5 |
| HsF | Homestead silt loam, very shallow, steep | 9,570 | 7,310 | 16,880 | 3.7 |
| JaA | Jacobsen very stony silt loam, nearly level | | 9,880 | 9,880 | 2.2 |
| JaB | Jacobsen very stony silt loam, gently sloping | | 850 | 850 | .2 |
| JbD | Jim and Bodenburg silt loams, hilly | 140 | | 140 | (1) |
| JbF | Jim and Bodenburg silt loams, steep | 910 | | 910 | .2 |
| KaA | Kalifonsky silt loam, nearly level | 80 | 290 | 370 | .1 |
| KaC | Kalifonsky silt loam, gently to moderately sloping | 10 | 140 | 150 | (1) |
| KaE | Kalifonsky silt loam, strongly sloping to steep | 330 | 110 | 440 | .1 |
| KeB | Kenai silt loam, undulating | | 170 | 170 | (1) |
| KnA | Knik silt loam, nearly level | 7,040 | 6,020 | 13,060 | 2.9 |
| KnB | Knik silt loam, undulating | 7,210 | 5,060 | 12,270 | 2.7 |
| KnC | Knik silt loam, rolling | 3,230 | 2,460 | 5,690 | 1.3 |
| KnD | Knik silt loam, hilly | 2,440 | 870 | 3,310 | .7 |
| KnE | Knik silt loam, moderately steep | 2,070 | 900 | 2,970 | .7 |
| KnF | Knik silt loam, steep | 10,210 | 1,300 | 11,510 | 2.6 |
| Ma | Matanuska silt loam | 1,320 | | 1,320 | .3 |
| Ml | Mixed alluvial land | 1,190 | 8,740 | 9,930 | 2.2 |
| Mr | Moose River silt loam | 160 | 5,490 | 5,650 | 1.2 |
| NaA | Nancy silt loam, nearly level | | 800 | 800 | .2 |
| NaB | Nancy silt loam, undulating | | 390 | 390 | .1 |
| NaC | Nancy silt loam, rolling | | 310 | 310 | .1 |
| NaD | Nancy silt loam, hilly | | 340 | 340 | .1 |
| NaE | Nancy silt loam, moderately steep | | 820 | 820 | .2 |
| NpA | Naptowne silt loam, nearly level | | 2,120 | 2,120 | .5 |
| NpB | Naptowne silt loam, undulating | | 4,740 | 4,740 | 1.0 |
| NpC | Naptowne silt loam, rolling | | 3,220 | 3,220 | .7 |
| NpD | Naptowne silt loam, hilly | | 4,120 | 4,120 | .9 |
| NpE | Naptowne silt loam, moderately steep | | 2,450 | 2,450 | .5 |
| NpF | Naptowne silt loam, steep | | 1,060 | 1,060 | .2 |
| Ns | Niklason silt loam | 1,670 | 290 | 1,960 | .4 |
| Nv | Niklason very fine sand | 510 | 250 | 760 | .2 |
| Re | Reedy silt loam | 2,530 | 60 | 2,590 | .6 |
| Rm | Rough mountainous land | 3,040 | 30 | 3,070 | .7 |
| Sa | Salamatof peat | 2,090 | 60,500 | 62,590 | 13.9 |
| Sf | Salamatof peat, ever frozen variant | 50 | 40 | 90 | (1) |
| ShA | Schrock silt loam, nearly level | 70 | 2,170 | 2,240 | .5 |
| ShB | Schrock silt loam, undulating | | 670 | 670 | .1 |
| Sl | Sea cliffs | | 100 | 100 | (1) |
| Sm | Slikok mucky silt loam | 1,750 | 4,020 | 5,770 | 1.3 |
| Sn | Slikok stony mucky silt loam | 270 | 950 | 1,220 | .3 |

See footnote at end of table.

TABLE 3.—*Acreage and proportionate extent of the soils*—Continued

| Map symbol | Soil name | Palmer Soil Conservation Subdistrict | Wasilla Soil Conservation Subdistrict | Total Matanuska Valley Area | Proportionate extent |
|---|---|---|---|---|---|
| | | *Acres* | *Acres* | *Acres* | *Percent* |
| SpA | Spenard silt loam, nearly level | | 1,300 | 1,300 | .3 |
| SpB | Spenard silt loam, gently sloping | | 760 | 760 | .2 |
| Su | Susitna silt loam | 1,790 | 2,740 | 4,530 | 1.0 |
| Sv | Susitna very fine sand | 1,520 | | 1,520 | .3 |
| SwA | Susitna and Niklason very fine sands, overflow, 0 to 3 percent slopes | 910 | 370 | 1,280 | .3 |
| TaE | Talkeetna silt loam, moderately steep to steep | | 200 | 200 | (1) |
| Te | Terrace escarpments | 2,430 | | 2,430 | .5 |
| Tf | Tidal flats | 1,730 | 3,480 | 5,210 | 1.1 |
| Tm | Tidal marsh | 11,280 | 5,040 | 16,320 | 3.6 |
| ToA | Torpedo Lake silt loam, nearly level | 520 | 3,530 | 4,050 | .9 |
| ToB | Torpedo Lake silt loam, gently sloping | 940 | 6,170 | 7,110 | 1.6 |
| ToC | Torpedo Lake silt loam, moderately sloping | 790 | 390 | 1,180 | .3 |
| ToD | Torpedo Lake silt loam, strongly sloping | 520 | 190 | 710 | .1 |
| TpB | Torpedo Lake-Homestead silt loams, undulating | 100 | 4,820 | 4,920 | 1.1 |
| TpC | Torpedo Lake-Homestead silt loams, rolling | 140 | 4,380 | 4,520 | 1.0 |
| TpD | Torpedo Lake-Homestead silt loams, hilly | 110 | 2,870 | 2,980 | .7 |
| TpE | Torpedo Lake-Homestead silt loams, moderately steep | | 350 | 350 | .1 |
| Wa | Wasilla silt loam | 1,960 | 1,040 | 3,000 | .7 |
| | Total land area | 135,100 | 314,200 | 449,300 | 100.0 |
| | Water area | 5,500 | 19,490 | 24,990 | |
| | Total map area | 140,600 | 333,690 | 474,290 | |

[1] Less than 0.05 percent.

## Anchorage Series

The Anchorage series consists of deep, excessively drained sandy soils on stabilized dunes. Choppy, undulating to steep slopes predominate, but a few small areas are nearly level.

These soils are moderately extensive on low hills along Knik Arm and Big Lake, and they also occur as scattered, hilly to steep areas along the Matanuska and Knik Rivers. They support forests that consist mainly of paper birch, white spruce, and aspen. A few tracts are used for crops and pasture.

Representative profile of Anchorage very fine sandy loam in the SE¼NE¼ sec. 34, T. 16 N., R. 3 W., Seward Meridian:

O1—2 inches to 0, dark reddish-brown (5YR 2/2) mat of decomposing organic materials; extremely acid; abrupt, wavy boundary. 1 to 3 inches thick.

A2—0 to 1 inch, gray (10YR 5/1) silt loam; very weak, medium, platy structure; very friable; plentiful roots; extremely acid; abrupt, irregular boundary. 1 to 2½ inches thick.

B21—1 inch to 2 inches, dark-brown (7.5YR 4/4) very fine sandy loam; pockets of yellowish red (5YR 4/6); weak, medium, granular structure; very friable; plentiful roots; extremely acid; abrupt, irregular boundary. ½ inch to 2 inches thick.

B22—2 to 6 inches, brown (10YR 4/3) very fine sandy loam with yellowish-brown streaks and patches; very weak, medium, granular structure; very friable; very strongly acid; plentiful roots; clear, wavy boundary. 3 to 8 inches thick.

B3—6 to 12 inches, light olive-brown (2.5Y 5/4) fine sand; single grain; loose; few roots; strongly acid; clear, wavy boundary. 4 to 12 inches thick.

C—12 to 40 inches, olive (5Y 4/3) sand; structureless; loose; yellowish-brown, weakly cemented, undulating bands, ⅛ inch thick, at a depth between 30 and 37 inches; very few roots; strongly acid. Many feet thick.

The surface layer is dominantly very fine sandy loam, but in nearly level places it is silt loam, and on a few hilly to steep sites in the eastern part of the Area it is sand. Coarse sand, gravel, and stones are at a depth of 30 inches or more. The Anchorage soils in the eastern part of the Area are grayer, coarser, and less strongly acid than those in the western part.

**Anchorage sand, undulating to rolling** (3 to 12 percent slopes) (AcC).—This soil is grayer, has a coarser textured surface layer, and is less acid than the one described for the series. About three-fourths of this soil is on scattered, rolling knolls and ridges that have short, irregular slopes. The rest is on small, undulating plains. Most of it adjoins Bodenburg soils or steeper Anchorage sand. A few steep slopes were included in mapping.

This soil has a low moisture-supplying capacity and is highly susceptible to blowing if protective cover is not maintained.

Cleared areas are used chiefly for hay and pasture. (Management group 16)

**Anchorage sand, hilly to steep** (12 to 45 percent slopes) (AcE).—This soil is on irregular, hilly ridges along the Matanuska and Knik Rivers. The steeper ridges generally are closer to the rivers. This soil is grayer, has a coarser textured surface layer, and is less acid than the one described for the series.

Some areas are highly susceptible to blowing unless protective cover is maintained. Droughtiness limits suitability for crops or pasture.

Most of the acreage is forested, but a few acres have been cleared and are used for grazing. (Management group 30)

**Anchorage silt loam, nearly level** (0 to 3 percent slopes) (AhA).—This soil is in a few small, nearly level places that border glacial outwash plains and large lakes. The surface layer is about 8 inches thick over fine sand. A few low sandy ridges were included in mapping.

This soil is droughty and is susceptible to blowing if the surface is exposed. If cleared, it should be kept in grass most of the time. (Management group 16)

**Anchorage very fine sandy loam, undulating** (3 to 7 percent slopes) (AnB).—This soil makes up more than half of the total acreage of Anchorage soils in the Matanuska Valley Area. A few tracts are fairly large, but there are many small, irregular ones. Silt loam and fine sandy loam were included in mapping. Also included were a few low sandy ridges and a few small tracts of very shallow soils underlain by gravel.

This soil is droughty and is susceptible to blowing if the surface is exposed. It should not be used intensively for cultivated crops. (Management group 16)

**Anchorage very fine sandy loam, rolling** (7 to 12 percent slopes) (AnC).—This soil occurs as scattered areas on short slopes adjoining undulating plains. Small gravelly spots and a few moderately steep slopes were included in mapping.

The moisture-supplying capacity is low. If cleared, this soil is susceptible to blowing. Cleared areas should be used mainly for hay or pasture. (Management group 16)

**Anchorage very fine sandy loam, hilly** (12 to 20 percent slopes) (AnD).—This soil occurs as small, scattered, stabilized dunes that have short, irregular slopes. The surface layer is generally less than 5 inches thick over deep fine sand. Some areas of silt loam and fine sandy loam were included in mapping, and also a few moderately steep slopes.

This soil is very droughty and blows readily if the surface is exposed. Cleared tracts should be kept in grass. (Management group 23)

**Anchorage very fine sandy loam, moderately steep** (20 to 30 percent slopes) (AnE).—This soil occurs as small, scattered, stabilized dunes that have short, choppy slopes.

Because it is very droughty and highly susceptible to blowing, this soil should remain in native vegetation. (Management group 30)

## Bodenburg Series

The Bodenburg series consists of well-drained soils that formed in deep, wind-laid silt loam and very fine sandy loam. This wind-laid material commonly is underlain by gravelly loamy coarse sand.

These soils occupy nearly level to rolling terraces and a few hilly to steep areas along the Matanuska River near Palmer. They are not so brown as the Doone soils or the shallower Knik soils, and they formed in a thicker mantle of wind-laid sediments than the Jim soils, which are underlain by rock.

The Bodenburg soils support forest consisting mostly of birch and white spruce. Most of the nearly level areas have been cleared and are used for crops. These soils are not extensive but are important as cropland.

Representative profile of Bodenburg silt loam in the NW¼NW¼ sec. 9, T. 17 N., R. 2 E., Seward Meridian:

O11—2 to 1½ inches, forest litter.

O12—1½ inches to 0, mat of roots and partly decomposed organic material, dominantly very dark brown (10YR 2/2); abrupt, smooth boundary. 1 to 3 inches thick.

C1—0 to 3 inches, gray (5Y 5/1) silt loam; mottles of very dark grayish brown; weak, very fine, subangular blocky structure; friable; many roots; very strongly acid; abrupt, smooth boundary. 2 to 5 inches thick.

C2—3 to 8 inches, mixed, very dark grayish-brown (10YR 3/2), dark-brown (10YR 4/3), and dark-gray (5Y 4/1) silt loam; dominant color is dark grayish brown; weak, medium, subangular blocky structure; friable; roots common; strongly acid; clear, wavy boundary. 3 to 6 inches thick.

C3—8 to 27 inches, gray (5Y 5/1) silt loam; mottles and a few horizontal streaks of dark brown; weak, medium, subangular blocky structure that breaks to coarse platy; friable; few roots; strongly acid; clear, wavy boundary. 12 to 30 inches thick.

C4—27 to 36 inches, mixed olive-brown (2.5Y 4/4) and gray (5Y 5/1) silt loam; dominantly olive brown; massive; friable; very few roots; medium acid; abrupt boundary. 4 to 10 inches thick.

IIC5—36 to 48 inches +, very gravelly loamy coarse sand. Many feet thick.

The mantle of wind-laid material ranges from 30 inches to 10 feet in thickness but is generally less than 40 inches thick. It commonly contains thin layers or fragments of buried organic matter, as shown in figure 8. It is underlain in most places by gravelly deposits but in a few places by rock. In cultivated fields the surface layer is commonly medium acid.

**Bodenburg silt loam, nearly level** (0 to 3 percent slopes) (BbA).—This soil is on nearly level terraces. It is generally 30 inches or more deep over gravel, but slightly shallower areas south of Palmer were included in mapping. Included also were a few small outcrops of rock, small depressions, and a few patches of Jim soils in the southern part of Palmer and to the south and east of Palmer. The depressions are ponded for short periods in spring. Artificial drainage of these spots is not difficult, and it minimizes crop losses and the delays in farmwork.

Most of this soil is used for crops, and it is suited to all crops commonly grown in the Area. In large fields it is susceptible to blowing if exposed to strong winds. (Management group 2)

**Bodenburg silt loam, undulating** (3 to 7 percent slopes) (BbB).—This soil is on undulating plains that have short, irregular slopes. One area of about 40 acres near Bodenburg Butte is underlain by rock at a depth of 30 to 40 inches. This area includes a few spots of Jim soils. Near the Matanuska River there are small inclusions of Bodenburg very fine sandy loam on low knolls and ridges. A few small depressions are also included.

Most of this soil is used for crops, and it is suited to all crops commonly grown in the Area. In large cultivated fields it is susceptible to blowing if the surface is exposed to strong winds. It is also slightly susceptible to water erosion, which generally can be controlled by simple conservation practices. (Management group 4)

**Bodenburg silt loam, rolling** (7 to 12 percent slopes) (BbC).—This soil is inextensive. It is on low ridges and knolls that have short, irregular slopes. It generally borders Doone silt loam or Bodenburg very fine sandy loam. Patches of the bordering soils and a few small hilly areas were included in mapping.

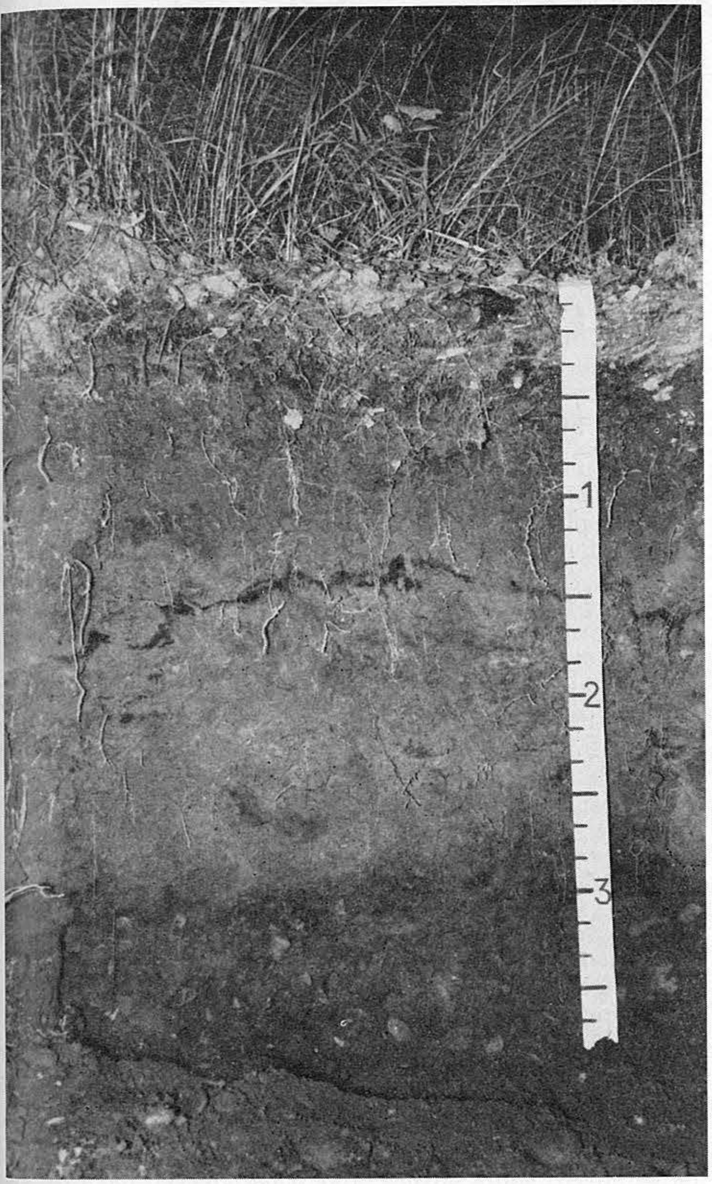


*Figure 8.*—**Profile of Bodenburg silt loam showing a thin, dark-colored layer of organic material at a depth of 18 inches and gravel and sand at a depth of about 3½ feet.**

This soil is suited to all crops grown in the Area. If cleared, it is susceptible to blowing and to water erosion, but the loss of soil generally can be controlled without difficulty. (Management group 6)

**Bodenburg silt loam, hilly** (12 to 20 percent slopes) (BbD).—This soil is on irregular hills and ridges that have short slopes. It commonly borders Knik or Doone soils. The depth to gravel varies more than in the less hilly Bodenburg soils. In some places the texture is slightly coarser than normal, and in some there are thin lenses of very fine sand. Small areas of Bodenburg very fine sandy loam, Doone silt loam, and Knik silt loam were included in mapping. Also included were a few steep slopes.

If exposed, this soil is highly susceptible to water erosion and moderately susceptible to blowing. It is suited to perennial grasses. (Management group 13)

**Bodenburg very fine sandy loam, nearly level** (0 to 3 percent slopes) (BdA).—This soil is on nearly level terraces, and commonly it borders Bodenburg silt loam. It formed in deep, wind-laid, very fine sandy material that contained a moderate amount of silt. It is more uniform in depth to gravel than steeper Bodenburg soils. A few short slopes and a few patches of Bodenburg silt loam were included in mapping.

Most of this soil is used for grain and grass and for potatoes and other vegetables, which are grown commercially. It usually can be worked earlier in spring than silty soils, and for this reason it is well suited to vegetables. If cultivated, this soil is susceptible to blowing. Stripcropping and windbreaks are effective in controlling soil blowing. (Management group 1)

**Bodenburg very fine sandy loam, undulating** (3 to 7 percent slopes) (BdB).—This soil has short, gentle, irregular slopes. It commonly borders Bodenburg silt loam or other phases of Bodenburg very fine sandy loam on broad terraces. In places it contains less silt than Bodenburg very fine sandy loam, nearly level. A few sandy spots and a few short, moderate slopes were included in mapping.

Most of this soil is used for grass and small grain and for potatoes and other vegetables. It is well suited to vegetables, as it tends to warm up earlier in spring than silty soils.

If the surface is exposed, this soil is susceptible to blowing, which can ordinarily be controlled by simple conservation measures. (Management group 3)

**Bodenburg very fine sandy loam, rolling** (7 to 12 percent slopes) (BdC).—This soil has short, irregular slopes and commonly borders other Bodenburg soils on terraces. In places it contains less silt than Bodenburg very fine sandy loam, nearly level. A few small hills of Anchorage sand and a few small depressions were included in mapping.

This soil is suited to all climatically adapted crops, but it is susceptible to blowing and to water erosion if the surface is exposed. Conservation practices are needed to control soil loss if row crops are grown. The small sandy spots are droughty and are less productive than the areas of finer textured soil. (Management group 5)

**Bodenburg very fine sandy loam, hilly** (12 to 20 percent slopes) (BdD).—This soil is in small areas that include a few knolls of Anchorage sand.

Row crops are difficult to plant and harvest because the slopes are short and irregular. If the surface is exposed, this soil is susceptible to blowing and to water erosion. It is better suited to hay or pasture than to tilled crops. (Management group 13)

**Bodenburg very fine sandy loam, moderately steep** (20 to 30 percent slopes) (BdE).—This soil occurs as small, irregular areas and has short slopes. It commonly borders other Bodenburg soils on broad terraces, and it occurs on ridges and slopes with the sandy Anchorage soils. In places it is coarser textured than the more gently sloping Bodenburg soils. Sandy spots and a few steep slopes were included in mapping. Because of the severe erosion hazard, this soil is better suited to permanent pasture or to woodland than to crops. (Management group 20)

**Bodenburg and Knik silt loams, steep** (30 to 45 percent slopes) (BkF).—These soils occupy narrow escarpments and steep, irregular ridges. They commonly border less steeply sloping Bodenburg soils. In most places the mantle of silty material is 2 to 3½ feet thick over gravelly deposits. The Knik soils are browner than the Bodenburg soils and have a mantle of loess less than 30 inches thick. About 10 percent of the total acreage consists of moderately steep slopes. In addition, a few small knolls and ridges of Doone silt loam and Bodenburg very fine sandy loam were included in mapping.

These soils are too steep for crops. They are better suited to woodland. The included moderately steep tracts can be kept in permanent grass. (Management group 28)

## Chena Series

The Chena series consists of excessively drained soils that formed in a thin mantle of silty and very fine sandy material, 2 to 10 inches thick, over loose gravelly deposits.

These soils occur mainly in nearly level areas bordering streams in the eastern part of the survey Area. They are commonly forested with white spruce, but in places cottonwood (balsam poplar) and paper birch are the dominant trees.

Representative profile of Chena silt loam in the NW¼NE¼ sec. 26, T. 17 N., R. 2 E., Seward Meridian:

O1—3 inches to 0, dark reddish-brown (5YR 2/2) mat of moss and decomposing plants; many fine roots; mycelia; abrupt, smooth boundary.

A1—0 to 2 inches, very dark gray (5Y 3/1) silt loam; weak, medium, granular structure; friable; fine roots common; clear, smooth boundary.

C1—2 to 4 inches, olive-gray (5Y 4/2) gravelly silt loam; weak, medium, subangular blocky structure; friable; roots common; clear, smooth boundary.

IIC2—4 to 18 inches, olive-gray (5Y 4/2) sand and gravel; structureless; loose; more than 50 percent of mass consists of rounded stones and cobblestones.

These soils are very strongly acid. In places the surface layer is very fine sandy loam.

**Chena silt loam** (0 to 3 percent slopes) (Ct).—Most of this soil is on broad, low stream terraces. Included with it in mapping were areas on narrow terraces bordering the smaller streams where the slope is more than 3 percent. Included also were a few short, steep slopes, a few stony areas, and some spots of very fine sandy loam.

This soil is droughty and is too shallow over gravelly material for deep tillage. If cleared, it can be seeded to perennial grasses and used for hay or pasture. (Management group 22)

## Clunie Series

The Clunie series consists of very poorly drained peat soils underlain by tidal silt and clay at a depth of 12 to 30 inches. This underlying material distinguishes these soils from the Salamatof soils, which formed in deep peat. The Clunie soils are extensive in nearly level depressions in the tidal plains along Knik Arm.

These soils support native vegetation of sphagnum moss, sedges, Labrador-tea, and other plants common in muskeg areas.

Representative profile of Clunie peat in the SW¼ NW¼ sec. 17, T. 15 N., R. 3 W., Seward Meridian:

0 to 11 inches, raw moss and sedge peat with admixture of very dark gray (5Y 3/1) silt loam; many fine roots; strongly acid; abrupt, smooth boundary.

11 to 27 inches, moss and sedge peat; dark reddish brown (5YR 2/2) when moist, brown or dark brown (7.5YR 4/4) when squeezed dry; few woody fragments; roots common to a depth of 20 inches; slightly acid; abrupt, smooth boundary.

27 to 33 inches, dark-gray (N 4/0) clay and silty clay loam with layers of sedge and moss peat; slightly sticky, slightly plastic; slightly acid; abrupt, smooth boundary.

33 to 48 inches +, greenish-gray (5BG 5/1) silty clay loam; massive; slightly sticky, slightly plastic; few roots; slightly acid.

Both the peat and the underlying material are slightly acid. In places there are thin layers of silt or clay in the peat materials. The water table is always at or near the surface.

**Clunie peat** (Cl).—This soil is occasionally inundated by very high tides or is flooded for short periods by overflow from fresh-water streams. Artificial drainage for agricultural purposes is not feasible. In places the native vegetation can be used for light grazing. Waterfowl and other wildlife frequent these areas. (Management group 34)

## Coal Creek Series

The Coal Creek series consists of dark-colored, poorly drained soils that formed in moderately deep silty material over firm, moderately fine textured sediments.

These soils occur in nearly level to gently sloping stream valleys, on the borders of muskegs, and in depressions. They also occur on low, gentle slopes that receive seepage and runoff from surrounding uplands. They are finer textured than the Moose River soils and the Wasilla soils and are lower in content of organic matter than the Slikok soils.

The Coal Creek soils support several types of vegetation. The most common type consists of sparse forests of paper birch, white spruce, and black spruce, heavily understoried with alder, willow, grasses, horsetail, and fireweed. Around muskegs, the vegetation generally consists of dense forests of black spruce and a thick ground cover of moss. In numerous small depressions, the dominant vegetation is grass. These soils are widespread throughout the Area.

Representative profile of Coal Creek silt loam in the NW¼NE¼ sec. 28, T. 19 N., R. 2 E., Seward Meridian:

O1—3 inches to 0, black (5YR 2/1) mat of roots and decomposing organic material; extremely acid; abrupt, smooth boundary. 2 to 6 inches thick.

A11—0 to 2 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; very friable; many fine roots; extremely acid; abrupt, smooth boundary. 1 to 5 inches thick.

A12g—2 to 9 inches, very dark gray (10YR 3/1) silt loam; many, coarse, faint mottles of dark brown; weak, medium, platy structure that breaks to weak, fine, granular; friable; many fine pores; plentiful roots; extremely acid; clear, smooth boundary. 4 to 10 inches thick.

C1g—9 to 14 inches, gray (10YR 5/1) silty clay loam; many, medium, distinct mottles of yellowish brown; massive; firm; few roots; clear, smooth boundary. 3 to 10 inches thick.

C2g—14 to 28 inches, dark-gray (10YR 4/1) silt loam and pockets of sandy clay loam; common, fine, distinct mottles of strong brown; weak, medium, platy structure that breaks to weak, medium, granular; many fine pores; friable; very strongly acid; gradual, smooth boundary. 10 to 20 inches thick.

C3g—28 to 41 inches +, grayish-brown (10YR 5/2) clay loam; many, medium, distinct mottles of strong brown; massive; very firm; slightly sticky and plastic when wet; very strongly acid. Many feet thick.

The upper layers are generally extremely acid, and the lower layers are very strongly acid or strongly acid. Under a cover of native grasses, the upper third of the profile is dark brown rather than dark gray. In some places thin strata of silty clay loam occur within 10 inches of the surface, but in other places the silty clay loam strata are lacking and the entire profile is silt loam to a depth of 28 to 40 inches. The substratum, below a depth of 28 to 40 inches, generally consists of firm silty clay loam, clay loam, or sandy clay loam, but in places it consists of very gravelly and stony deposits. Some areas have many stones within 20 inches of the surface.

**Coal Creek silt loam** (0 to 3 percent slopes) (Co).—This soil is in scattered low valleys along small streams, in depressions that range from 10 to 40 acres in size, and in areas that border muskegs. Some areas are ponded occasionally for short periods. Typically, the profile is similar to the one described for the series, but in many scattered grass-covered depressions, the profile is browner near the surface. The soil in these depressions formed in medium-textured sediments underlain by coarse-textured or stony deposits. Most of the small areas that have gravelly substrata at a depth of 20 to 30 inches are in depressions on low terraces in the eastern part of the Area.

About 2 percent of the acreage consists of gently sloping areas that receive runoff and seepage from adjoining uplands. Small patches of peat or mucky soils and of stony and gravelly soils were included in mapping.

This soil is suitable for hay or pasture if cleared and artificially drained. Most of it is in native vegetation. Some areas of native grasses can be grazed. (Management group 18)

**Coal Creek stony silt loam** (0 to 3 percent slopes) (Cs).—This soil occupies minor drainageways, muskeg borders, and small scattered depressions within larger areas of Homestead soils throughout the western half of the survey Area. The total acreage is small. The mineral surface layer is commonly dark brown, and many stones occur in the upper 20 inches. Some areas are ponded occasionally for short periods. Small patches of peat and of mucky soils were included in mapping. This soil is too stony to be improved for crops, but in most places it supports native grasses that can be used for light grazing. (Management group 32)

## Doone Series

The Doone series consists of well-drained silt loams underlain by coarse gravelly material at a depth of 28 to 40 inches.

These soils are on high terraces bordering the Matanuska River between Sutton and Palmer. They are also on many steep escarpments and ridges. They are deeper to gravel than the Knik soils and browner than the Bodenburg soils.

The native vegetation is forest consisting mainly of paper birch, white spruce, quaking aspen, and cottonwood (balsam poplar). Although not extensive, these soils are important as cropland.

Representative profile of Doone silt loam in the SW¼ NW¼ sec. 10, T. 18 N., R. 2 E., Seward Meridian:

O11—3 to 2½ inches, loose litter of leaves, twigs, and other plant remains; clear, smooth boundary.

O12—2½ inches to 0, black (10YR 2/1) mat of decomposing organic matter that contains some silt; many roots and mycelia; abrupt, smooth boundary. 2 to 4 inches. thick.

A2—0 to 7 inches, dark-gray (5Y 4/1) silt loam; common, medium, distinct mottles of dark reddish brown; weak, very thin, platy structure; very friable; roots plentiful; abrupt, wavy boundary. 3 to 8 inches thick.

B2—7 to 13 inches, dark-brown (7.5YR 4/4) silt loam; dark yellowish-brown patches and streaks; weak, very thin, platy structure; very friable; few small concretions that have reddish-brown interiors; roots plentiful; clear, wavy boundary. 5 to 8 inches thick.

B31—13 to 21 inches, dark yellowish-brown (10YR 4/4) silt loam; dark-brown patches; weak, very thin, platy structure; very friable; few roots; gradual boundary. 6 to 10 inches thick.

B32—21 to 26 inches, brown (10YR 4/3) silt loam; moderate, thin, platy structure; very friable; many, small, smooth-walled vesicles; gradual boundary. 4 to 8 inches thick.

C1—26 to 33 inches, dark grayish-brown (2.5Y 4/2) silt loam streaked with very dark grayish brown; weak, thin platy structure; very friable; abrupt, wavy boundary. 5 to 12 inches thick.

IIC2—33 to 40 inches +, coarse sand and gravel; structureless; loose. Many feet thick.

The lower layers range from silt loam to very fine sandy loam. Coarse sand and gravel occur at a depth of 28 to 40 inches.

**Doone silt loam, nearly level** (0 to 3 percent slopes) (DeA).—This soil occupies fairly large, nearly level plains on high terraces. The depth to gravel is about 36 inches and is fairly uniform throughout broad areas. In places there is a layer of very fine sandy loam just above the gravel. Small undulating areas, a few patches of Knik soils, and scattered depressions are common mapping inclusions.

Most of the acreage is cropland, and all of the crops adapted to the Area can be grown. In large fields, the soil is susceptible to blowing if the surface is exposed. (Management group 2)

**Doone silt loam, undulating** (3 to 7 percent slopes) (DeB).—This soil occupies fairly broad plains on high terraces. It is not so uniform in depth to gravel as Doone silt loam, nearly level. A few narrow escarpments and small nearly level tracts were included in mapping.

Most of this soil is cropland. Small grain and hay are the principal crops, but all of the crops adapted to the Area can be grown.

Water erosion is a slight hazard in large cultivated fields, but this can ordinarily be controlled by simple conservation measures. Soil blowing is also a hazard if the surface is exposed. (Management group 4)

**Doone silt loam, rolling** (7 to 12 percent slopes) (DeC).—This soil is in scattered, rolling areas on high terraces and outwash plains. Short escarpments, small nearly level tracts, and patches of Knik soils were included in mapping.

All climatically adapted crops can be grown on this soil, but, if row crops are grown, conservation measures are needed to control soil blowing and water erosion. (Management group 6)

**Doone and Knik silt loams, hilly** (12 to 20 percent slopes) (DkD).—These soils are in scattered, hilly areas, generally bordering broad terraces. The slopes are short and irregular. In most places the depth to gravel is between 24 and 36 inches, but in the Knik soils a depth of between 15 and 24 inches is fairly common. A few short escarpments were included in mapping.

If used as cropland, these soils should be kept in perennial grasses most of the time, as they are highly susceptible to water erosion if cultivated. They are moderately susceptible to soil blowing. (Management group 13)

**Doone and Knik silt loams, moderately steep** (20 to 30 percent slopes) (DkE).—These soils occur as small scattered areas on terrace escarpments and ridges bordering broad plains. The depth to gravel is 24 to 36 inches, but many patches where the depth is less were included in mapping.

These soils are too steep for crops; they are suitable for pasture or woodland. (Management group 20)

**Doone and Knik silt loams, steep** (30 to 45 percent slopes) (DkF).—These soils are on sharp ridges and terrace escarpments, a few of which have slopes that are more than 400 feet long. The depth to gravel generally is between 24 and 36 inches, but spots where the depth is less were included in mapping.

These steep soils should remain in native vegetation, as they are extremely susceptible to erosion. (Management group 28)

## Flat Horn Series

The Flat Horn series consists of well-drained soils that formed in deep, layered silty and fine sandy materials. These soils occupy nearly level to steep slopes on high, dissected terraces bordering major and secondary streams in the western part of the Area.

Flat Horn soils differ from Nancy soils in that they formed in stratified material rather than in silty loess. They are not so coarse textured as Anchorage soils. Flat Horn soils are older and more strongly developed than Schrock soils, which are on lower terraces.

These soils support forest that consists dominantly of paper birch, white spruce, and quaking aspen. They are of minor extent in this Area.

Representative profile of Flat Horn silt loam in the NW¼SE¼ sec. 14, T. 17 N., R. 4 W., Seward Meridian:

O1—3 inches to 0, dark reddish-brown (5YR 2/2) mat of decomposing moss and organic material; many fine roots and mycelia; abrupt, smooth boundary. 2 to 6 inches thick.

A21—0 to 1 inch, very dark gray (10YR 3/1) silt loam; weak, medium, granular structure; very friable; fine roots common; abrupt, smooth boundary. ½ to 1 inch thick.

A22—1 to 2 inches, gray (10YR 5/1) silt loam; weak, thin, platy structure; very friable; fine roots common; abrupt, irregular boundary. 1 to 3 inches thick.

B2—2 to 5 inches, mixed reddish-brown (5YR 4/4) and yellowish-red (5YR 4/6) silt loam; weak, medium, granular structure; very friable; roots common; abrupt, wavy boundary. 2 to 5 inches thick.

B3—5 to 7 inches, yellowish-brown (10YR 5/6) silt loam; very weak, fine, subangular blocky structure; very friable; roots common; abrupt, broken boundary. 0 to 4 inches thick.

A2b—7 to 8 inches, grayish-brown (10YR 5/2) silt loam; weak, thin, platy structure; friable; roots common; abrupt, wavy boundary. ½ to 2 inches thick.

IIB2b—8 to 11 inches, dark-brown (7.5YR 4/4) fine sandy loam; weak, fine, granular structure; very friable; roots common; clear, wavy boundary. 2 to 4 inches thick.

IIB3b—11 to 19 inches, olive-brown (2.5Y 4/4) fine sandy loam; brown streaks; very weak, thin, platy structure; very friable; contains a few thin (⅛-inch) layers of olive-gray silt; few roots; gradual, smooth boundary. 3 to 12 inches thick.

IIC—19 to 40 inches, olive (5Y 4/3) fine sand, very fine sand, and silt in stratified layers; fine sand is structureless and loose; the silt and very fine sand are massive and very friable; 2 feet to many feet thick over coarse, stratified sand and gravel.

These soils are very strongly acid. The layers of silty and sandy material vary in number and thickness, but the upper 10 inches is dominantly silty.

**Flat Horn silt loam, nearly level** (0 to 3 percent slopes) (FhA).—This soil occurs as fairly large tracts on high terraces. It commonly has a thicker silt mantle and is more uniform throughout broad areas than the undulating and rolling Flat Horn soils. On terraces along Fish Creek, a few low ridges and knolls of Anchorage soils were included in mapping. Near Willow, small areas of Nancy soils, a few short, steep escarpments, and a few undulating areas were included in mapping.

This soil can be used for all crops commonly grown in the Area. (Management group 1)

**Flat Horn silt loam, undulating** (3 to 7 percent slopes) (FhB).—This soil is on high terraces, commonly with Flat Horn silt loam, nearly level. The silty surface mantle varies more in thickness than that of the nearly level soil. A few patches of Anchorage soils and of shallow Homestead soils were included in mapping.

This soil can be used for all crops adapted to the Area. Water erosion is a slight hazard in cultivated fields, but it can be controlled by simple conservation practices. (Management group 3)

**Flat Horn silt loam, rolling** (7 to 12 percent slopes) (FhC).—This soil occurs as a few scattered areas on short slopes. Small sandy ridges of Anchorage very fine sandy loam and a few patches of shallow soil were included in mapping.

This soil is suited to all of the crops commonly grown in the Area. If row crops are grown, conservation practices are needed to control erosion. (Management group 5)

**Flat Horn silt loam, hilly to steep** (12 to 45 percent slopes) (FhE).—This mapping unit consists of almost equal acreages of hilly, moderately steep, and steep silt loam on high terraces. Because they have similar management requirements, all phases of this soil were mapped as one unit. The steep soils generally have a thinner silt mantle and are slightly coarser textured than the hilly and moderately steep soils.

This soil is susceptible to erosion and, if cleared, should be kept in perennial grasses. (Management group 20)

## Gravelly Alluvial Land

Gravelly alluvial land (Ga) consists mostly of loose gravelly and stony material on low-lying areas along major rivers and streams that have a rapidly fluctuating water level. The areas are only slightly above the normal water level and are flooded several times a year. They are dissected by many secondary channels and sloughs. In places they are covered by recent deposits of silty and fine sandy sediments. Parts of these areas are barren of vegetation, but willow brush, alder thickets, grassy patches, and scattered cottonwoods are common.

This land is not suitable for crops or for grazing and rarely supports timber of merchantable size. Some of the native vegetation provides excellent browse for moose, which frequent these areas, especially in winter. (Management group 36)

## Gravel Pits and Strip Mines

Gravel pits and Strip mines (Gp) are open excavations, more than 3 acres in size, from which the soil and some of the underlying material have been removed. Most of these areas are nearly barren of vegetation, but a few that have been abandoned for a long time support clumps of willow, birch, quaking aspen, and many kinds of low-growing plants that provide habitat for wildlife. Areas of this kind that are less than 3 acres in size are indicated on the soil map by a pick-and-hammer or a pick-and-shovel symbol. (Not in a management group)

## Homestead Series

The Homestead series consists of well-drained silty soils that are shallow and very shallow over loose sand and gravel. These are the most extensive soils on uplands. They are on broad outwash plains and gravelly moraines, where the range of slope is from nearly level to steep.

In the eastern half of the Area there is a broad, gradual boundary between the Homestead soils and the grayer Knik soils. A similar boundary occurs between the Homestead soils and the Nancy soils in the western part of the Area. The thin, gray surface layer and brownish subsoil in the Homestead soils are more prominent than those in the Knik soils, but they are not so thick or so prominent as those in the Nancy soils.

On the foot slopes of the Talkeetna Mountains, the Homestead soils occur in an intricate pattern with the poorly drained Torpedo Lake soils and are mapped with them in complexes.

Homestead soils generally support forests of paper birch, white spruce, and quaking aspen and a ground cover consisting of low-growing shrubs and a thin blanket of moss. In some slight depressions and on low terraces, however, the vegetation consists of black spruce and a thick cover of moss. The soil under this kind of vegetation has a darker colored mineral surface layer, with some mottling, and a redder B horizon than is typical. It is more strongly acid than most Homestead soils.

Representative profile of Homestead silt loam in the SW¼ sec. 9, T. 17 N., R. 2 W., Seward Meridian:

O11—3 to 2½ inches, forest litter.

O12—2½ inches to 0, very dark brown (10YR 2/2) mat of roots and partly decomposed organic material; few mycelia; abrupt, smooth boundary. 1 to 4 inches thick.

A2—0 to 3 inches, dark-gray (5Y 4/1) silt loam; weak, very fine, granular structure; friable; roots plentiful; extremely acid; abrupt, irregular boundary. 1 to 4 inches thick.

B2—3 to 7 inches, mixed dark yellowish-brown (10YR 4/4), brownish-yellow (10YR 6/8), and reddish-yellow (5YR 6/8) silt loam, dominantly dark yellowish brown; colors occur as large patches rather than as mottles; weak, fine, subangular blocky structure; friable; few roots; strongly acid; clear, wavy boundary. 2 to 5 inches thick.

B3—7 to 10 inches, mixed brown (10YR 5/3) and yellowish-brown (10YR 5/4) silt loam; few patches and streaks of dark brown (10YR 3/3); weak, fine, subangular blocky structure; friable; few roots; strongly acid; clear, wavy boundary. 3 to 6 inches thick.

IIC—10 to 24 inches +, yellowish-brown (10YR 5/6) and dark yellowish-brown (10YR 4/4) gravelly sandy loam; loose; very few roots; strongly acid. Many feet thick.

The silty loess mantle ranges from 5 to 18 inches in thickness over coarse material. Homestead soils that formed in less than 10 inches of silty material are mapped as very shallow phases. In some places rounded stones and cobblestones are within 8 inches of the surface, and in others a layer of loose fine sand as much as 15 inches thick is immediately beneath the silty material.

**Homestead silt loam, nearly level** (0 to 3 percent slopes) (HoA).—This soil is the second most extensive in the Homestead series. On broad outwash plains it occurs as large tracts, some more than 1,000 acres in size; it also occurs as many small tracts that commonly border the more strongly sloping Homestead soils. In most places this soil formed in loess 10 to 15 inches thick over gravel, but on a large outwash plain southwest of Goose Bay, the loess was about 18 inches thick. Small patches of the nearly level, very shallow Homestead silt loam were included in mapping. A few short slopes of more than 3 percent and some small poorly drained depressions were also included.

Most of the acreage is in trees, but much of it has been cleared and is used for crops and pasture. Small grains and perennial grasses are the principal crops, but yields are frequently low, as this soil is low in natural fertility and tends to be droughty. If it is adequately fertilized and carefully managed to conserve moisture, it produces satisfactory yields of most crops adapted to the Area. (Management group 8)

**Homestead silt loam, undulating** (3 to 7 percent slopes) (HoB).—This soil is one of the most extensive in the Area. It occurs as scattered, irregular tracts that range from a few acres to several hundred acres in size. It is on outwash plains and low moraines that have short, irregular slopes. The depth to gravelly material ranges from 10 to 18 inches, except where fine sand lies immediately below the silt loam.

Patches of very shallow Homestead silt loam and small, poorly drained depressions were included in mapping. Inclusions make up as much as 15 percent of some areas mapped. They are a nuisance to farmers.

Much of the acreage is cropland and pasture, but well over half of it is forest.

In addition to being moderately droughty, this soil is slightly susceptible to water erosion if cultivated. Although small grains and perennial grasses are the principal crops, satisfactory yields of most adapted crops can be obtained through practices that conserve moisture, control erosion, and maintain adequate levels of fertility. (Management group 7)

**Homestead silt loam, rolling** (7 to 12 percent slopes) (HoC).—This soil is extensive on low, rolling moraines. As much as 15 percent of some areas mapped consists of gravelly spots, patches of very shallow Homestead silt loam, and small, poorly drained depressions. The very shallow spots are poorly suited to tillage, and the poorly drained depressions are commonly bypassed in farming operations.

In addition to being moderately droughty, this soil is moderately susceptible to water erosion. Nevertheless, it produces satisfactory yields of most crops adapted to the Area if moisture is conserved, erosion is controlled, and fertility is maintained. (Management group 7)

**Homestead silt loam, hilly** (12 to 20 percent slopes) (HoD).—This soil is fairly extensive. It is in many scattered areas that have short, irregular slopes. Patches of very shallow Homestead silt loam, make up as much as 15 percent of some areas. A few short, steep slopes were also included.

Most of this soil is forested, but a few areas are used for crops or pasture.

In addition to being droughty, this soil is highly susceptible to erosion. If used for crops, it should be kept in perennial grasses most of the time. (Management group 14)

**Homestead silt loam, moderately steep** (20 to 30 percent slopes) (HoE).—The largest area of this soil is on rough, irregular moraines adjoining Big Lake. Other areas are widely scattered. The thickness of the silty material varies between 10 and 18 inches within short distances. The substratum is dominantly loose coarse gravelly material, but in places it is slightly firm and compact. Inclusions of stony spots, very shallow Homestead soils, Naptowne soils, and Nancy soils are more common in areas of this soil than in those of the less steep Homestead soils. Small, gently sloping ridgetops were also included, and a few of these have been cleared for small fields or gardens.

This soil is used mainly for permanent pasture and woodland, as the slopes are too steep and irregular for crops. (Management group 20)

**Homestead silt loam, steep** (30 to 45 percent slopes) (HoF).—This soil occurs as steep, narrow escarpments and hillsides scattered throughout the Area. The silt loam is 10 to 18 inches thick over a coarse gravelly substratum. Very shallow Homestead soils, gravelly spots, and stony areas were included in mapping to the extent of 20 percent of some areas.

This soil is too steep for crops. It should remain in native vegetation. (Management group 28)

**Homestead silt loam, very shallow, nearly level** (0 to 3 percent slopes) (HsA).—This soil is extensive on broad, nearly level outwash plains. The silt loam is only 6 to 10 inches thick over loose coarse gravelly deposits. Patches of Homestead soils 10 to 15 inches thick over gravel were included in mapping. A few stony patches and a few small, scattered, poorly drained depressions were also included.

Most of this soil is forested, but a few tracts are used for crops or pasture. Small grain and hay are the principal crops.

This soil is too shallow for row crops. Yields are limited by droughtiness and low fertility. Conserving moisture and maintaining fertility are essential in order to obtain satisfactory yields. (Management group 15)

**Homestead silt loam, very shallow, undulating** (3 to 7 percent slopes) (HsB).—This is the most extensive well-drained soil on uplands. It is on plains and low ridges and occupies tracts that range from a few acres to more than a hundred acres in size. The silt loam is only about 8 inches thick over coarse gravelly deposits. Small patches of Homestead silt loam more than 10 inches thick were included in mapping, to the extent of 15 percent of some areas. Small gravelly patches, a few short steep slopes, and scattered poorly drained depressions are minor inclusions.

Most of this soil supports a native forest of paper birch, white spruce, and aspen, but many areas have been cleared for crops. Small grain and hay are the principal crops, as the soil is too shallow to be suitable for row crops.

Droughtiness is a major limitation. Conservation practices that conserve moisture and maintain fertility are required in order to obtain satisfactory yields. (Management group 15)

**Homestead silt loam, very shallow, rolling** (7 to 12 percent slopes) (HsC).—This soil is extensive on ridges and low hills that have short, irregular slopes. It occurs mostly in the western half of the Area. The silt loam is only about 8 inches thick over loose gravelly material. Included in mapping were areas of Homestead silt loam more than 10 inches thick; spots of stony and gravelly soils; a few short steep slopes; and a few poorly drained depressions. These inclusions make up as much as 15 percent of some mapped areas.

Most of the acreage is in native forest consisting mainly of paper birch, white spruce, and quaking aspen, but a few tracts have been cleared and are used for small grain and for hay and pasture.

This soil is too shallow for deep tillage. It is droughty and is low in natural fertility. To obtain satisfactory yields of grasses and small grains, conservation practices that conserve moisture and maintain fertility are required. (Management group 15)

**Homestead silt loam, very shallow, hilly** (12 to 20 percent slopes) (HsD).—This soil is extensive in the western half of the Area. It is on hilly moraines that have short, irregular slopes. The silt loam is only 5 to 10 inches thick over coarse gravelly material. In places fine material is mixed with the gravel, and the substratum is moderately firm. Small patches of Naptowne soils and of Homestead soils more than 10 inches thick were included in mapping. Also included were small, poorly drained depressions and minor drainageways.

Most of this soil is forested with stands of paper birch, white spruce, and quaking aspen. It is droughty and is too shallow for deep tillage. Cleared areas can be seeded to perennial grasses and used for permanent pasture, but yields are limited by droughtiness. (Management group 21)

**Homestead silt loam, very shallow, moderately steep** (20 to 30 percent slopes) (HsE).—This soil occupies rough moraines in the western half of the Area. The silt loam is only 5 to 10 inches thick over coarse gravelly material. Gravelly spots, small patches of Naptowne soils and of other Homestead soils, and a few poorly drained sites were included in mapping.

This soil is droughty and is highly susceptible to erosion if cover is removed. It should remain in native vegetation. (Management group 21)

**Homestead silt loam, very shallow, steep** (30 to 45 percent slopes) (HsF).—This soil is extensive and occurs on long, narrow escarpments, hills, and ridges. The silt loam is only 5 to 10 inches thick over coarse gravelly material. Many stony and gravelly spots were included in mapping, as well as a few patches of moderately steep Homestead silt loam. This soil should be kept in native vegetation. (Management group 29)

## Jacobsen Series

The Jacobsen series consists of very poorly drained, very stony silt loams in broad depressions, in muskeg borders, and in low areas along secondary streams.

These soils are extensive and are widely distributed in the western half of the Area. They are stonier near the surface than the Slikok soils and are lighter colored and less mucky.

The Jacobsen soils are generally covered with a thick mat of sphagnum moss and support scattered stands of willows, stunted black spruce, and low-growing shrubs.

Representative profile of Jacobsen very stony silt loam in the NW¼NW¼ sec. 23, T. 17 N., R. 3 W., Seward Meridian:

O11—16 inches to 8 inches, mat of sphagnum moss, roots, and decomposing leaves and twigs; strongly acid; gradual, smooth boundary. 3 to 12 inches thick.

O12—8 inches to 0, black (5YR 2/1) decomposing mat of moss, woody particles, and leaves; roots plentiful; strongly acid; clear, wavy boundary. 6 to 12 inches thick.

A1—0 to 10 inches, very dark grayish-brown (10YR 3/2) very stony silt loam; very dark gray (10YR 3/1) streaks and patches; massive; nonsticky, nonplastic; few roots; strongly acid; clear, wavy boundary. 8 to 24 inches thick.

C1—10 to 26 inches, dark olive-gray (5Y 3/2) very stony loam; massive; slightly sticky, slightly plastic; contains many pebbles; extremely acid. 8 to 20 inches thick.

IIC2—26 to 32 inches, light-colored and dark-colored subrounded stones, gravel, and sand. Many feet thick.

These soils are extremely acid to strongly acid. The organic mat on the surface ranges from 10 to 24 inches in thickness.

**Jacobsen very stony silt loam, nearly level** (0 to 3 percent slopes) (JaA).—This soil occurs in nearly level depressions that range from a few acres to more than a hundred acres in size. Many areas also border large muskegs occupied by Salamatof peat. Small areas of Slikok soils and Salamatof peat were included in mapping.

This soil is not suited to crops. In places the native vegetation provides limited grazing. Artificial drainage is not feasible. (Management group 32)

**Jacobsen very stony silt loam, gently sloping** (3 to 7 percent slopes) (JaB).—This soil is inextensive. It generally occurs in small tracts bordering secondary streams. Small patches of Slikok and Salamatof soils were included in mapping. In places large stones are scattered on the surface.

This soil is not suited to crops. In places the native vegetation may be suitable for light grazing. Drainage is not feasible. (Management group 32)

## Jim Series

The Jim series consists of well-drained soils that formed in silty, wind-laid deposits 20 to 30 inches thick over bedrock.

These soils are on foot slopes of mountains and buttes in the eastern part of the Area. They differ from Bodenburg soils in that they are underlain by solid rock at a depth of less than 30 inches.

On south-facing slopes, Jim soils support thick stands of grass, mainly bluejoint, but on most north-facing slopes they support forests of paper birch, white spruce, and quaking aspen.

Representative profile of Jim silt loam in the SW¼SW¼ sec. 23, T. 17 N., R. 2 E., Seward Meridian:

O1—1½ inches to 0, dark reddish-brown (5YR 2/2) mat of decomposing organic matter; gray silt admixture.

A1—0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; very dark grayish-brown (10YR 3/2) patches; weak, fine, subangular blocky structure; very friable; many roots; clear, wavy boundary. 3 to 7 inches thick.

C1—5 to 22 inches, olive-gray (5Y 4/2) silt loam; few, fine, faint spots of dark yellowish brown; weak, medium, subangular blocky structure; friable; few, thin, very dark reddish-brown streaks of organic matter; roots plentiful; gradual, wavy boundary.

C2—22 to 26 inches, olive-brown (2.5Y 4/4) silt loam; massive; friable; few thin lenses of very fine sand; few large roots; abrupt boundary.

IIC3—26 inches +, bedrock; dark-colored consolidated metamorphic rock.

These soils are strongly acid near the surface and medium acid in the lower layers. A few thin lenses of very fine sand generally occur in the lower layers, and some may occur at any depth.

**Jim and Bodenburg silt loams, hilly** (12 to 20 percent slopes) (JbD).—This mapping unit is of minor extent and occurs on buttes and on mountain foot slopes. The two dominant soils formed in a mantle of silt loam that ranges from 20 to about 60 inches in thickness over bedrock. At the base of Bodenburg Butte the soils are coarser in texture and are similar to the adjoining Susitna very fine sand. A few rolling tracts, steep slopes, and scattered rock outcrops were included in mapping.

These soils are highly susceptible to water erosion and blowing if the vegetative cover is removed. If used for crops, they should be kept in perennial grasses most of the time. (Management group 13)

**Jim and Bodenburg silt loams, steep** (30 to 45 percent slopes) (JbF).—These soils formed in a silt mantle 20 to 60 inches thick over bedrock. Patches of shallow soils in which the silt is less than 20 inches thick were included, to the extent of 15 percent of some mapped areas. Also included were a few moderately steep slopes that have a gradient between 20 and 30 percent. In places bare rock is exposed at the surface.

These soils are too steep for crops, but in places the native grasses provide limited grazing for livestock. (Management group 28)

## Kalifonsky Series

The Kalifonsky series consists of somewhat poorly drained silty soils that are moderately deep to deep over coarse gravelly material.

These soils are not extensive and occur only in the eastern half of the Area. They are in slight depressions and on north-facing slopes. They have a coarser textured subsoil than the Coal Creek soils and the Wasilla soils and are less poorly drained. They are not so well drained as the Bodenburg soils and are mottled.

The Kalifonsky soils support dense forests of black spruce and, in places, stands of paper birch. A few nearly level areas are used for crops.

Representative profile of Kalifonsky silt loam in the NW¼NE¼ sec. 19, T. 17 N., R. 2 E., Seward Meridian:

O11—6 to 4 inches, mat of sphagnum moss and roots; clear, smooth boundary. 2 to 5 inches thick.

O12—4 inches to 0, dark reddish-brown (5YR 2/2) mat of moss, roots, and decomposing organic material; clear, smooth boundary. 3 to 6 inches thick.

A1—0 to 2½ inches, very dark gray (5Y 3/1) silt loam; olive-gray (5Y 4/2) streaks and patches; common, medium, distinct mottles of dark yellowish brown; weak, medium, granular structure; very friable; few thin bands of black, finely divided organic matter; roots plentiful; clear, wavy boundary. 1 to 5 inches thick.

C1g—2½ to 18 inches, dark-gray (5Y 4/1) silt loam; many, medium, prominent mottles of dark reddish brown; weak, medium, subangular blocky structure; friable; few roots; gradual, wavy boundary. 10 to 20 inches thick.

C2—18 to 28 inches, dark grayish-brown (2.5Y 4/2) silt loam; many large, dark-gray (10YR 4/1) patches; massive to very weak, fine, platy structure; very friable; abrupt, smooth boundary. 5 to 20 inches thick.

IIC3—28 to 40 inches +, olive-brown (2.5Y 4/4) coarse sand and gravel with many light-colored and dark-colored fragments; single grain; loose. Many feet thick.

These soils are very strongly acid to strongly acid. The depth to gravelly material ranges from 24 to 30 inches.

**Kalifonsky silt loam, nearly level** (0 to 3 percent slopes) (KaA).—This soil is in small, scattered, somewhat poorly drained depressions within larger areas of the well-drained Bodenburg or Knik soils.

Several areas are used for crops. Artificial drainage is beneficial. (Management group 11)

**Kalifonsky silt loam, gently to moderately sloping** (3 to 12 percent slopes) (KaC).—This soil is of minor extent. It is in small areas that receive runoff and seepage from soils on bordering slopes. Small patches of the well-drained Bodenburg and Knik soils were included in mapping.

A few acres are used for crops. Artificial drainage is needed to divert water that runs off the bordering slopes. (Management group 11)

**Kalifonsky silt loam, strongly sloping to steep** (12 to 45 percent slopes) (KaE).—This soil is on north-facing slopes. It generally has a thicker moss cover and remains frozen later in spring than less steep Kalifonsky soils. Within mapped areas of this soil are inclusions of the well-drained Bodenburg and Knik soils that average less than an acre in size.

The thick moss cover, the seepage from bordering slopes, and the north-facing position all contribute to impeded drainage and to a low soil temperature during the growing season. Although this soil is not suitable for cropping, the native vegetation in places may provide light grazing. Because of the erosion hazard, the vegetation should not be disturbed. (Management group 31)

## Kenai Series

The Kenai series consists of well-drained soils that formed in a mantle of silty loess over firm, moderately fine textured glacial till. The Kenai soils in the Matanuska Valley Area differ from the typical Kenai soils elsewhere in that (a) they formed in a thinner mantle of loess, generally less than 10 inches thick; (b) they have an intermediate layer of loam; and (c) they are underlain by finer textured glacial till consisting mostly of weathered shale and sandstone. This glacial till is finer textured and firmer than that underlying the Naptowne soils and much finer and firmer than the gravelly material underlying the Homestead soils.

The Kenai soils in the Matanuska Valley Area are of limited extent. They occupy only a few scattered tracts on broad, benchlike ridges near Houston. They support forests consisting mostly of paper birch, white spruce, clumps of alder, and a dense understory of shrubs.

Representative profile of Kenai silt loam in the NW¼ NE¼ sec. 20, T. 18 N., R. 3 W., Seward Meridian:

O1—2 inches to 0, dark reddish-brown (5YR 2/2) mat of decomposing organic material; many fine roots and mycelia; abrupt, smooth boundary. 1 to 4 inches thick.

A2—0 to 1½ inches, dark-gray (10YR 4/4) silt loam; common, fine, prominent mottles of yellowish red; weak, thin, platy structure; very friable; roots plentiful; abrupt, irregular boundary. 1 to 3 inches thick.

B21—1½ to 2 inches, dark reddish-brown (5YR 3/4) silt loam; weak, medium, granular structure; very friable; roots plentiful; abrupt, broken boundary. 0 to 1½ inches thick.

B22—2 to 4 inches, strong-brown (7.5YR 5/6) gritty silt loam; patches of brown and yellowish brown; weak, medium, granular structure; very friable; roots plentiful; clear, wavy boundary. 2 to 4 inches thick.

B3—4 to 10 inches, dark yellowish-brown (10YR 4/4) heavy loam; massive; friable; few rounded pebbles and stones; gradual, smooth boundary. 3 to 10 inches thick.

IIC1—10 to 20 inches, dark grayish-brown (10YR 4/2) sandy clay loam; large, faint patches of dark gray; massive; friable when moist; few roots; subangular and angular stones comprise about 20 percent of the soil mass; gradual, smooth boundary. 5 to 30 inches thick.

IIC2—20 to 32 inches, light olive-brown (2.5Y 5/4) clay loam; common, medium, distinct mottles of strong brown; massive; firm; many coarse fragments of unweathered shale and sandstone and other angular and subangular stones. Many feet thick.

Kenai soils are strongly acid throughout. In places, stones are fairly numerous on or near the surface.

**Kenai silt loam, undulating** (3 to 7 percent slopes) (KeB).—This soil commonly occurs as scattered tracts where slope is between 3 and 7 percent. Included in mapping were a few small rolling to hilly tracts that have a slope of as much as 20 percent. Also included were a few stony patches. Small drainageways and wet seepage spots occur within the mapped areas. This soil is suited to crops that require only shallow tillage. (Management group 15)[4]

## Knik Series

The Knik series consists of well-drained silty soils that are shallow over coarse gravelly material. These soils are on nearly level to rolling plains and hilly to steep, rough moraines.

The Knik soils are extensive over a broad zone in the central part of the Area. They grade to the Bodenburg and Doone soils in the east and to Homestead soils in the west. They are browner than the Bodenburg soils, are shallower to gravel than the Doone soils, and have less prominent soil horizons than the Homestead soils.

The Knik soils support a forest consisting mostly of paper birch, white spruce, and quaking aspen, but many areas are in crops or pasture. A profile of Knik silt loam is shown in figure 9.

Representative profile of Knik silt loam in the NW¼ SE¼ sec. 17, T. 17 N., R. 1 E., Seward Meridian:

O11—4 to 3½ inches, forest litter.

O12—3½ inches to 0, very dark brown (10YR 2/3) to very dark grayish-brown (10YR 2/2, 3/2) mat of roots and partly decomposed organic material; many very fine granules of very dark brown silt loam; few mycelia; abrupt, smooth boundary.

A2—0 to 3 inches, gray (N 5/0) silt loam mottled with reddish brown; weak, fine, subangular blocky structure; friable; many roots, especially in upper part of horizon; strongly acid; abrupt, wavy boundary. 2 to 6 inches thick.

B2—3 to 7 inches, mixed dark-brown (10YR 3/3) and dark-gray (5Y 4/1) silt loam; fine spots of dark reddish brown; weak, medium, subangular blocky structure; friable; few roots; few, fine, dark-colored concretions; strongly acid; clear, wavy boundary. 3 to 6 inches thick.

C1—7 to 12 inches, gray (5Y 5/1) silt loam; spots of dark yellowish brown (10YR 4/4) and a few horizontal streaks of very dark brown (10YR 2/2); massive, but breaks under pressure into poorly defined thin plates; few roots; medium acid; gradual boundary. 4 to 6 inches thick.

C2—12 to 19 inches, mixed dark-brown (10YR 4/3) and olive-brown (2.5Y 4/4) silt loam; thicker streaks of very dark brown (10YR 2/2) than in C1 horizon, and few streaks of reddish yellow (7.5YR 6/6); massive; friable; few roots; medium acid; abrupt boundary. 5 to 8 inches thick.

IIC3—19 to 32 inches +, very gravelly coarse sand. Many feet thick.

In places as much as 12 inches of fine sand underlies the silt mantle.

**Knik silt loam, nearly level** (0 to 3 percent slopes) (KnA).—This is one of the most extensive well-drained soils in the Area. It occurs mostly on broad terraces and plains. It formed in a silty mantle that is ordinarily about 16 inches in thickness over very gravelly coarse sand but ranges from 12 to 24 inches. A few narrow escarpments and poorly drained depressions were included in mapping. In places, they limit farming.

All of the crops adapted to the Area can be grown on this soil, but yields are usually less than on deeper soils, largely because of a lower moisture-supplying capacity. Satisfactory yields of most crops can be obtained if moisture is conserved and fertility is maintained.

In large fields this soil is moderately susceptible to blowing. (Management group 8)

**Knik silt loam, undulating** (3 to 7 percent slopes) (KnB).—This is one of the most extensive well-drained soils in the Area. It consists of scattered tracts, from a few acres to more than a hundred acres in size, on terraces

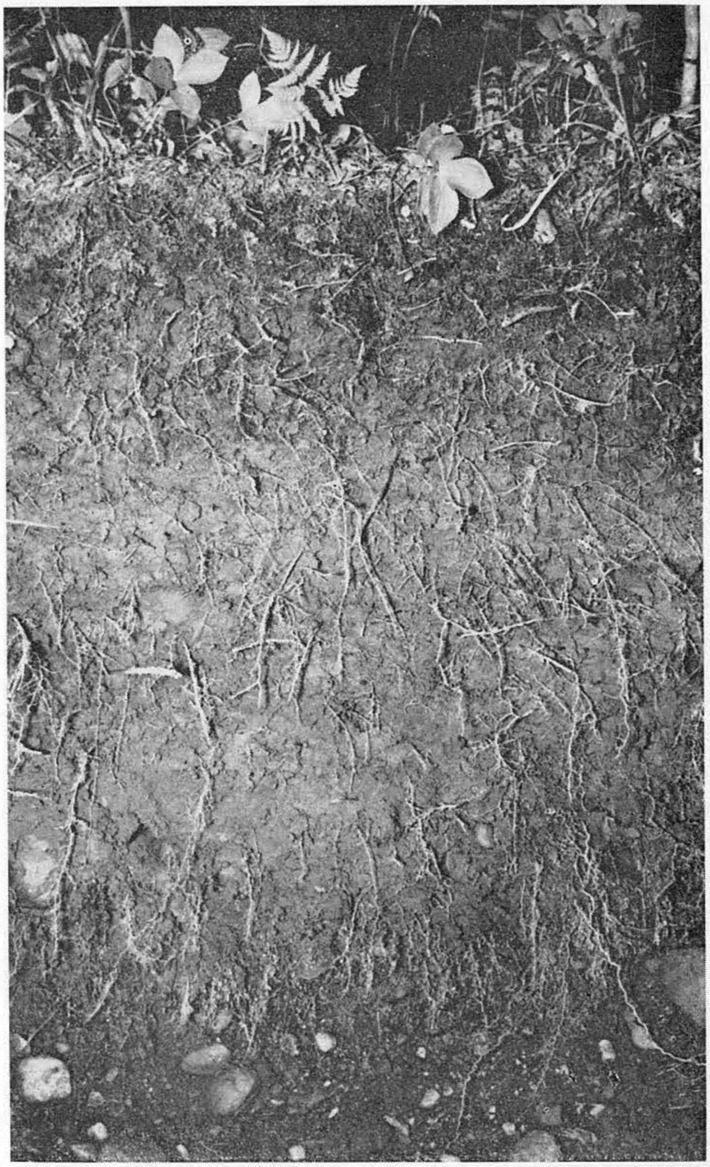


*Figure 9.*—**Profile of Knik silt loam. Depth to underlying gravel and sand is about 18 inches.**

[4] Because the Kenai soil in the Matanuska Valley Area is shallower than Kenai soils in other areas, it is in a different management group.

and plains. A few narrow escarpments and poorly drained depressions were included in mapping. In places, they limit farming.

This soil tends to be droughty. It is susceptible to water erosion and moderately susceptible to blowing if the surface is exposed.

If erosion is controlled and the soil is otherwise well managed, all of the crops adapted to the Area can be grown. (Management group 7)

**Knik silt loam, rolling** (7 to 12 percent slopes) (KnC).—This soil is on scattered knolls and irregular ridges that have short, choppy slopes. It is moderately extensive. A few steeper slopes were included in mapping, and there are small, scattered, poorly drained depressions.

This soil is suited to all of the crops adapted to the Area, but conservation practices are needed to control erosion if row crops are grown (Management group 7)

**Knik silt loam, hilly** (12 to 20 percent slopes) (KnD).—This soil is in scattered areas that have short, complex slopes. Poorly drained areas in small, deep depressions and a few slopes of more than 20 percent were included in mapping.

If used for crops, this soil should be kept in perennial grasses most of the time. It is susceptible to erosion, which is difficult to control on these steep slopes when the surface is exposed. (Management group 14)

**Knik silt loam, moderately steep** (20 to 30 percent slopes) (KnE).—This soil is on narrow terrace escarpments and on rough, choppy terrain. Most of the acreage is forested, but a few small tracts are used for hay or pasture. The erosion hazard is severe, and erosion on these steep slopes is difficult to control if the surface is exposed. (Management group 20)

**Knik silt loam, steep** (30 to 45 percent slopes) (KnF).—This soil is extensive on steep escarpments and irregular ridges. It is too steep for farming and should remain in native vegetation. (Management group 28)

## Matanuska Series

The Matanuska series consists of well-drained soils that are shallow over gravelly material. These soils formed in a layer of silty material about 10 inches thick over a moderately fine textured layer.

These soils are not extensive and occur only on a few broad, low, nearly level terraces in the eastern part of the Area. They are better drained than the Wasilla soils or Coal Creek soils and are distinguished from the Susitna soils and Bodenburg soils by having a firmer, finer textured subsoil layer.

The Matanuska soils support a forest consisting mainly of white spruce and paper birch, but a few small areas are cleared.

Representative profile of Matanuska silt loam in the SW¼SE¼ sec. 35, T. 18 N., R. 2 E., Seward Meridian:

O1—2½ inches to 1 inch, mat of leaves and decomposing organic matter; clear, smooth boundary. 1 to 3 inches thick.

O2—1 inch to 0, black (5YR 2/1) mat of finely divided organic matter; many fine roots; mycelia; abrupt, smooth boundary. ½ inch to 1½ inches thick.

A1—0 to 5 inches, dark-gray (5YR 4/1) silt loam; common, fine, distinct mottles of dark brown; weak, fine, granular structure; friable; many fine roots; clear, wavy boundary. 3 to 6 inches thick.

C1—5 to 9 inches, patches and streaks of dark grayish-brown (2.5Y 4/2), dark yellowish-brown (10YR 4/4), and dark-brown (7.5YR 4/4) silt loam; weak, fine, granular structure; very friable; roots plentiful; abrupt, smooth boundary. 3 to 8 inches thick.

IIC2—9 to 18 inches, olive (5Y 5/3) silty clay loam; weak, medium, subangular blocky structure that breaks to weak, fine, granular; firm; few roots; gradual, wavy boundary. 8 to 14 inches thick.

IIIC3—18 to 32 inches +, olive-brown (2.5Y 4/4) coarse sand and gravel that contains dark-colored and light-colored rounded stones and cobblestones; structureless; loose. Many feet thick.

Under the organic mat, the silty material ranges from 5 to 15 inches in thickness, and the moderately fine textured underlying layer ranges from 5 to 10 inches in thickness. In places fine material is mixed with the gravelly substratum. The depth to gravel ranges from 12 to 24 inches.

**Matanuska silt loam** (nearly level) (Ma).—This soil is on a few broad, nearly level, low terraces in the eastern part of the Area, adjoining the Bodenburg and Knik soils. Included in mapping were a few small undulating areas in which slopes are slightly steeper than 3 percent. Small patches of the Bodenburg and Knik soils were also included.

Most of this soil is forested, but scattered tracts are used for crops. It is suited to crops, but yields are somewhat low because of the slowly permeable layer and the shallowness to gravel. (Management group 10)

## Mixed Alluvial Land

Mixed alluvial land (Ml) is extensive on the flood plains of secondary streams. It occurs as low, nearly level, frequently flooded areas. Most of it consists of medium-textured to very coarse textured recent sediments that range from a few inches to several feet in thickness over loose cobblestones, stones, and boulders. Irregular patches of silty and very fine sandy sediments, as well as stony and gravelly spots, are common. There are many sloughs and secondary channels, which carry excess water when the main stream channels are full. Most of this land type is flooded from one to several times each year, but a few, small, elevated spots on natural levees are flooded only rarely.

The native vegetation varies. It consists mainly of dense alder and willow thickets, scattered stands of cottonwood (balsam poplar), paper birch, and white spruce, and patches of native grass. This land is not suited to cultivated crops, but the native grass can be grazed lightly for short periods of time. (Management group 33)

## Moose River Series

The Moose River series consists of poorly drained soils that formed in silty and sandy water-laid sediments. These soils are in depressions and low areas bordering lakes and secondary streams.

The Moose River soils are not so dark colored as the Slikok soils, and they have a coarser textured subsoil than the Coal Creek and Wasilla soils.

The native vegetation consists of alder and willow, scattered stands of black spruce, and patches of grass.

A ground cover of sphagnum moss, sedges, and low-growing shrubs is common.

Representative profile of Moose River silt loam in the SE¼SW¼ sec. 11, T. 17 N., R. 4 W., Seward Meridian:

O1—3 inches to 0, dark reddish-brown (5YR 2/2) mat of decomposing moss, leaves, and twigs; many roots; abrupt, wavy boundary.

A1—0 to 6 inches, very dark grayish-brown (2.5Y 3/2) silt loam; weak, fine, granular structure; nonsticky and nonplastic; many roots; few streaks and patches of black (10YR 2/1); extremely acid; clear, smooth boundary.

C1—6 to 14 inches, olive-gray (5Y 4/2) fine sand; single grain; loose; few streaks and patches of dark brown (10YR 3/3); few thin lenses of silt; few roots; extremely acid; gradual boundary.

C2g—14 to 38 inches, dark-gray (5Y 4/1), stratified fine sand and silt loam; few, large, distinct, olive-brown mottles; massive; nonsticky and nonplastic; strata are ¼ inch to 3 inches thick; very strongly acid; clear, smooth boundary.

IIC3g—38 to 48 inches +, dark-gray (5Y 4/1) very gravelly coarse sand; single grain; loose.

The water table is at or near the surface for long periods during the growing season, but in places it drops rapidly to several feet below the surface during extended dry periods. The surface layer ranges from silt loam to fine sandy loam. Below the surface layer the soil is dominantly sandy but contains lenses of silty material of varying thickness. The depth to coarse sand and gravel ranges from 27 inches to more than 40 inches.

**Moose River silt loam** (nearly level) (Mr).—This soil is moderately extensive and is widely scattered in depressions and on small, low alluvial plains bordering secondary streams. Included in mapping were a few gently sloping tracts adjoining uplands. Patches of Salamatof peat and Jacobsen very stony silt loam were also included.

Artificial drainage is generally not feasible. In places the native grasses and sedges provide limited grazing. (Management group 27)

## Nancy Series

The Nancy series consists of well-drained silty soils that are moderately deep to deep over thick deposits of loose sand and gravel.

These soils are on nearly level high terraces and gently sloping to steep moraines in the northwestern part of the Area. They formed in a thicker mantle of silt than the Homestead soils. They differ from the Naptowne soils in that they are underlain at a depth of 20 to 30 inches by loose gravelly deposits rather than firm glacial till.

The Nancy soils support a forest of paper birch, white spruce, and quaking aspen. They are of relatively minor extent in the Area, and only a few small tracts have been cleared for crops.

Representative profile of Nancy silt loam in the NW¼SE¼ sec. 17, T. 19 N., R. 4 W., Seward Meridian:

O1—3 inches to 0, dark reddish-brown (5YR 2/2) mat of decomposing organic material; many fine roots; mycelia; clear, smooth boundary. 1 to 5 inches thick.

A2—0 to 1½ inches, light-gray (10YR 6/1) silt loam; weak, fine, platy structure; friable; roots plentiful; abrupt, irregular boundary. 1 to 4 inches thick.

B21—1½ to 2½ inches, reddish-brown (5YR 4/4) silt loam; weak, medium, granular structure; very friable; roots plentiful; abrupt, wavy boundary. ½ inch to 1½ inches thick.

B22—2½ to 6 inches, strong-brown (7.5YR 5/6) silt loam; weak, medium, granular structure; very friable; roots plentiful; abrupt, wavy boundary. 3 to 10 inches thick.

A2b—6 to 7 inches, grayish-brown (2.5Y 5/2) silt loam; weak, fine, granular structure; very friable; roots plentiful; abrupt, broken boundary. 0 to 1½ inches thick.

B2b—7 to 7½ inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, granular structure; very friable; roots plentiful; abrupt, wavy boundary. ½ inch to 2 inches thick.

B3b—7½ to 16 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; few roots; clear, wavy boundary. 6 to 12 inches thick.

C1—16 to 21 inches, olive-brown (2.5Y 4/4) silt loam; massive; friable; few roots; clear, smooth boundary. 2 to 12 inches thick.

IIC2—21 to 32 inches, olive-brown (2.5Y 4/4) and olive (5Y 4/3) gravelly sand; single grain; loose; a few weakly cemented fragments. Many feet thick.

These soils are very strongly acid, especially near the surface. The silty loess mantle ranges from 18 to more than 30 inches in thickness. Thin layers of very fine sand and fine sand occur in some places below a depth of 15 inches. In places the silty material is underlain by deep, fine to medium sand that contains many pebbles.

**Nancy silt loam, nearly level** (0 to 3 percent slopes) (NaA).—This soil is on a few, broad, nearly level, high terraces in the northwestern part of the Area. It formed in a silty mantle that is 20 to 24 inches thick over loose gravelly or sandy deposits. The silty layer is more uniform in depth to gravel than is the corresponding layer of the steeper Nancy soils. A few patches of Homestead soils were included in mapping.

Most of this soil is forested, but a few tracts are used for crops. All crops adapted to the Area can be grown if an adequate level of fertility is maintained. (Management group 2)

**Nancy silt loam, undulating** (3 to 7 percent slopes) (NaB).—This soil is on undulating terraces. It formed in a silty mantle about 20 inches thick over gravelly or sandy material. A few spots of shallow Homestead silt loam and a few short slopes of as much as 12 percent were included in mapping.

Most of this soil is in native vegetation, but a few tracts are used for crops. All crops adapted to the Area can be grown, but the soil is slightly susceptible to water erosion if the surface is exposed. Simple conservation measures are generally adequate. (Management group 4)

**Nancy silt loam, rolling** (7 to 12 percent slopes) (NaC).—This soil occurs as small, scattered areas on moraines. The slopes are short. The silty mantle ranges generally from 18 to 30 inches in thickness within short distances but is shallower in places. Small, scattered, poorly drained depressions and a few short slopes of as much as 20 percent were included in mapping.

This soil is not extensive and is mostly forested. It is suited to all crops grown in the Area, but conservation practices are needed to control water erosion if row crops are grown. (Management group 6)

**Nancy silt loam, hilly** (12 to 20 percent slopes) (NaD).—This soil is on moraines. The slopes are short. The depth to gravel ranges from 18 to 36 inches within short distances. A few rolling areas, a few moderately steep slopes, and small patches of Homestead soils were included in mapping.

This soil is not extensive, and most of it is forested. Although it can be used for crops, it should be kept in perennial grasses most of the time because it is susceptible to water erosion if the vegetation is removed. (Management group 13)

**Nancy silt loam, moderately steep** (20 to 30 percent slopes) (NaE).—This is the most extensive of the Nancy soils. The silty mantle ranges from 18 to 36 inches in thickness. Included in mapping were a few areas of Homestead silt loam, a few small poorly drained depressions, and about 100 acres of steep slopes.

The erosion hazard is severe if the surface is exposed. Therefore, cleared areas should be kept in grass, and steep areas should remain in forest. (Management group 20)

## Naptowne Series

The Naptowne series consists of well-drained soils on glacial moraines in the western part of the Area. These soils are nearly level to steep. They formed in silty, wind-laid material that is shallow to moderately deep over gravelly glacial till. The till is not so coarse or so loose as the material underlying the Nancy and Homestead soils and it is not so fine or so firm as that underlying the Kenai soils.

Naptowne soils are moderately extensive. They support forests consisting dominantly of paper birch and white spruce and interspersed patches of alder. A small acreage has been cleared and is farmed.

Representative profile of Naptowne silt loam in the NE¼SE¼ sec. 26, T. 16 N., R. 4 W., Seward Meridian:

O2—4 inches to 0, dark reddish-brown (5YR 2/2), partly decomposed organic matter.

A2—0 to 1½ inches, gray (10YR 5/1) silt loam; weak, very thin, platy structure breaking to weak, fine, granular; very friable; extremely acid; abrupt, irregular boundary.

B21—1½ to 3 inches, dark reddish-brown (5YR 3/4) and reddish-brown (5YR 4/4) silt loam; moderate, very fine, granular structure; very friable; extremely acid; clear, wavy boundary.

B22—3 to 5 inches, brown (7.5YR 4/4) silt loam; weak, very fine, granular structure; very friable; extremely acid; clear, wavy boundary.

B3—5 to 10 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, very fine, granular structure; very friable; extremely acid; clear, smooth boundary.

C1—10 to 15 inches, light olive-brown (2.5Y 5/4) silt loam; very weak, thin, platy structure; very friable; many pinholes; extremely acid; abrupt, wavy boundary.

IIC2—15 to 24 inches, olive-gray (5Y 4/2) gravelly sandy loam; weak, thin, platy structure that breaks to single grain under slight pressure; friable to firm; contains pockets of gravelly silt loam that has a weak, very thin, platy structure; a few angular and subrounded stones and boulders; very strongly acid.

The silty loess mantle ranges from 15 to 30 inches in thickness. In a few places, a fine sandy layer as much as 12 inches thick occurs immediately under the silty material. The underlying till contains varying quantities of fine-grained material. In places scattered stones and boulders are on or near the surface.

**Naptowne silt loam, nearly level** (0 to 3 percent slopes) (NpA).—This soil commonly occurs on broad, smooth moraines. In most places, the soil profile is similar to the one described for the series, but in the vicinity of Goose Bay, the silty mantle is commonly about 24 to 30 inches thick and is underlain by a layer of fine sand over firm glacial till.

The slope is generally 2 or 3 percent, but small areas with a slope of as much as 5 percent were included in mapping. Slight depressions and drainageways occupied by somewhat poorly drained soils were also included. Patches of stones interfere with tillage in some places.

This soil can be used for all crops grown in the Area, but yields are generally lower than on deeper soils. (Management group 2)

**Naptowne silt loam, undulating** (3 to 7 percent slopes) (NpB).—Most of this soil is on low, broad glacial moraines. In the vicinity of Goose Bay, the silty mantle is 24 inches thick over till, but elsewhere it ranges from 15 to 30 inches in thickness.

Long, very narrow, winding ridges occupied by shallow, gravelly Homestead soils are common inclusions in mapped areas several miles northeast of Big Lake. These inclusions interfere with tillage. In places stones are a nuisance also, unless they are removed.

This soil can be used for crops, but yields of most crops are likely to be lower than on deeper soils. If row crops are grown, conservation measures are generally needed to control erosion. All crops adapted to the Area can be grown if fertility is maintained. (Management group 4)

**Naptowne silt loam, rolling** (7 to 12 percent slopes) (NpC).—This soil is on low glacial moraines. It formed in silty material 15 to 30 inches thick over moderately firm glacial till. The slopes are short and irregular.

Areas range from 10 to 100 acres in size. Scattered wet spots, minor tracts of shallow soils, and a few short slopes of as much as 20 percent were included in mapping. These inclusions occupy as much as 15 percent of some areas and may interfere with cultivation or limit the extent of cleared fields. In places, stones are a nuisance also, unless they are removed.

This soil is suited to crops, but cleared fields are moderately susceptible to water erosion. Erosion generally can be controlled by simple conservation measures. (Management group 6)

**Naptowne silt loam, hilly** (12 to 20 percent slopes) (NpD).—This soil is on glacial moraines. The slopes are short, and the silty mantle ranges from 15 to 30 inches in thickness within distances of a few yards. Small spots of Homestead soils, stony patches, and a few small depressions were included in mapping. In a few places there are slopes of as much as 30 percent.

This soil is suited to crops but should be kept in grass most of the time. It is not suited to row crops, as it is highly susceptible to erosion if the vegetative cover is removed. (Management group 13)

**Naptowne silt loam, moderately steep** (20 to 30 percent slopes) (NpE).—This soil is on rough, irregular terrain. The slopes are short and choppy. The silty cap ranges from 15 to 30 inches in thickness within short distances. Small shallow spots, stony patches, a few deep, poorly drained depressions, and slopes exceeding 30 percent were included in mapping.

The use of this soil is limited to pasture or woodland, because of the slope. (Management group 20)

**Naptowne silt loam, steep** (30 to 45 percent slopes) (NpF).—This soil is on rough, irregular terrain. Stony places, patches of shallow soils, and small, deep depressions were included in mapping.

This soil should be kept in native vegetation, as it is highly susceptible to erosion if the vegetative cover is removed. (Management group 28)

## Niklason Series

The Niklason series consists of well-drained soils that formed in shallow to moderately deep, well-sorted layers of water-laid silt, very fine sand, and fine sand over coarse gravelly material.

These soils are on low plains bordering the major rivers and streams. They commonly adjoin the Susitna soils, which formed in deeper sediments.

The Niklason soils support forests of paper birch and white spruce and, in places, large cottonwood (balsam poplar) trees. A heavy understory of alder, willow, and shrubs is common. A considerable area has been cleared and is farmed.

Representative profile of Niklason silt loam in the NW¼SW¼ sec. 35, T. 18 N., R. 2 W., Seward Meridian:

O1—2½ inches to 0, very dark brown (10YR 2/2) mat of decomposing organic matter; many fine roots; abrupt, smooth boundary.

A1—0 to 1½ inches, very dark grayish-brown (10YR 3/2) silt loam that has a few black and very dark brown streaks; weak, fine, granular structure; very friable; many roots; clear, smooth boundary.

C1—1½ to 4½ inches, very dark grayish-brown (2.5Y 3/2) and dark grayish-brown (2.5Y 4/2) silt loam that has a few fine streaks of dark brown; weak, thin, platy structure; very friable; roots common; clear, smooth boundary.

C2—4½ to 10 inches, dark grayish-brown (2.5Y 4/2) very fine sandy loam that has streaks and patches of olive gray and very dark grayish brown; very weak, thin, platy structure; very friable; roots common; abrupt, smooth boundary.

C3—10 to 14 inches, olive-gray (5Y 4/2) silt loam that has a few small patches of brown; weak, thin, platy structure; friable; few thin lenses of very fine sand; few roots; abrupt, smooth boundary.

C4—14 to 19 inches, olive-gray (5Y 4/2) very fine sand; loose; few, thin, dark grayish-brown streaks; few roots; clear, smooth boundary.

IIC5—19 to 30 inches +, olive (5Y 4/3) gravelly coarse sand; loose; many light-colored and dark-colored pebbles and cobblestones.

These soils are very strongly acid to strongly acid. The texture of the surface layer ranges from silt loam to very fine sand. The sorted layers of silt, very fine sand, and fine sand vary in number and thickness. The depth to gravelly material ranges from 15 to 27 inches.

**Niklason silt loam** (0 to 3 percent slopes) (Ns).—This soil is moderately extensive on plains along the Matanuska River. It is dominantly silty but contains layers of very fine sand. In most places it is underlain by gravelly deposits at a depth of 15 to 20 inches; in some places it is deeper to gravel. Patches of shallower soils, small tracts of Susitna soils, and scattered spots of Niklason very fine sand were included in mapping. Also included were a few undulating slopes of between 3 and 7 percent. Abandoned stream channels, 1 or 2 feet lower than the surrounding plains, are fairly common. The soil in these channels is essentially the same as on the plains, but the steep banks interfere with farming operations.

Most crops adapted to the Area can be grown on this soil, although it is shallow and has a low moisture-supplying capacity. Yields are limited by droughtiness. Large fields in the vicinity of Palmer are susceptible to blowing. (Management group 9)

**Niklason very fine sand** (0 to 3 percent slopes) (Nv).—Although this soil is dominantly very fine sand, it contains many thin layers of silt. Except for the difference in texture, it is similar to Niklason silt loam and occurs in the same general areas. The depth to gravel is between 15 and 20 inches in most places, but in some it is as much as 27 inches. Small tracts of Susitna soils, Niklason silt loam, and Chena silt loam were included in mapping. A few undulating slopes were also included, and abandoned stream channels are fairly common.

This soil is suited to most crops adapted to the Area, although it is moderately droughty. Cultivated fields near Palmer are susceptible to blowing. (Management group 9)

## Reedy Series

The Reedy series consists of moderately well drained soils that formed in silty and very fine sandy, water-laid sediments underlain by moderately fine textured tidal deposits.

These soils are on natural levees along streams that flow through nearly level, stabilized plains of Tidal marsh. The levees are only a few feet higher than the surrounding plains.

The native vegetation consists of scattered clumps of cottonwood (balsam poplar) trees and dense thickets of willow and alder brush. Patches of native grass are common.

Representative profile of Reedy silt loam SW¼NW¼ sec. 26, T. 17 N., R. 1 E., Seward Meridian:

O1—1 inch to 0, black (5YR 2/1) mat of decomposing leaves and twigs mixed with finely divided organic matter and a few mineral grains; abrupt, smooth boundary. 1 to 2 inches thick.

A1—0 to 3 inches, dark grayish-brown (2.5Y 4/2) very fine sandy loam; very dark grayish-brown (10YR 3/2) streaks; thin silty lenses; very weak, medium, platy structure that breaks to weak, fine, granular; friable; many roots; clear, wavy boundary. 2 to 5 inches thick.

C1—3 to 18 inches, olive-gray (5Y 4/2) silt loam; thin lenses of very fine sandy loam; few, fine, distinct mottles of dark brown; weak, medium, platy structure; roots common; clear, smooth boundary. 10 to 30 inches thick.

IIC2—18 to 40 inches, greenish-gray (5GY 5/1) silty clay loam; common, medium, distinct mottles of dark yellowish brown; massive; friable. Many feet thick.

The upper layers are dominantly silty but range to very fine sand. In places, pockets of very fine sand occur in the underlying, slowly permeable, moderately fine textured material.

**Reedy silt loam** (0 to 3 percent slopes) (Re).—This soil is inextensive. It occurs as narrow strips on natural levees along streams that flow through the tidal plains along Knik Arm. Small patches of Tidal marsh and very narrow sandy strips adjoining some streams were included in mapping.

All crops commonly grown in the Area can be grown on this soil, but yields are limited by lack of moisture during extended dry periods. (Management group 10)

## Rough Mountainous Land

Rough mountainous land (Rm) consists of very steep rough areas on buttes and mountain slopes. Slopes vary abruptly. They range from 45 to more than 100 percent in gradient and are broken by numerous cliffs. Bedrock is exposed in many places, but in most places it is covered by a thin mantle of loess. This land commonly borders Jim soils, and patches of Jim soils were included in mapping. Patches of grass or clumps of white birch, white spruce, and quaking aspen are common where there is a thin covering of silt.

This land is not suited to farming and is poorly suited to forestry. (Management group 35)

## Salamatof Series

The Salamatof series consists of very poorly drained, deep peat soils in nearly level muskegs. They are the most extensive organic soils in the Area. The peat material is dominantly coarse and is derived chiefly from sphagnum moss and sedges.

The native vegetation consists of a thick mat of sphagnum moss, plus bog birch, willows, scattered sedges, and many kinds of low-growing plants common in northern muskegs. In places there are forests of black spruce.

Representative profile of Salamatof peat in the SW¼ SW¼ sec. 16, T. 17 N., R. 3 W., Seward Meridian:

0 to 10 inches, undecomposed moss peat; strong brown (7.5YR 5/6) when wet, light yellowish brown (10YR 6/4) when squeezed dry; a few pockets of coarse sedge peat; roots of woody shrubs plentiful; extremely acid; gradual boundary.

10 to 50 inches +, moss peat; dark reddish brown (5YR 3/3) when wet, dark yellowish brown (7.5YR 4/4) when squeezed dry; interlayered with sedge peat; contains a few layers of finely divided peat; many woody fragments; thin mineral layer near bottom of horizon; extremely acid; 30 inches to many feet thick.

**Salamatof peat** (Sa).—This is the most extensive soil in the Area. It is in level muskegs that range from a few acres to several hundred acres in size. A few areas of poorly drained mineral soils along small streams or around muskegs were included in mapping.

Except for scattered black spruce trees, 80 percent of the acreage is not forested. Stands of paper birch, willows, and stunted slow-growing black spruce occupy the other 20 percent. The water table is usually near the surface, but it fluctuates and, in places, drops to a depth of several feet during extended dry periods.

This soil has no potential value for crops. Artificial drainage is not feasible. (Management group 34)

**Salamatof peat, ever frozen variant** (20 to 45 percent slopes) (Sf).—This soil is on the north-facing slopes of sharp ridges southwest of Palmer. The peat consists mostly of extremely acid, undecomposed moss. It is perennially frozen below a depth of 15 to 30 inches. The native vegetation consists of stunted black spruce, low-growing shrubs, and a surface layer of live moss.

This soil is not suitable for crops or pasture and should remain in native vegetation. (Management group 34)

## Schrock Series

The Schrock series consists of well drained to moderately well drained soils that formed in thick deposits of water-laid silty and fine sandy material underlain by coarse sand and gravel. The upper layers are dominantly silty, and the lower layers are dominantly very fine sand.

These soils are on nearly level and undulating plains along some of the streams that flow from the Talkeetna Mountains. They are browner than the Susitna soils.

The Schrock soils support forests that consist mostly of paper birch and white spruce, but patches of alder, willow, and large cottonwood (balsam poplar) trees are fairly common.

Representative profile of Schrock silt loam in the NE¼ NW¼ sec. 19, T. 18 N., R. 1 W., Seward Meridian:

O11—3 to 2 inches, mat of undecomposed leaves, stems, and twigs; abrupt, smooth boundary. 1 to 3 inches thick.

O12—2 inches to 0, dark reddish-brown (5YR 2/2) mat of decomposing organic material; many fine roots and mycelia; extremely acid; abrupt, wavy boundary. 1 to 4 inches thick.

A11—0 to 1 inch, dark reddish-brown (5YR 3/2) silt loam; weak, fine, granular structure; very friable; many fine roots; extremely acid; abrupt, irregular boundary. ½ inch to 3 inches thick.

A12—1 inch to 3 inches, dark-brown (7.5YR 3/2) silt loam; patches of dark grayish brown; weak, medium, granular structure; friable; roots abundant; extremely acid; clear, wavy boundary. 2 to 6 inches thick.

B2—3 to 8 inches, dark-brown (10YR 4/3) silt loam; common, fine, distinct mottles of reddish brown; weak, medium, granular structure; friable; roots plentiful; very strongly acid; clear, wavy boundary. 2 to 12 inches thick.

B3—8 to 22 inches, patchy dark yellowish-brown (10YR 4/4) and dark grayish-brown (2.5Y 4/2) silt loam; lenses of very fine sand; weak, thin, platy structure; friable; few roots; very strongly acid; gradual, smooth boundary. 6 to 18 inches thick.

C1—22 to 34 inches, dark grayish-brown (2.5Y 4/2) very fine sand and silt strata; few, thin, dark-brown streaks; massive; friable; micaceous; strongly acid; clear, smooth boundary. 10 to 20 inches thick.

IIC2—34 to 52 inches, olive-brown (2.5Y 4/4) sandy and gravelly strata with thin lenses of olive-gray silt loam; micaceous; single grain; loose; strongly acid. Many feet thick.

These soils are extremely acid near the surface and strongly acid in the lower layers. The upper mineral layers are dominantly silty but contain fine sandy layers that vary in number and thickness. Black fragments of charcoal and reddish-brown pockets of organic matter are buried in the upper part of the profile. The depth to coarse sandy and gravelly material ranges from 24 to 50 inches.

**Schrock silt loam, nearly level** (0 to 3 percent slopes) (ShA).—This is the more extensive soil in the Schrock series. It is on low terraces and plains near secondary streams and, in places, is dissected by a few abandoned stream channels as much as 3 feet deep. Small patches of Susitna soils and Gravelly alluvial land were included in mapping.

In a few places this soil is flooded for short periods. Most of it is forested, but a few small tracts have been cleared and are used for crops. It is suited to all crops adapted to the Area. (Management group 1)

**Schrock silt loam, undulating** (3 to 7 percent slopes) (ShB).—This soil is of minor extent. It occurs as small scattered areas near secondary streams. Generally, it contains more fine sand in the upper layers and is shallower to coarse sand and gravel than Schrock silt loam, nearly level. Small inclusions of Homestead soils are fairly common.

This soil is suited to all crops adapted to the Area, but it is slightly susceptible to erosion if cultivated. (Management group 3)

## Sea Cliffs

Sea cliffs (Sl) rise more than 100 feet above several of the beaches along Knik Arm near Goose Bay. Moderately fine textured silty and sandy sediments are exposed in the lower parts of these cliffs; gravelly material is generally exposed in the upper parts.

Most areas are barren of vegetation, but a few partly stabilized areas support patches of alder and willow and a few birch trees. This land is not suitable for crops or for grazing. (Management group 35)

## Slikok Series

The Slikok series consists of poorly drained, very dark colored soils that formed in mucky and silty sediments along secondary drainageways, in seepage areas, and on lowlands around lakes and muskegs. These soils are moderately extensive and are scattered throughout the Area.

These soils have a thick, black, mucky surface layer and a very dark colored silty and mucky subsoil. They are darker than the Wasilla and Torpedo Lake soils, and they lack the firm, moderately fine textured subsoil that is typical of those soils. They are darker than the Coal Creek soils.

The dominant vegetation consists of alder, willow, and paper birch, but in places there are patches of grass growing in large tussocks.

Representative profile of Slikok mucky silt loam in the SE¼SE¼ sec. 1, T. 17 N., R. 1 W., Seward Meridian:

O1—12 to 7 inches, black (5YR 2/1) mat of decomposing organic material; clear, smooth boundary. 2 to 6 inches thick.

O2—7 inches to 0, black (5YR 2/1), finely divided, decomposing organic matter containing a few coarse woody particles; many roots; gradual, smooth boundary. 3 to 15 inches thick.

A1—0 to 8 inches, black (5YR 2/1) mucky silt loam; a few pockets of dark reddish-brown, finely divided organic matter; weak, fine, granular structure; nonplastic, nonsticky; roots plentiful; strongly acid; gradual, wavy boundary. 6 to 20 inches thick.

AC—8 to 42 inches, very dark gray (10YR 3/1) mucky silt loam; lenses of dark grayish-brown (10YR 4/2) silt loam; massive; nonsticky, nonplastic; few thin lenses of fine sand and thin layers of sedge and woody peat; roots plentiful to few; strongly acid. 12 to 48 inches thick.

In places there are many stones within 20 inches of the surface. The depth to grayish gravelly material underlying the AC horizon, ranges from 30 to 60 inches. The upper layers of these soils are strongly acid, but acidity decreases with depth. The water table is near the surface most of the time.

**Slikok mucky silt loam** (0 to 3 percent slopes) (Sm).—This is the more extensive soil of the Slikok series. It commonly occurs along drainageways, and there are many springs and seepage places and a few small streams within the mapped areas. Several small, gently sloping areas constitute about 3 percent of the total acreage. Stony patches and small areas of Wasilla silt loam are also included.

Artificial drainage ordinarily is needed before crops can be grown. (Management group 18)

**Slikok stony mucky silt loam** (0 to 3 percent slopes) (Sn).—This soil is in small drainageways and along secondary streams. It is inextensive but widely scattered throughout the Area. Because of the many stones and boulders within 20 inches of the surface, artificial drainage is not feasible, but some areas of native grasses probably can be grazed to a limited extent. (Management group 32)

## Spenard Series

The Spenard series consists of somewhat poorly drained and poorly drained soils that formed in a thin mantle of silt underlain by firm, moderately fine textured glacial till. They are of minor extent and occur only in the northwestern part of the Area.

These soils are in nearly level areas bordering muskegs and on fairly long, smooth, gentle to moderate slopes of glacial moraines. They are not so poorly drained as the Torpedo Lake soils and the Coal Creek soils.

The Spenard soils commonly support a dense forest of black spruce and a thick ground cover of moss, but in some places the forest consists of paper birch, white spruce, and dense clumps of alder brush.

Representative profile of Spenard silt loam in the SW¼SE¼ sec. 16, T. 18 N., R. 3 W., Seward Meridian:

O1—5 inches to 0, dark reddish-brown (5YR 2/2) mat of moss and decomposing organic material; extremely acid; clear, smooth boundary. 3 to 10 inches thick.

A1—0 to 3 inches, very dark gray (10YR 3/1) silt loam; pockets of black (5YR 2/1) silt loam; weak, medium, subangular blocky structure; friable when moist, nonsticky when wet; many roots; extremely acid; abrupt, wavy boundary. 2 to 6 inches thick.

AC—3 to 5 inches, very dark brown (10YR 2/2) silt loam; splotches of dark reddish brown (5YR 3/3); massive; firm when moist, nonsticky and slightly plastic when wet; roots plentiful; extremely acid; abrupt, wavy boundary. 1 to 4 inches thick.

IIC1g—5 to 14 inches, dark-gray (10YR 4/1) sandy clay loam; common, coarse, distinct mottles of dark yellowish brown; common, medium, prominent mottles of reddish brown; massive; firm when moist, slightly sticky and slightly plastic when wet; few roots; very strongly acid; abrupt, wavy boundary. 6 to 12 inches thick.

IIC2g—14 to 31 inches, very dark gray (10YR 3/1) gravelly silty clay loam; common, medium, distinct mottles of dark reddish brown; massive; slightly sticky and slightly plastic when wet; very few fine roots; many pebbles and few cobblestones and stones; very strongly acid. Many feet thick.

The silty mantle ranges from 2 to 10 inches in thickness. The glacial till ranges from sandy clay loam to silty clay loam in texture and becomes firmer and more compact with depth. Pebbles, cobblestones, and stones are common in the till. These soils are very strongly acid to extremely acid.

**Spenard silt loam, nearly level** (0 to 3 percent slopes) (SpA).—This is the more extensive soil of the Spenard series. It commonly borders muskegs. Patches of Torpedo Lake soils and Jacobsen soils were included in mapping.

Most of this soil is covered by a dense forest of black spruce and a thick ground cover of moss. If cleared and artificially drained, it is suitable for grasses and small grains. In places stones interfere with tillage. (Management group 17)

**Spenard silt loam, gently sloping** (3 to 7 percent slopes) (SpB).—This soil is inextensive and occupies the smooth slopes of low glacial moraines. In the western part of the Area, it includes some slopes of slightly more than 7 percent. A few small areas of well-drained Kenai silt loam and of Torpedo Lake silt loam in drainageways were included in mapping.

Dense forests of black spruce and stands of paper birch and alder are equally common. This soil is suited to grain and grass if cleared and artificially drained. In places the surface is stony, and it may be necessary to remove stones before farm machinery can be used. (Management group 17)

## Susitna Series

The Susitna series consists of well-drained soils that formed in layers of water-laid silt and very fine sand over coarse sand and gravel.

These soils are on low, nearly level and undulating plains along major rivers and streams, and they are the most extensive soils in these areas. They are grayer than the Schrock soils and are deeper to coarse gravelly material than the Niklason soils.

The forest cover generally consists of large cottonwood (balsam poplar) trees and a understory of alder and willow; in places paper birch and white spruce are dominant. A considerable acreage is used for farming.

Representative profile of Susitna silt loam in the NE¼NW¼ sec. 34, T. 17 N., R. 2 E., Seward Meridian:

O1—2 inches to 0, dark reddish-brown (5YR 2/2) mat of decomposing organic material; clear, smooth boundary.

A1—0 to 2 inches, dark grayish-brown (2.5Y 3/2) silt loam; streaks of dark reddish brown and dark brown; weak, medium, granular structure; very friable; many fine roots; clear, smooth boundary.

C1—2 to 15 inches, olive-gray (5Y 4/2) silt loam with patches of olive; weak, fine, subangular blocky structure; friable; many very fine pores; few roots; few lenses of fine sand; few dark reddish-brown pockets of organic matter; clear, smooth boundary.

C2—15 to 35 inches, olive-gray (5Y 4/2) fine sand; layers of silt loam as much as 1 inch thick; weak, thin, platy structure; very friable; clear, smooth boundary.

C3—35 to 46 inches +, dark-gray and light-gray coarse sand and gravel; structureless; loose. Many feet thick.

These soils are strongly acid. The texture of the surface layer ranges from silt loam to very fine sand. The depth to coarse gravelly material ranges from 27 to 40 inches. Some areas are flooded annually.

**Susitna silt loam** (0 to 3 percent slopes) (Su).—This is the most extensive soil in the Susitna series. It is silty near the surface, but the lower layers are dominantly fine sand. The depth to coarse gravel is more than 27 inches. Many small patches of Niklason soils, a few sandy spots, and a few poorly drained depressions were included in mapping.

Scars of former stream channels, a foot or two lower in elevation, are fairly common, but the soil in them is generally the same as the surrounding soil. In places, the abrupt banks of these old channels interfere with farming.

This soil is suited to all crops adapted to the Area. In large cultivated fields near Palmer, it is susceptible to blowing, but this can be controlled by windbreaks and stripcropping. (Management group 1)

**Susitna very fine sand** (0 to 3 percent slopes) (Sv).—This soil is on low plains along the Matanuska River. The upper layers are dominantly very fine sand but contain layers of silty material. The depth to coarse gravelly material is more than 27 inches. Small areas of undulating Susitna soils, patches of Niklason soils, and a few poorly drained depressions were included in mapping. In places there are remnants of meandering stream channels. The soil in these abandoned channels is like the surrounding soil, but sharp banks in a few places interfere with farming operations.

This soil is suited to all crops adapted to the Area. In large fields near Palmer, windbreaks and stripcropping are needed to control blowing. (Management group 1)

**Susitna and Niklason very fine sands, overflow, 0 to 3 percent slopes** (SwA).—These soils occur in numerous small tracts on flood plains along most of the major rivers in the Area. Small stream channels, patches of Gravelly alluvial land, and small areas of other Susitna and Niklason soils were included in mapping. The surface layer in some places is silt loam. The depth to gravel ranges from 15 to 36 inches within short distances.

These soils are flooded for short periods at least once or twice a year, usually in spring or late in summer. If cleared, they are suited to hay or pasture. Other crops are likely to be damaged by flooding. (Management group 19)

## Talkeetna Series

The Talkeetna series consists of well-drained silty soils that are shallow to gravelly and stony material. These soils are on mountain slopes at elevations of more than 1,000 feet.

The Talkeetna soils are redder than the Homestead soils and the Nancy soils, which occur at lower elevations. The native vegetation consists mostly of tall grass, alder, willow, fireweed, and ferns. Talkeetna soils are inextensive in the Area.

Representative profile of Talkeetna silt loam beside Willow Creek Road, 0.6 mile east of junction with Fern Mine Road:

O1—3 inches to 0, yellowish-brown (10YR 5/4) mat of decomposing organic matter; many fine grass roots; clear, wavy boundary.

A1—0 to 3 inches, dark reddish-brown (5YR 2/2) silt loam; few, fine, distinct, brown mottles; weak, very fine, granular structure; very friable; many roots; clear, wavy boundary.

A2—3 to 5 inches, brown (7.5YR 5/2) silt loam; weak, very thin, platy structure; very friable; roots common; abrupt, wavy boundary.

B21—5 to 7 inches, dark reddish-brown (2.5YR 2/4) silt loam; releases water and becomes smeary when rubbed; moderate, fine, granular structure; very friable; roots common; clear, wavy boundary.

B22—7 to 11 inches, dark reddish-brown (5YR 3/3) silt loam streaked with 5YR 2/2; smeary when rubbed; weak, fine, subangular blocky structure; very friable; many, very fine, tubular pores and vesicles; roots common; clear, wavy boundary.

B23—11 to 14 inches, dark reddish-brown (5YR 3/4) silt loam; smeary when rubbed; weak, fine, platy structure; very friable; few roots; very fine tubular pores and vesicles; abrupt, broken boundary.

IIB3—14 to 21 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam; massive; moderately firm; few roots; very fine tubular pores and vesicles; gradual boundary.

IIC—21 to 30 inches +, olive (5Y 4/3) stony sandy loam; massive; friable; no roots; reddish stains on underside of stones.

The silty material ranges from a few inches to 20 inches in thickness. Stones and boulders are common on and near the surface. In places the profile has been disturbed by heaving and by downslope movement of soil.

**Talkeetna silt loam, moderately steep to steep** (20 to 45 percent slopes) (TaE).—This very inextensive soil occurs above the treeline in the Talkeetna Mountains, in the north-central part of the Area. Rock outcrops, a few wet spots, and small mountain streams were included in mapping.

This soil is too steep to be cultivated, and the growing season is too short for crops. The native grasses can be used for limited grazing. (Management group 28)

## Terrace Escarpments

Terrace escarpments (Te) is a land type at the edge of river terraces. It includes many active landslides and rock outcrops that are bare of vegetation. Very shallow gravelly soils in some stabilized areas support some vegetation, mainly alder, willow, and birch. Patches of grass, ferns, and devilsclub are common.

Terrace escarpments is not suitable for crops or for grazing. (Management group 35)

## Tidal Flats

Tidal flats (Tf) consists of layered tidal deposits on broad flats bordering Knik Arm. These deposits range from sandy to clayey in texture.

Tidal flats is inundated regularly by high tides. Large areas are bare of vegetation, but in places there are very sparse stands of beach ryegrass and a few clumps of sedge. The vegetative cover is not so dense as that on Tidal marsh, which is slightly higher and is only occasionally flooded by high tides. Tidal flats has no potential value as cropland or as pasture. (Management group 36)

## Tidal Marsh

Tidal marsh (Tm) consists of poorly drained clayey sediments. It is extensive on low-lying plains bordering Knik Arm, and a fairly large tract occurs a few miles inland, east of the mouth of the Knik River.

In places Tidal marsh is inundated several times each year by very high tides. On rare occasions it is flooded for short periods by overflow from fresh-water streams. On the seaward side, Tidal marsh adjoins Tidal flats, which is slightly lower, is inundated regularly, and is almost bare of vegetation. On the inland side, Tidal marsh adjoins Clunie peat.

Tidal marsh commonly supports moderately dense stands of grasses, sedges, and other plants common in coastal meadows. It is not suited to crops, but the native vegetation can be grazed, and in places it can be harvested for hay. (Management group 24)

## Torpedo Lake Series

The Torpedo Lake series consists of poorly drained, nearly level to moderately steep soils in depressions and drainageways.

On foot slopes of the Talkeetna Mountains, the Torpedo Lake soils occur in an intricate, irregular pattern with the Homestead soils and are mapped with them in complexes. The total acreage of the complexes is small. The Torpedo Lake soils are dominant in the complexes and occupy the drainageways, swales, and low-lying places that separate the small tracts of well-drained Homestead soils. Small patches of the Schrock and Slikok soils also occur in these areas, as well as a few spots of Gravelly alluvial land.

The Torpedo Lake soils have a thicker surface layer than the Coal Creek and Spenard soils, and a firmer, finer textured subsoil than the Slikok soils.

Dense stands of black spruce, and a thick ground cover of moss are interspersed with patches of grass, thickets of alder, and scattered birch trees on the poorly drained Torpedo Lake soils. Willow, devilsclub, and wild celery are also common. Forests of paper birch and white spruce are dominant on the well-drained Homestead soils.

Representative profile of Torpedo Lake silt loam in the NE¼NW¼ sec. 20, T. 18 N., R. 3 W., Seward Meridian:

O1—5 inches to 0, black (5YR 2/1) mat of decomposing twigs, leaves, grass, and moss; many mycelia; strongly acid; abrupt, smooth boundary. 3 to 10 inches thick.

A11—0 to 8 inches, dark reddish-brown (5YR 2/2) mucky silt loam; weak, very fine, granular structure; nonsticky and nonplastic when wet; roots plentiful; few stones; strongly acid; clear, smooth boundary. 5 to 14 inches thick.

A12—8 to 12 inches, dark reddish-brown (5YR 3/2) and dark grayish-brown (10YR 3/2) silt loam; weak, fine, subangular blocky structure; slightly sticky and slightly plastic when wet; roots plentiful; few subrounded stones; strongly acid; abrupt, smooth boundary. 4 to 12 inches thick.

IICg—12 to 26 inches, dark greenish-gray (5GY 4/1) sandy clay loam; many, coarse, prominent mottles of yellowish brown; massive; very firm when moist, sticky and plastic when wet; very few decaying roots; contains pebbles and stones below 16 inches; strongly acid. Many feet thick.

The Torpedo Lake soils are strongly acid throughout. The moderately fine textured lower layers commonly become firmer and finer with depth. In places stones are near the surface, and pebbles and cobblestones are common below a depth of 15 inches. The water table is near the surface most of the time.

**Torpedo Lake silt loam, nearly level** (0 to 3 percent slopes) (ToA).—This soil is fairly extensive and occurs in depressions and broad, poorly defined drainageways.

Homestead, Spenard, and Naptowne soils commonly occur on adjoining slopes, and small areas of them were included in mapping. Patches of Jacobsen soils were also included.

This soil is too wet and cold to be suitable for crops, but patches of native grass can be used for light grazing. Artificial drainage is not feasible. (Management group 25)

**Torpedo Lake silt loam, gently sloping** (3 to 7 percent slopes) (ToB).—This is the most extensive soil of the Torpedo Lake series. It is in poorly defined drainageways and seepage areas on broad glacial moraines and mountain foot slopes. Small tracts of Jacobsen, Spenard, and Naptowne soils were included in mapping, and there are very small streams and springs.

Patches of native grasses are suitable for limited grazing, and some areas could be seeded to tame grasses for improved pasture. This soil is not suitable for cultivated crops, and drainage for agricultural purposes is not feasible. (Management group 25)

**Torpedo Lake silt loam, moderately sloping** (7 to 12 percent slopes) (ToC).—This soil is in drainageways that dissect glacial moraines and mountain foot slopes. Homestead or Naptowne soils are in most of the well-drained sites between the drainageways. Patches of Jacobsen and Spenard soils are common inclusions.

This soil is generally stonier than the less strongly sloping Torpedo Lake soils. It is not suitable for cultivated crops, but in places it can be improved for permanent pasture. Patches of native grasses are suitable for limited grazing. (Management group 25)

**Torpedo Lake silt loam, strongly sloping** (12 to 20 percent slopes) (ToD).—This inextensive soil is in narrow, strongly sloping drainageways. Homestead or Naptowne soils occur on the well-drained slopes between the drainageways. A few small areas of Spenard soils are mapping inclusions.

This soil is stonier than the less strongly sloping Torpedo Lake soils. The native grasses are suitable for limited grazing. (Management group 25)

**Torpedo Lake-Homestead silt loams, undulating** (3 to 7 percent slopes) (TpB).—Areas of this mapping unit range from 10 to 100 acres in size and are characterized by shallow drainageways, swales, and seepage spots separated by an irregular pattern of well-drained low ridges and knolls. Torpedo Lake soils are in the low, poorly drained part and make up about 50 percent of the total area. Homestead soils occupy most of the well-drained tracts, which generally are between 1 and 5 acres in size, and make up about 25 percent of the area. The rest consists of soils that formed in sediments along very small streams.

Most of this complex is in native vegetation. A few well drained and moderately well drained tracts have been cleared and seeded to perennial grasses for pasture. They are generally too small and too irregular to be used for extensive farming. Patches of native grasses are suitable for limited grazing. (Management group 26)

**Torpedo Lake-Homestead silt loams, rolling** (7 to 12 percent slopes) (TpC).—The pattern and the proportions of the major soils in this mapping unit are about the same as in the undulating unit. Minor areas of poorly drained stony soils, other than Torpedo Lake, border very small streams.

Most of this complex is in native vegetation. The grasses are suitable for light grazing. Well-drained sites can be cleared and seeded for permanent pasture. They are generally too small and too irregular to be used for extensive farming. (Management group 26)

**Torpedo Lake-Homestead silt loams, hilly** (12 to 20 percent slopes) (TpD).—An irregular pattern of hilly ridges and knolls separated by many drainageways and swales characterizes this mapping unit. Homestead soils are on the hilly, well-drained sites, and Torpedo Lake soils are on the poorly drained sites. Generally, these two soils make up more than 80 percent of the total acreage and are about equal in proportion. A few small gently sloping sites were included in mapping. Also included were patches of wet stony soils, other than Torpedo Lake, along minor streams.

It is not practical to improve these soils for cultivated crops, but irregular patches of Homestead soils on the well-drained slopes can be seeded for permanent pasture. The native grasses that generally grow on the low-lying areas can be used for light grazing. (Management group 26)

**Torpedo Lake-Homestead silt loams, moderately steep** (20 to 35 percent slopes) (TpE).—This unit has about the same composition as the hilly complex, except that the proportion of Homestead silt loam is somewhat higher. In addition to the major soils, there are peat soils in deep depressions and wet stony soils other than Torpedo Lake.

The Homestead soils are suitable for improved pasture. They are too steep and too irregular for cultivation. Patches of native grasses suitable for limited grazing are common on the Torpedo Lake soils. (Management group 26)

## Wasilla Series

The Wasilla series consists of somewhat poorly drained to poorly drained soils on low, nearly level plains along streams. These soils are dominantly silty but contain stratified layers of sandy material and moderately firm, moderately fine textured material underlain by coarse sand and gravel.

The Wasilla soils have a less sandy subsoil than the Moose River soils, and they have a coarser textured substratum than the Coal Creek soils. They are not so mucky or so high in content of organic matter as the Slikok soils.

The native vegetation consists mostly of paper birch, black spruce, clumps of alder and willow, and patches of grass.

Representative profile of Wasilla silt loam in the NE¼ NE¼ sec. 34, T. 18 N., R. 1 E., Seward Meridian:

O1—4 to 3 inches, mat of decomposing organic material; abrupt, smooth boundary.

O2—3 inches to 0, black (5YR 2/1), finely divided organic matter containing a few undecomposed twigs and leaves; many roots; clear, smooth boundary.

A1—0 to 8 inches, very dark brown (10YR 2/2) silt loam; common, coarse, faint mottles of dark yellowish brown; massive; friable when moist, nonsticky and nonplastic when wet; many roots; clear, wavy boundary. 6 to 18 inches thick.

IIC1g—8 to 22 inches, dark-gray (5Y 4/1) sandy clay loam; many, medium, distinct mottles of yellowish red that grade to brown (7.5YR 5/4) at the boundaries;

moderate, medium, platy structure that breaks readily to moderate, very fine, subangular blocky; firm; contains a few stratified lenses of silty and very fine sandy loam as much as ¼ inch thick; buried woody plant parts; few roots; strongly acid; gradual, smooth boundary. 6 to 18 inches thick.

IIIC2g—22 to 48 inches +, dark-gray (5YR 4/1), stratified fine to coarse sand; single grain; loose; pockets of very dark gray (5YR 3/1) silt loam comprise as much as 30 percent of the mass; massive; friable; many woody fragments; few pebbles and rounded cobblestones; very few roots; strongly acid. One foot to many feet thick; commonly undarlain by coarse sand and gravel.

Below the silt loam surface layer the substratum is commonly well stratified and consists of moderately firm silty clay loam to sandy clay loam interlayered with strata of silt, very fine sand, and fine sand that vary in number and thickness. The depth to coarse sand, gravel, and stony material is generally more than 30 inches. In places a few large stones or boulders occur near the surface. These soils are very strongly acid to strongly acid.

**Wasilla silt loam** (0 to 3 percent slopes) (Wa).—This soil occurs on many creek bottoms and on the flood plains of the major rivers. Along the smaller streams it is commonly associated with the Slikok soils, which are more poorly drained. Small tracts of Slikok silt loam were included. On the flood plains of the Knik and Matanuska Rivers it borders the well-drained Susitna and Niklason soils.

If artificially drained, this soil is suited to small grains and perennial grasses. (Management group 12)

## *Management of Soils for Crops and Pasture*

The first part of this section contains a discussion of land clearing, fertilization, irrigation, suitable crops, and estimated yields. The second part contains a description of the capability classification system by which the soils are grouped according to the management they need. Following this, each management group is described and suggestions are given for the use and conservation of the soils.

### Land Clearing

Much of the potential farmland in the Area is forested. In many places there are stands of merchantable trees. Harvesting these trees for lumber or other purposes before the land is cleared not only prevents waste but generally makes land clearing easier.

Except for poorly drained areas, land usually can be cleared at any time of year. When the ground is not frozen, brush and trees that remain after logging are most efficiently removed by a bulldozer equipped with a scarifier blade similar to that shown in figure 10.

When the ground is frozen, brush and trees are sheared off at ground level with a bulldozer equipped with a shearing type blade. This method is suitable for clearing off light brush and small trees. Where trees larger than 6 inches in diameter are sheared off at ground level, however, the subsequent removal of stumps and heavy roots is often very difficult and time consuming. After the soil has thawed, the stumps and roots remaining in the soil can be removed by several methods. Removing and windrowing them with a scarifier blade is usually the most efficient method. Small roots and stumps can be removed by working the land with a large breaking plow or heavy disc, but this generally involves the difficult task of removing many roots and other debris by hand before the soil can be successfully tilled. If left in the soil, these materials decompose very slowly, and the larger pieces interfere with cultivation for a long time.

*Figure 10.*—**Bulldozer with scarifier blade used for land clearing.**

Much of the success of any land-clearing project in the Area depends upon freeing the roots and stumps of as much soil as possible before pushing them into windrows for burning. This is especially important on shallow soils where gravel and stones will hinder tillage if much surface soil is removed during land clearing.

Poorly drained soils like the Slikok and Wasilla, generally cannot be cleared with heavy equipment unless they are frozen or are artificially drained. These soils commonly have a thick surface mat of moss or sedges that should be removed during clearing, as it tends to prevent the soil from drying.

In the undisturbed soils of the uplands, the organic matter is commonly concentrated in a surface mat 2 to 4 inches thick. In clearing the land of trees or brush, it is important that some of this material be allowed to remain on the ground. This organic matter, mixed with the underlying mineral soil, is effective in maintaining good tilth and in promoting the infiltration of water.

In cultivated fields of Bodenburg, Doone, and other soils where blowing is a hazard, natural windbreaks of adequate width and spacing should be left to control soil blowing and drifting.

Also important are the precautionary measures necessary to prevent the spreading of fires to nearby forests. For safe burning it is essential that all windrows or piles of debris are well within cleared areas and are not too close to woodland or brush.

### Fertilization

The successful production of crops in the Area depends considerably upon fertilization. Newly cleared soils need fairly heavy applications of a complete fertilizer—one that contains nitrogen, phosphorus, and potassium. The need for nitrogen is especially high on newly cleared soils, because so much nitrogen is used by bacteria in decomposing the native organic material. Under continued cultivation there is a tendency for the natural structure of the soil to break down; hence, periodic additions of manure or other organic material helps to maintain tilth.

In the paragraphs that follow, the suggested minimum application rates are based on experience and research of the Alaska Agricultural Experiment Station (7). Heavier applications usually will result in better yields if other management requirements are met. These rates are general suggestions and are subject to change. They are intended mainly to indicate the needs for fertilizer in the Area. For the most efficient use of fertilizer, it is best to determine rates from the results of periodic soil tests, because requirements depend on the soil, the crops, previous management, and other factors. Lime requirements are not given here, but field trials by the Alaska Agricultural Experiment Station have shown that liming is beneficial for certain crops on many soils in this Area.

*Cereals for forage or grain.*—For grain only, drill in at planting time or broadcast and work into the seedbed before planting, 20 pounds of nitrogen (N) per acre, 40 pounds of phosphate ($P_2O_5$), and 20 pounds of potash ($K_2O$). For grain planted with peas or vetch or with forage seedings, apply in the same manner 30 pounds of nitrogen per acre, 60 pounds of phosphate, and 30 pounds of potash.

*Grass or grass-legume mixtures seeded without a nurse crop.*—For grass only, broadcast and work into the seedbed before planting, 60 pounds each of nitrogen (N), phosphate ($P_2O_5$), and potash ($K_2O$). For a grass-legume mixture, apply in the same manner 32 pounds of nitrogen, 128 pounds of phosphate, and 80 pounds of potash.

*Established grass and grass-legume mixtures.*—For grass only, apply as a topdressing early in spring the first year, 60 pounds each of nitrogen (N), phosphate ($P_2O_5$), and potash ($K_2O$). The second year and after, apply early in spring 120 pounds of nitrogen and 60 pounds each of phosphate and potash. More nitrogen is needed after the first harvest. For a grass-legume mixture, apply early in spring 45 pounds of nitrogen, 90 pounds of phosphate, and 45 pounds of potash. These spring applications should be broadcast as early as possible. If the ground is bare of snow, spread the fertilizer before frost leaves the soil. Late yields of grass generally can be increased by applying 40 pounds of nitrogen early in July, or as soon as possible after the first harvest.

*Figure 11.*—**Sprinkler irrigation of bromegrass on Bodenburg very fine sandy loam, nearly level.**

*Potatoes.*—For potatoes, not irrigated, apply 60 pounds of nitrogen (N) per acre, 240 pounds of phosphate ($P_2O_5$), and 120 pounds of potash ($K_2O$). For potatoes, irrigated, apply 80 pounds of nitrogen, 320 pounds of phosphate, and 160 pounds of potash. Apply the fertilizer 1 inch below and on both sides of seed at planting time, or drill it in 4 inches deep before planting. On new land apply an additional 300 pounds of fertilizer per acre.

## Irrigation

Sprinkler irrigation is a recent practice in the Area and is used on a few farms to supplement rainfall. Studies by the Alaska Agricultural Experiment Station have shown that sprinkler irrigation generally increases average yields, especially when additional quantities of fertilizer are applied. Beneficial returns have been obtained from irrigating forage crops such as the grass shown in figure 11, but the greatest returns have been obtained from irrigating the more intensively grown crops, such as potatoes, carrots, and other truck crops. In addition to increased yields, benefits from irrigation include earlier and more uniform germination of seeds. This is especially important in truck farming, as crops often must be harvested to meet marketing contract dates. Earlier germination is also beneficial to dairymen, as it helps assure first-year stands of grass and lengthens the grazing and haying seasons.

## Suitable Crops

Only crops that will grow in cool climates with long summer days are adapted to the Area. Perennials need to have a high degree of winter hardiness.

In 1963 more than 75 percent of the harvested crops were used for forage. Smooth bromegrass is the principal grass crops, but a variety of timothy well adapted to Alaskan conditions has been developed by the Alaska Agricultural Experiment Station and is also grown extensively. First cuttings of these grasses are generally harvested for hay; second cuttings are commonly used for silage or pasture, as weather conditions late in summer are usually unfavorable for field curing. Kentucky bluegrass is common in lawn seedings. Meadow foxtail and red fescue can also be grown successfully, but at present only minor acreages are seeded to these. Combinations of oats and peas or vetch, as shown in figure 12, are grown extensively for silage or hay.

Climatically adapted varieties of red clover, alsike clover, white clover, and sweet clover can be grown with fair success, but only small acreages are seeded, generally in combination with grasses. Hardy varieties of alfalfa have been grown, but thus far, none have been sufficiently productive to justify extensive use.

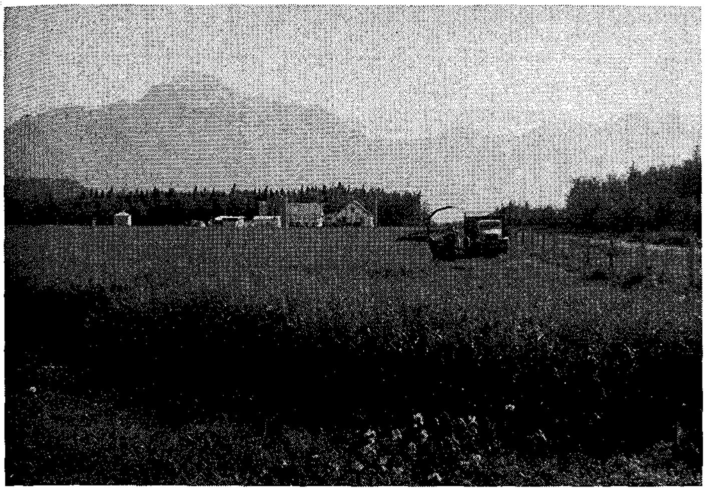


***Figure 12.*—Harvesting a crop of green oats and peas for silage on Bodenburg silt loam, nearly level. Yields of 7 tons per acre are obtained under good management.**

Spring barley and oats are the main cereal crops. The harvested grain commonly needs artificial drying for safe storage. Although nearly all of the grain harvested is used for livestock, the oat varieties adapted to the Area are also suitable for milling, and the barley varieties are suitable for malting.

Field corn is not suited to the Area, and rye and flax generally will not mature. Small acreages of early-maturing wheat are grown, but yields of total digestible nutrients per acre are generally lower than those produced by oats or barley (*1*).

In general, root vegetables and leafy vegetables are especially suitable for the Area. Potatoes are the leading cash crop, but cabbage, carrots, and head lettuce are also grown on a commercial scale. Garden vegetables include celery, cauliflower, beets, turnips, radishes, onions, garden peas, beans, Brussels sprouts, broccoli, and others. Tomatoes, cucumbers, and sweet corn can be grown safely only in greenhouses. Recent experiments, however, indicate that sweet corn can be grown outdoors with the aid of a plastic mulch.

Tame varieties of raspberries, strawberries, and currants are grown on a small scale. Except for Siberian crabapple, fruit trees have not been grown successfully. Small fruits native to the Area include lingenberries, mooseberries (highbush cranberries), raspberries, blueberries, cloudberries, currants, and rose hips.

## Estimated Yields

Estimated average yields per acre of principal crops grown on soils of the Area are given in table 4. These estimates are averages expected over several years. The increase in yields that can be obtained by irrigation has not been considered in these estimates. The yields in columns A are expected under average management, and those in columns B are expected under improved management. The estimates were made on the basis of information from the Alaska Agricultural Experiment Station, the Alaska Agricultural Crop Reporting Service, agricultural fieldworkers, and farmers.

Practices and conditions under average management include the following: (1) Minimum amounts of fertilizer are applied according to results of occasional soil tests, but fertility is commonly not adequate for optimum plant growth; (2) sod crops, barnyard manure, and crop residue are used to a limited extent, but the quality and quantity are generally inadequate for the most efficient use of moisture and plant nutrients; (3) conservation practices to control soil blowing and water erosion are applied to a limited extent, but they are generally not adequate on all fields; (4) weeds and harmful insects are controlled to some extent on cropland, but seldom on pastures; (5) cutting and grazing of forage is only partly regulated, and stands are weakened by overgrazing; (6) artificial drainage is adequate on soils that require it.

TABLE 4.—*Estimated average acre yields of principal crops under two levels of management*

[Dashed lines indicate the soil is not suited to, or is not used for, the crop]

| Soil | Oats | | Barley | | Bromegrass hay (2 cuttings) | | Silage: Oats and peas | | Silage: Grass [1] | | Potatoes | | Pasture productivity [2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | A | B | A | B | A | B | A | B | A | B | |
| | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | |
| Anchorage sand, undulating to rolling | 30 | 40 | 25 | 35 | 1. 50 | 2. 50 | 3. 50 | 4. 50 | 3. 00 | 4. 50 | ------ | ------ | Fair. |
| Anchorage sand, hilly to steep | ---- | ---- | ---- | ---- | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | Poor. |
| Anchorage silt loam, nearly level | 35 | 45 | 30 | 40 | 1. 50 | 2. 50 | 3. 75 | 5. 00 | 3. 00 | 4. 50 | 6. 00 | 9. 00 | Fair. |
| Anchorage very fine sandy loam, undulating | 35 | 45 | 30 | 40 | 1. 50 | 2. 50 | 3. 75 | 5. 00 | 3. 00 | 4. 50 | 6. 00 | 9. 00 | Fair. |
| Anchorage very fine sandy loam, rolling | 30 | 40 | 25 | 35 | 1. 25 | 2. 25 | 3. 50 | 4. 50 | 2. 50 | 4. 00 | ------ | ------ | Fair. |
| Anchorage very fine sandy loam, hilly | ---- | ---- | ---- | ---- | 1. 00 | 1. 75 | ------ | ------ | 2. 00 | 3. 00 | ------ | ------ | Poor. |
| Anchorage very fine sandy loam, moderately steep | ---- | ---- | ---- | ---- | ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | Poor. |
| Bodenburg silt loam, nearly level | 55 | 65 | 45 | 55 | 2. 50 | 3. 50 | 5. 50 | 7. 50 | 5. 00 | 7. 00 | 9. 00 | 13. 00 | Good. |
| Bodenburg silt loam, undulating | 55 | 65 | 45 | 55 | 2. 50 | 3. 50 | 5. 50 | 7. 50 | 5. 00 | 7. 00 | 9. 00 | 13. 00 | Good. |
| Bodenburg silt loam, rolling | 50 | 65 | 40 | 55 | 2. 25 | 3. 50 | 5. 00 | 7. 00 | 4. 50 | 7. 00 | 8. 00 | 12. 00 | Good. |
| Bodenburg silt loam, hilly | 35 | 50 | 30 | 45 | 2. 00 | 3. 00 | 4. 00 | 6. 00 | 4. 00 | 6. 00 | ------ | ------ | Good. |

See footnotes at end of table.

TABLE 4.—*Estimated average acre yields of principal crops under two levels of management*—Continued

| Soil | Oats | | Barley | | Bromegrass hay (2 cuttings) | | Silage | | | | Potatoes | | Pasture productivity [2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Oats and peas | | Grass [1] | | | | |
| | A | B | A | B | A | B | A | B | A | B | A | B | |
| | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | |
| Bodenburg very fine sandy loam, nearly level | 55 | 65 | 45 | 55 | 2.50 | 3.50 | 5.50 | 7.50 | 5.00 | 7.00 | 9.00 | 13.00 | Good. |
| Bodenburg very fine sandy loam, undulating | 55 | 65 | 45 | 55 | 2.50 | 3.50 | 5.50 | 7.50 | 5.00 | 7.00 | 9.00 | 13.00 | Good. |
| Bodenburg very fine sandy loam, rolling | 50 | 65 | 40 | 55 | 2.25 | 3.50 | 5.00 | 7.00 | 4.50 | 7.00 | 8.00 | 12.00 | Good. |
| Bodenburg very fine sandy loam, hilly | 35 | 50 | 30 | 45 | 2.00 | 3.00 | 4.00 | 6.00 | 4.00 | 6.00 | | | Good. |
| Bodenburg very fine sandy loam, moderately steep | | | | | 1.50 | 2.00 | | | 3.00 | 4.00 | | | Fair. |
| Bodenburg and Knik silt loams, steep: | | | | | | | | | | | | | |
| Bodenburg | | | | | | | | | | | | | Poor. |
| Knik | | | | | | | | | | | | | Poor. |
| Chena silt loam | | | | | 1.00 | 1.75 | | | 2.00 | 3.00 | | | Poor. |
| Clunie peat | | | | | | | | | | | | | |
| Coal Creek silt loam | | | | | 2.00 | 3.00 | 5.00 | 7.00 | 4.00 | 6.00 | | | Good. |
| Coal Creek stony silt loam | | | | | | | | | | | | | Poor. |
| Doone silt loam, nearly level | 50 | 65 | 40 | 55 | 2.50 | 3.50 | 5.50 | 7.50 | 5.00 | 7.00 | 9.00 | 13.00 | Good. |
| Doone silt loam, undulating | 50 | 65 | 40 | 55 | 2.50 | 3.50 | 5.50 | 7.50 | 5.00 | 7.00 | 9.00 | 13.00 | Good. |
| Doone silt loam, rolling | 45 | 65 | 35 | 55 | 2.25 | 3.50 | 4.50 | 7.00 | 4.50 | 7.00 | 8.00 | 12.00 | Good. |
| Doone and Knik silt loams, hilly: | | | | | | | | | | | | | |
| Doone | 35 | 50 | 30 | 45 | 2.00 | 3.00 | 4.00 | 6.00 | 4.00 | 6.00 | | | Good. |
| Knik | 35 | 45 | 30 | 40 | 1.75 | 2.50 | 4.00 | 6.00 | 3.50 | 5.00 | | | Fair. |
| Doone and Knik silt loams, moderately steep. | | | | | | | | | | | | | |
| Doone | | | | | 1.50 | 2.00 | | | 3.00 | 4.00 | | | Fair. |
| Knik | | | | | 1.50 | 2.00 | | | 3.00 | 4.00 | | | Fair. |
| Doone and Knik silt loams, steep: | | | | | | | | | | | | | |
| Doone | | | | | | | | | | | | | Poor. |
| Knik | | | | | | | | | | | | | Poor. |
| Flat Horn silt loam, nearly level | 50 | 65 | 40 | 55 | 2.25 | 3.25 | 5.00 | 7.50 | 4.50 | 6.50 | 8.00 | 11.00 | Good. |
| Flat Horn silt loam, undulating | 50 | 65 | 40 | 55 | 2.25 | 3.25 | 5.00 | 7.50 | 4.50 | 6.50 | 8.00 | 11.00 | Good. |
| Flat Horn silt loam, rolling | 45 | 65 | 35 | 55 | 2.00 | 3.00 | 4.50 | 7.00 | 4.00 | 6.00 | 7.00 | 11.00 | Good. |
| Flat Horn silt loam, hilly to steep | | | | | | | | | | | | | Fair. |
| Gravel pits and Strip mines | | | | | | | | | | | | | |
| Gravelly alluvial land | | | | | | | | | | | | | |
| Homestead silt loam, nearly level | 40 | 55 | 35 | 50 | 2.00 | 3.00 | 4.50 | 6.50 | 4.00 | 6.00 | 6.50 | 10.00 | Good. |
| Homestead silt loam, undulating | 40 | 55 | 35 | 50 | 2.00 | 3.00 | 4.50 | 6.50 | 4.00 | 6.00 | 6.50 | 10.00 | Good. |
| Homestead silt loam, rolling | 35 | 50 | 30 | 45 | 1.75 | 2.75 | 4.00 | 6.00 | 3.50 | 5.50 | 6.00 | 10.00 | Fair. |
| Homestead silt loam, hilly | 30 | 45 | 25 | 40 | 1.50 | 2.50 | 3.50 | 5.50 | 3.00 | 5.00 | | | Fair. |
| Homestead silt loam, moderately steep | | | | | 1.25 | 2.00 | | | 2.50 | 4.00 | | | Fair. |
| Homestead silt loam, steep | | | | | | | | | | | | | Poor. |
| Homestead silt loam, very shallow, nearly level | 35 | 45 | 30 | 40 | 1.50 | 2.25 | 3.75 | 5.00 | 3.00 | 4.50 | | | Fair. |
| Homestead silt loam, very shallow, undulating | 35 | 45 | 30 | 40 | 1.50 | 2.25 | 3.75 | 5.00 | 3.00 | 4.50 | | | Fair. |
| Homestead silt loam, very shallow, rolling | 30 | 40 | 25 | 35 | 1.25 | 2.00 | 3.00 | 4.50 | 2.50 | 4.00 | | | Fair. |
| Homestead silt loam, very shallow, hilly | | | | | 1.00 | 1.75 | | | 2.00 | 3.50 | | | Poor. |
| Homestead silt loam, very shallow, moderately steep | | | | | | | | | | | | | Poor. |
| Homestead silt loam, very shallow, steep | | | | | | | | | | | | | Poor. |
| Jacobsen very stony silt loam, nearly level | | | | | | | | | | | | | Poor. |
| Jacobsen very stony silt loam, gently sloping | | | | | | | | | | | | | Poor. |
| Jim and Bodenburg silt loams, hilly: | | | | | | | | | | | | | |
| Jim | 35 | 50 | 30 | 45 | 1.75 | 2.50 | 4.00 | 6.00 | 3.50 | 5.00 | | | Fair. |
| Bodenburg | 35 | 50 | 30 | 45 | 2.00 | 3.00 | 4.00 | 6.00 | 4.00 | 6.00 | | | Good. |
| Jim and Bodenburg silt loams, steep: | | | | | | | | | | | | | |
| Jim | | | | | | | | | | | | | Poor. |
| Bodenburg | | | | | | | | | | | | | Poor. |
| Kalifonsky silt loam, nearly level | | | | | 2.50 | 3.50 | 5.50 | 7.50 | 5.00 | 7.00 | 6.00 | 9.00 | Good. |
| Kalifonsky silt loam, gently to moderately sloping | | | | | 2.50 | 3.50 | 5.50 | 7.50 | 5.00 | 7.00 | 6.00 | 9.00 | Good. |
| Kalifonsky silt loam, strongly sloping to steep | | | | | | | | | | | | | Poor. |
| Kenai silt loam, undulating | 35 | 45 | 30 | 40 | 1.75 | 2.50 | 4.00 | 6.00 | 3.50 | 5.00 | | | Fair. |
| Knik silt loam, nearly level | 45 | 60 | 40 | 55 | 2.25 | 3.25 | 5.00 | 7.25 | 4.50 | 6.50 | 8.00 | 12.00 | Good. |
| Knik silt loam, undulating | 45 | 60 | 40 | 55 | 2.25 | 3.25 | 5.00 | 7.25 | 4.50 | 6.50 | 8.00 | 12.00 | Good. |
| Knik silt loam, rolling | 40 | 55 | 35 | 50 | 2.00 | 3.00 | 4.50 | 7.00 | 4.00 | 6.00 | 7.00 | 11.00 | Good. |
| Knik silt loam, hilly | 35 | 45 | 30 | 40 | 1.75 | 2.50 | 4.00 | 6.00 | 3.50 | 5.00 | | | Fair. |

See footnotes at end of table.

TABLE 4.—*Estimated average acre yields of principal crops under two levels of management*—Continued

| Soil | Oats | | Barley | | Bromegrass hay (2 cuttings) | | Silage: Oats and peas | | Silage: Grass [1] | | Potatoes | | Pasture productivity [2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | A | B | A | B | A | B | A | B | A | B | |
| | *Bu.* | *Bu.* | *Bu.* | *Bu.* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | *Tons* | |
| Knik silt loam, moderately steep | | | | | 1. 50 | 2. 00 | | | 3. 00 | 4. 00 | | | Fair. |
| Knik silt loam, steep | | | | | | | | | | | | | Poor. |
| Matanuska silt loam | 45 | 60 | 40 | 55 | 2. 25 | 3. 25 | 5. 00 | 7. 00 | 4. 50 | 6. 50 | 7. 00 | 10. 00 | Good. |
| Mixed alluvial land | | | | | | | | | | | | | Fair. |
| Moose River silt loam | | | | | 1. 50 | 2. 50 | 4. 00 | 6. 00 | 3. 00 | 5. 00 | | | Fair. |
| Nancy silt loam, nearly level | 50 | 65 | 40 | 55 | 2. 25 | 3. 50 | 5. 00 | 7. 50 | 4. 50 | 7. 00 | 8. 00 | 11. 00 | Good. |
| Nancy silt loam, undulating | 50 | 65 | 40 | 55 | 2. 25 | 3. 50 | 5. 00 | 7. 50 | 4. 50 | 7. 00 | 8. 00 | 11. 00 | Good. |
| Nancy silt loam, rolling | 45 | 65 | 35 | 55 | 2. 00 | 3. 25 | 4. 50 | 7. 00 | 4. 00 | 6. 50 | 7. 00 | 11. 00 | Good. |
| Nancy silt loam, hilly | 30 | 50 | 25 | 45 | 1. 75 | 2. 75 | 3. 50 | 5. 75 | 3. 50 | 5. 50 | | | Fair. |
| Nancy silt loam, moderately steep | | | | | 1. 50 | 2. 00 | | | 3. 00 | 4. 00 | | | Fair. |
| Naptowne silt loam, nearly level | 40 | 55 | 35 | 45 | 2. 25 | 3. 25 | 4. 50 | 6. 50 | 4. 50 | 6. 50 | 6. 50 | 10. 50 | Good. |
| Naptowne silt loam, undulating | 40 | 55 | 35 | 45 | 2. 25 | 3. 25 | 4. 50 | 6. 50 | 4. 50 | 6. 50 | 6. 50 | 10. 50 | Good. |
| Naptowne silt loam, rolling | 35 | 50 | 30 | 45 | 2. 00 | 3. 00 | 4. 00 | 6. 50 | 4. 00 | 6. 00 | 6. 00 | 10. 00 | Good. |
| Naptowne silt loam, hilly | 30 | 45 | 25 | 40 | 1. 75 | 2. 50 | 3. 25 | 5. 50 | 3. 50 | 5. 50 | | | Fair. |
| Naptowne silt loam, moderately steep | | | | | 1. 25 | 2. 00 | | | 2. 50 | 4. 00 | | | Fair. |
| Naptowne silt loam, steep | | | | | | | | | | | | | Poor. |
| Niklason silt loam | 45 | 55 | 40 | 50 | 2. 00 | 3. 00 | 4. 50 | 6. 50 | 4. 00 | 6. 00 | 7. 00 | 10. 00 | Good. |
| Niklason very fine sand | 40 | 50 | 35 | 45 | 1. 75 | 3. 00 | 4. 00 | 6. 00 | 4. 00 | 6. 00 | 7. 00 | 10. 00 | Good. |
| Reedy silt loam | 40 | 55 | 35 | 50 | 2. 00 | 3. 00 | 4. 50 | 6. 50 | 4. 00 | 6. 00 | 7. 00 | 10. 00 | Good. |
| Rough mountainous land | | | | | | | | | | | | | |
| Salamatof peat | | | | | | | | | | | | | |
| Salamatof peat, ever frozen variant | | | | | | | | | | | | | |
| Schrock silt loam, nearly level | 55 | 65 | 45 | 55 | 2. 50 | 3. 50 | 5. 50 | 7. 50 | 5. 00 | 7. 00 | 9. 00 | 12. 50 | Good. |
| Schrock silt loam, undulating | 55 | 65 | 45 | 55 | 2. 50 | 3. 50 | 5. 50 | 7. 50 | 5. 00 | 7. 00 | 9. 00 | 12. 50 | Good. |
| Sea cliffs | | | | | | | | | | | | | |
| Slikok mucky silt loam | | | | | 2. 00 | 3. 00 | 5. 00 | 7. 00 | 3. 00 | 5. 00 | | | Fair. |
| Slikok stony mucky silt loam | | | | | | | | | | | | | Poor. |
| Spenard silt loam, nearly level | | | | | 2. 00 | 3. 00 | 5. 00 | 7. 00 | 4. 00 | 6. 00 | | | Good. |
| Spenard silt loam, gently sloping | | | | | 2. 00 | 3. 00 | 5. 00 | 7. 00 | 4. 00 | 6. 00 | | | Good. |
| Susitna silt loam | 55 | 65 | 45 | 55 | 2. 50 | 3. 50 | 5. 50 | 7. 50 | 5. 00 | 7. 00 | 9. 00 | 13. 00 | Good. |
| Susitna very fine sand | 55 | 65 | 45 | 55 | 2. 50 | 3. 50 | 5. 50 | 7. 50 | 5. 00 | 7. 00 | 9. 00 | 13. 00 | Good. |
| Susitna and Niklason very fine sands, overflow, 0 to 3 percent slopes | | | | | 1. 75 | 2. 50 | 4. 50 | 6. 50 | 3. 50 | 5. 00 | | | Fair. |
| Talkeetna silt loam, moderately steep to steep | | | | | | | | | | | | | Poor. |
| Terrace escarpments | | | | | | | | | | | | | |
| Tidal flats | | | | | | | | | | | | | |
| Tidal marsh | | | | | | | | | | | | | Fair. |
| Torpedo Lake silt loam, nearly level | | | | | | | | | | | | | Fair. |
| Torpedo Lake silt loam, gently sloping | | | | | | | | | | | | | Fair. |
| Torpedo Lake silt loam, moderately sloping | | | | | | | | | | | | | Fair. |
| Torpedo Lake silt loam, strongly sloping | | | | | | | | | | | | | Fair. |
| Torpedo Lake-Homestead silt loams, undulating: | | | | | | | | | | | | | |
| Torpedo Lake | | | | | | | | | | | | | Fair. |
| Homestead | 40 | 55 | 35 | 50 | 2. 00 | 3. 00 | 4. 50 | 6. 50 | 4. 00 | 6. 00 | 6. 50 | 10. 00 | Good. |
| Torpedo Lake-Homestead silt loams, rolling: | | | | | | | | | | | | | |
| Torpedo Lake | | | | | | | | | | | | | Fair. |
| Homestead | 35 | 50 | 30 | 45 | 1. 75 | 2. 75 | 4. 00 | 6. 00 | 3. 50 | 5. 50 | 6. 00 | 10. 00 | Fair. |
| Torpedo Lake-Homestead silt loams, hilly: | | | | | | | | | | | | | |
| Torpedo Lake | | | | | | | | | | | | | Fair. |
| Homestead | 30 | 45 | 25 | 40 | 1. 50 | 2. 50 | 3. 50 | 5. 50 | 3. 00 | 5. 00 | | | Fair. |
| Torpedo Lake-Homestead silt loams, moderately steep: | | | | | | | | | | | | | |
| Torpedo Lake | | | | | | | | | | | | | Fair. |
| Homestead | | | | | 1. 25 | 2. 00 | | | 2. 50 | 4. 00 | | | Fair. |
| Wasilla silt loam | | | | | 2. 00 | 3. 00 | 5. 00 | 7. 00 | 4. 00 | 6. 00 | | | Good. |

[1] Yields of grass silage are for a second cutting only, as first cuttings are commonly harvested for hay.

[2] Pasture productivity ratings are based on the number of acres of improved pasture required to produce sufficient forage for one dairy cow, or an equivalent animal unit, for the entire pasture season under average management. The ratings are as follows: Good, 1 acre or less; fair, 1 to 2 acres; poor, more than 2 acres.

*Figure 13.*—**Harvesting potatoes, the leading cash crop in the Area, on Doone silt loam. Yields of 13 tons per acre are obtained under improved management.**

The following practices and conditions are included under improved management: (1) Fertilizer is applied at maximum rates determined from periodic soil tests, and adequate fertility is maintained for optimum plant growth; (2) barnyard manure, crop residue, and grass crops are used intensively, and sufficient organic matter is maintained for the most efficient use of moisture and plant nutrients; (3) conservation practices are applied to the fullest extent for control of soil blowing and water erosion; (4) weeds and harmful insects are controlled on crops as well as pastures; (5) cutting and grazing of forage is carefully managed to maintain vigorous stands; (6) artificial drainage is adequate on soils that require it.

Only a few farms in the Area have been developed to the extent that improved management is practiced on the entire farm. There are a number of farms, however, where improved management is practiced on a few fields or on crops such as potatoes (fig. 13).

## Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible but unlikely major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels—the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

Capability Classes, the broadest grouping, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I. Soils that have few limitations that restrict their use. There are no class I soils in the Matanuska Valley Area.

Class II. Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils that have severe limitations that reduce the choice of plants, or require special conservation practices, or both.

Class IV. Soils that have very severe limitations that restrict the choice of plants, or require very careful management, or both.

Class V. Soils that are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover. There are no class V soils in the Matanuska Valley Area.

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VII Soils that have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Class VIII. Soils and landforms that have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within a class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c* used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

CAPABILITY UNITS are soil groups within the subclasses. In this survey they are designated as management groups. The soils in one capability unit, or management group, are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Such a grouping is convenient for making many statements about management of soils.

Capability units are generally identified by numbers assigned locally, for example, IIe–1 or IIIs–2. In the subsection that follows, the capability unit numbers are in parenthesis following the management group numbers.

### *Management groups*

In the following discussions of management groups, suggestions are given for the use, management, and conservation of the soils. The names of the soil series represented are given in the description of each group, but this does not mean that all the soils of a given series are in the same group. The group designation of each soil in the Area can be found in the "Guide to Mapping Units."

No specific recommendations are made as to the amounts and kinds of fertilizer needed, the most suitable crop varieties, or the best seeding rates, for these factors change with new developments in farming. Current information and recommendations are available from the local Extension Service and from the Alaska Agricultural Experiment Station.

It is assumed that the fertilizer needs of soils on a specific farm are to be determined through soil tests.

#### MANAGEMENT GROUP 1 (IIc–1)

This group consists of soils of the Bodenburg, Flat Horn, Schrock, and Susitna series. These soils are nearly level and moderately deep to deep. Drainage is good, and the moisture-supplying capacity is moderate. The texture is very fine sandy loam, very fine sand, or stratified silt and sand.

These soils are suited to all the climatically adapted crops. They are well suited to early vegetables, as they can be worked slightly earlier in spring than finer textured soils. They all need fertilizer, and the Flat Horn and Schrock soils need lime. Organic matter is needed in order to keep the soils in good tilth and promote efficient use of moisture and plant nutrients. The organic-matter content can be maintained by applying manure, utilizing crop residue, and including grasses and legumes in the cropping sequence. Irrigation in dry years helps to sustain yields and minimize seeding losses.

The Bodenburg and Susitna soils in the eastern part of the Area are susceptible to blowing. Large cultivated fields of these soils need a protective cover of stubble or grass throughout the winter, as they frequently lack a snow cover. Windbreaks and stripcropping also are effective in controlling soil blowing.

#### MANAGEMENT GROUP 2 (IIc–2)

This group consists of soils of the Bodenburg, Doone, Nancy, and Naptowne series. These soils are nearly level and moderately deep to deep. Their texture is silt loam. Drainage is good, and the moisture-supplying capacity is favorable.

These soils are suited to all the climatically adapted crops. They all need fertilizer, and the Nancy and Naptowne soils need lime. Organic matter is needed to maintain good tilth. It can be supplied by applying manure, utilizing crop residue, and including grasses and legumes in the cropping sequence. Irrigation in dry years helps to sustain yields and minimize seeding losses.

The Bodenburg and Doone soils are susceptible to blowing. Windbreaks and stripcropping are effective in protecting these soils. Fall plowing is not advisable, because there is often no snow cover in winter and the soils are exposed to blowing.

Small depressions that are occasionally ponded for short periods are common in areas of Bodenburg and Doone soils. Ordinarily these depressions can be ditched or smoothed, so as to facilitate the operation of farm equipment and to limit soil losses.

#### MANAGEMENT GROUP 3 (IIe-1)

This group consists of soils of the Bodenburg, Flat Horn, and Schrock series. These soils are undulating and are moderately deep to deep. They have short, irregular slopes that average between 3 and 7 percent in gradient. Their texture is very fine sandy loam or stratified silt and sand. Drainage is good, and the moisture-supplying capacity is moderate.

These soils are suited to all the crops climatically adapted to the Area. They are well suited to early vegetables, as they can be worked earlier in spring than finer textured soils. They all need fertilizer, and the Flat Horn and Schrock soils need lime. Organic matter is needed to keep the soils in good tilth and to promote full use of moisture and plant nutrients. The content of organic matter can be maintained by adding manure, making use of crop residue, and including grasses and legumes in the cropping sequence. Irrigation in dry years helps to sustain yields and minimize seeding losses.

Water erosion is a hazard in cultivated fields. It can be controlled by leaving natural waterways in sod and tilling on the contour. The Bodenburg soils in the eastern part of the Area are susceptible to blowing. Large cultivated fields of these soils need a protective cover of stubble or grass throughout the winter, as they frequently lack a snow cover. Windbreaks and stripcropping are effective in controlling soil blowing.

#### MANAGEMENT GROUP 4 (IIe-2)

This group consists of soils of the Bodenburg, Doone, Nancy, and Naptowne series. These soils are undulating and are moderately deep to deep. They have short, irregular slopes of 3 to 7 percent. Their texture is silt loam. Drainage is good, and the moisture-supplying capacity is favorable.

These soils are suited to all crops climatically adapted to the Area, and they produce good yields if fertilized. Lime is beneficial to most crops on the Nancy and Naptowne soils. Organic matter is needed to keep the soils in good tilth. It can be supplied by adding manure, making use of crop residue, and including grasses and legumes in the cropping sequence. In dry years irrigation helps to sustain yields and minimize seeding losses.

Water erosion is a moderate hazard in cultivated fields, but it can be controlled by tilling on the contour and leaving natural waterways in sod. The Bodenburg and Doone soils in the eastern part of the Area are susceptible to blowing if cultivated. They can be protected by windbreaks, by stripcropping, and by sod or stubble left on them during winter.

#### MANAGEMENT GROUP 5 (IIIe-1)

This group consists of soils of the Bodenburg and Flat Horn series. These soils are moderately deep to deep and are rolling. Their texture is very fine sandy loam or stratified silt and fine sand. They are well drained and have a favorable moisture-supplying capacity.

These soils are suited to all of the crops climatically adapted to the Area. They are well suited to early vegetables, as they can be worked earlier in spring than finer textured soils. Fertilizer is needed for satisfactory yields, and organic matter is needed for good tilth and for the efficient use of moisture and plant nutrients. Sprinkler irrigation in dry years helps to sustain yields and minimize seeding losses.

Water erosion is a severe hazard if these soils are cultivated. It is advisable to grow row crops not more than 1 year in 3 and to include grasses and legumes in the cropping sequence. Leaving natural waterways in grass and tilling on the contour also are effective in controlling erosion. Soil blowing is a hazard, and windbreaks and stripcropping are needed to control it.

#### MANAGEMENT GROUP 6 (IIIe-2)

This group consists of silty soils of the Bodenburg, Doone, Nancy, and Naptowne series. These soils are rolling and are moderately deep to deep. They have short, irregular slopes of 7 to 12 percent. Drainage is good.

These soils are suited to all of the crops climatically adapted to the Area, and they produce good yields if fertilized. Lime is needed for most crops on the Nancy and Naptowne soils. All of these soils need organic matter for good tilth and for efficient use of moisture and plant nutrients. Organic matter can be supplied by applying manure regularly, including grasses and legumes in the cropping sequence, and returning crop residue to the soil. In dry years, sprinkler irrigation helps to sustain yields and minimize seeding losses.

Cultivated fields are susceptible to severe water erosion. To control washing and rilling, it is advisable to plant row crops not more than 1 year in 3. Tilling on the contour and leaving natural waterways in sod are also effective in controlling water erosion. The Bodenburg and Doone soils are susceptible to blowing. They need winter cover and field windbreaks for protection. Plowing them in fall is not advisable, as it leaves them exposed during the winter and early in spring when the winds are strong.

#### MANAGEMENT GROUP 7 (IIIe-3)

This group consists of silty, shallow, well-drained soils of the Homestead and Knik series. These soils are undulating or rolling. They are underlain by gravel, generally at a depth of 10 to 20 inches; in places the depth is as much as 27 inches.

These soils can be used for all of the crops climatically adapted to the Area. Because of shallowness and susceptibility to water erosion, however, they should not be used for row crops more than 1 year in 3. They all need fertilizer and organic matter, and the Homestead soils need lime. Applying manure regularly, returning crop residue, and including grasses and legumes in the cropping sequence are means of maintaining the supply of organic matter needed for good tilth and the efficient use of moisture and plant nutrients. These practices also help to control erosion. Tilling on the contour and leaving waterways in grass are additional means of controlling erosion. Gravel interferes with deep tillage in some places.

A few areas of the Knik soils are in the path of strong winds and need winter cover and windbreaks for protection against soil blowing.

These soils tend to be droughty. Crops on Knik soils have responded well to irrigation during dry years; those on Homestead soils probably would also.

Most areas of these soils are forested. Many stands of paper birch and a few stands of white spruce are merchantable.

### MANAGEMENT GROUP 8 (IIIs-1)

This group consists of shallow soils of the Homestead and Knik series. These soils are nearly level and are underlain by coarse material. Their texture is silt loam, and they are well drained.

These soils can be used for all of the crops climatically adapted to the Area, but they are shallow over sand and gravel and therefore have a lower moisture-supplying capacity than most of the deeper silty soils. They should be used for row crops not more than 1 year in 3. They need fertilizer, and the Homestead soil needs lime for most crops. Because they are droughty, maintaining a supply of organic matter is especially important. Applying manure regularly, including grasses and legumes in the cropping sequence, and returning crop residue are means of supplying organic matter and thus maintaining good tilth for efficient use of moisture and plant nutrients.

Crops on the Knik soil have responded well to sprinkler irrigation in dry years. Those on the Homestead soil probably would respond similarly.

Gravel in some very small, shallow spots interferes with tillage. Water erosion on these nearly level soils is not a significant hazard, but the Knik soil in the eastern part of the Area is susceptible to blowing if cultivated. Windbreaks, stripcropping, and winter cover are needed to protect it.

### MANAGEMENT GROUP 9 (IIIs-2)

This group consists of shallow, well-drained soils of the Niklason series. These soils are nearly level. They are made up of stratified silt and sand underlain by coarse sand and gravel at a depth of 15 to 27 inches.

These soils can be used for all of the crops climatically adapted to the Area, but they are droughty, and yields are likely to be severely limited in dry years. Fertilizer and organic matter are needed. Applying manure regularly, returning crop residue to the soil, and including grasses and legumes in the cropping sequence are means of supplying the organic matter that is necessary for good tilth and the efficient use of moisture and plant nutrients. In dry years most crops respond to sprinkler irrigation.

In the eastern part of the Area, these soils are in the path of strong, gusty winds and are susceptible to blowing if cultivated. Windbreaks, stripcropping, and grass crops help to control soil blowing. Fall plowing is not advisable in this part of the Area, as it leaves the soils exposed to the winter winds.

Most of the areas are forested. Many stands of cottonwood (balsam poplar) and a few stands of paper birch and white spruce are merchantable.

### MANAGEMENT GROUP 10 (IIIs-3)

This group consists of nearly level, well-drained silty soils of the Matanuska and Reedy series. The Matanuska soils are shallow over gravelly material; the Reedy soils are underlain by slowly permeable material.

All of the crops climatically adapted to the Area can be grown on these soils, but the root growth of some crops is restricted by the moderately firm, slowly permeable subsoil. Thus, yields are limited, especially during dry years. Yields of grass and small grains are usually good, however, if adequate levels of fertilizer and organic matter are maintained.

### MANAGEMENT GROUP 11 (IIIw-1)

This group consists of silty soils of the Kalifonsky series. These soils are nearly level to moderately sloping. They are moderately deep to deep over coarse gravelly material and are well drained.

These soils are suitable as cropland, but they dry out slowly in spring and tend to remain cool throughout the growing season. Artificial drainage is feasible and generally is necessary for satisfactory yields and for the operation of farm machinery. Even if drained, these soils are suited to only short-season crops. Good yields of forage can be obtained from perennial grasses if the soils are fertilized. Small grains ordinarily do not mature but can be harvested for hay or silage.

The native forest consists mostly of slow-growing black spruce and has little commercial value.

### MANAGEMENT GROUP 12 (IIIw-2)

Wasilla silt loam is the only soil in this group. This soil is deep, nearly level, and poorly drained. It is underlain by slowly permeable material.

Most of the acreage is in native forest, and there are some stands of merchantable paper birch. If cleared, this soil could be used for crops, but drainage is required. Even after drainage, only short-season crops can be grown. Good yields of forage can be obtained from perennial grasses if fertilizer is applied. Small grains rarely mature but can be harvested for hay or silage.

### MANAGEMENT GROUP 13 (IVe-1)

This group consists of soils of the Bodenburg, Doone, Knik, Jim, Nancy, and Naptowne series. These soils are deep to moderately deep. Their texture is silt loam or very fine sandy loam, and they are well drained. They have short, hilly slopes of 12 to 20 percent.

If cleared and used for crops, these soils are susceptible to very severe water erosion. Leaving them in native vegetation is advisable. If they are needed as cropland, they should be kept in perennial grasses most of the time to control erosion.

Good yields of forage can be obtained if fertilizer is applied and harvesting is regulated. Lime also is needed on the Nancy and Naptowne soils. Grain can be grown occasionally if erosion is controlled by tilling on the contour and keeping waterways in grass. Merchantable stands of paper birch and quaking aspen are fairly common, and in a few places there are sparse stands of white spruce.

### MANAGEMENT GROUP 14 (IVe-2)

This group consists of shallow, silty soils of the Homestead and Knik series. These soils are well drained. They have hilly, irregular slopes of 12 to 20 percent.

These soils are not suited to row crops. They are droughty and susceptible to very severe water erosion if cultivated. Leaving them in native vegetation is desirable. If needed as cropland, they should be kept in perennial grasses most of the time. They produce satisfactory yields of forage if fertilized. In addition, the Homestead soil needs lime. Top dressings of fertilizer and manure applied frequently, help to maintain vigorous stands of perennial grasses. Cutting and grazing should be carefully regulated. Small grains can be grown occasionally if erosion is controlled by tilling on the contour. Yield of all crops are severely limited in dry years.

Stands of merchantable paper birch and quaking aspen are fairly common.

MANAGEMENT GROUP 15 (IVs-1)

This group consists of silty, shallow soils of the Homestead and Kenai series. These soils are nearly level to rolling. The Homestead soils are underlain by loose gravelly material and have a low moisture-supplying capacity. The Kenai soil is underlain by sandy clay loam material that contains many stones and restricts root growth.

Because of the gravelly and stony material within plow depth, these soils are not suited to row crops. They should be left in native vegetation. If cleared, they are suited to perennial grasses that can be used for hay, silage, or pasture. Small grains can be grown, but the gravelly and stony spots interfere with tillage.

In dry years yields are severely limited. In years of normal rainfall, fairly good yields can be obtained if enough fertilizer is applied and an adequate amount of organic matter is maintained. Lime is beneficial for most crops. Grazing and cutting should be regulated to maintain vigorous stands of perennial grasses.

Most areas of these soils are forested, and there are some merchantable stands of paper birch and quaking aspen.

MANAGEMENT GROUP 16 (IVs-2)

This group consists of excessively drained silty and sandy soils of the Anchorage series. They are nearly level to rolling.

These soils are droughty and are susceptible to blowing if cultivated. Leaving them in native vegetation is desirable. If cleared, they should be kept in perennial grasses most of the time. In years of normal rainfall, they produce satisfactory yields of forage if they are fertilized and if grazing and cutting are carefully managed. Yields are limited in dry years. Small grains can be grown, but yields are generally low.

MANAGEMENT GROUP 17 (IVw-1)

In this group are somewhat poorly drained soils of the Spenard series. These soils are in low positions. They have a silty surface layer and a firm, moderately fine textured, permeable subsoil.

Unless drained, these soils are too wet and cold for crops. Even if drained, they are suited to only short-season crops, as they remain cool and are susceptible to light frosts during the growing season. They produce good yields of perennial grasses if fertilized. Ordinarily, small grains do not mature on these soils, but they can be grown for hay or silage.

Stands of slow-growing black spruce are on most of the acreage. They have little commercial value.

MANAGEMENT GROUP 18 (IVw-2)

This group consists of poorly drained soils of the Coal Creek and Slikok series. These soils are in depressions and drainageways.

Unless drained, these soils are too wet for cultivation. Even if drained, they are susceptible to light frost during the growing season because of their low position. They can be used for forage crops or fast-maturing vegetables, but heavy applications of fertilizer are necessary.

Patches of native grasses can be used for light grazing, but the carrying capacity is low.

MANAGEMENT GROUP 19 (IVw-3)

This group consists of very fine sandy soils of the Susitna and Niklason series.

These soils are underlain by coarse sand and gravel. They are in nearly level areas along major rivers and are usually flooded one or more times a year, although occasionally they escape flooding for several years.

Because of the flood hazard, these soils should be left in native vegetation. If cleared, they can be seeded to perennial grasses for hay or pasture. Other crops are likely to be destroyed by flooding. Fairly good yields of pasture can be expected if the soils are fertilized and otherwise well managed. Overgrazing should be avoided to insure longer lasting stands.

Patches of native grasses are suitable for light grazing, but the carrying capacity is low. There are scattered stands of merchantable cottonwood (balsam poplar).

MANAGEMENT GROUP 20 (VIe-1)

This group consists of soils of the Bodenburg, Doone, Knik, Flat Horn, Homestead, Nancy, and Naptowne series. These soils are well drained. They are all silt loam in texture, except the Bodenburg soil, which is very fine sandy loam. The slope range is 20 to 30 percent.

Because of the steepness of slope, these soils generally are not suitable for cultivation. They are difficult to till and are susceptible to water erosion. Leaving them forested is advisable. If cleared, they should be kept in perennial grasses. Controlled grazing and applications of fertilizer and manure are needed to maintain lasting stands.

Although the moisture-supplying capacity is moderate, yields of forage on south-facing slopes are limited in dry years.

MANAGEMENT GROUP 21 (VIs-1)

This group consists of silty, very shallow soils of the Homestead series. These soils are hilly to moderately steep. Their moisture-supplying capacity is low.

These soils are too shallow for deep tillage. They should remain forested. If cleared, they can be seeded to perennial grasses for hay or pasture, but fertilization and controlled cutting and grazing are needed to obtain satisfactory yields of forage. Frequent light applications of fertilizer are generally more effective than a few heavy ones. Even if the soils are well managed, yields are frequently limited by droughtiness.

MANAGEMENT GROUP 22 (VIs-2)

Chena silt loam is the only soil in this group. This soil is very shallow over loose gravelly material and is excessively drained. Most of it is nearly level, but some of it is gently sloping to moderately sloping.

This soil is too shallow for cultivation. It is better suited to forest or to perennial grasses for hay or pasture. Fertilizer is needed for satisfactory yields of forage. Fertilizer should be applied more frequently than on deeper soils that have a more favorable moisture-supplying capacity. Even with careful control of cutting and grazing, limited yields can be expected in dry years.

Almost solid stands of white spruce are common on this soil, but cottonwood (balsam poplar) or paper birch is dominant in places.

#### MANAGEMENT GROUP 23 (VIs-3)

Anchorage very fine sandy loam, hilly, is the only soil in this group. It has short, irregular slopes of 12 to 20 percent.

This soil should be left in native vegetation. It is droughty and blows readily if the surface is exposed. If cleared, it should be kept in perennial grasses and used for hay, silage, or pasture. Fertilization and carefully controlled grazing and cutting are needed to maintain satisfactory stands. Low yields can be expected in dry years.

The forest cover consists of paper birch, scattered white spruce trees, and a few stands of quaking aspen.

#### MANAGEMENT GROUP 24 (VIw-1)

Tidal marsh is the only mapping unit in this group. This land type consists of poorly drained clayey sediments on tidal plains. In places Tidal marsh is occasionally inundated by high tides.

The native vegetation consists mostly of sedges and grasses that are fairly good for hay or pasture. Yields are low but probably could be improved by fertilization.

Because of its low position and moderately fine texture, Tidal marsh is difficult to drain and is not suited to cultivated crops. During dry years it could be seeded to perennial grasses.

#### MANAGEMENT GROUP 25 (VIw-2)

In this group are poorly drained silty soils of the Torpedo Lake series. These soils are in nearly level to strongly sloping drainageways and seepage areas. They have a tight clayey subsoil and are too wet for cultivation. Artificial drainage is not feasible. Some patches of native grasses are suitable for light grazing, and forage yields could probably be improved by removing scattered brush and trees.

#### MANAGEMENT GROUP 26 (VIw-3)

This group consists of poorly drained soils of the Torpedo Lake series and well-drained soils of the Homestead series that are intermingled in a complex pattern. These soils are silty. The poorly drained soils are in swales, drainageways, and seepage areas that separate the small, undulating to moderately steep knolls and ridges occupied by the well-drained soils.

These complexes are not suitable for extensive cultivation and ordinarily should be left in native vegetation. The irregular patches of Torpedo Lake soils are too wet for cultivation unless drained, and drainage is not feasible. The native grasses that commonly grow on these soils can be used for light grazing, but they are readily destroyed by overgrazing. Removing brush and scattered trees from these poorly drained places probably would improve the stands of grass.

Most of the well-drained sites are occupied by the Homestead soils and support forests, mostly of paper birch. In some places the trees are of merchantable size. The well-drained sites are too irregular and small for farming. If needed, they could be cleared and improved for pasture.

#### MANAGEMENT GROUP 27 (VIw-4)

Moose River silt loam is the only soil in this group. It is a poorly drained soil in low areas along streams.

This soil is not suited to cultivated crops. It should be left in native vegetation. It has a rapidly fluctuating water table, and artificial drainage generally is not feasible. If needed, it could be cleared of brush and seeded to perennial grasses for hay or pasture.

#### MANAGEMENT GROUP 28 (VIIe-1)

This group consists of silty, well-drained soils of the Bodenburg, Knik, Doone, Homestead, Jim, Naptowne, and Talkeetna series. All of these soils are steep except the Talkeetna, which is moderately steep to steep.

These soils are susceptible to severe erosion if cultivated. They should be left in native vegetation, which consists mainly of forests in which paper birch, quaking aspen, and white spruce are dominant. In places there are stands of merchantable trees. Also, there are large areas of shrubs and brushy vegetation that provide excellent browse and cover for wildlife. Patches of native grasses are suitable for grazing, but they are widely scattered and can be severely damaged by overgrazing.

If these soils are cleared, they should be seeded to perennial grasses to control erosion. Forage yields vary widely, depending on seasonal rainfall and slope exposure. Normally, the south-facing slopes produce forage earlier in spring than north-facing slopes but are droughtier. Fertilizing at regular intervals and controlling grazing can improve yields and help to insure longer lasting stands. The control of grazing also helps to prevent gullying.

#### MANAGEMENT GROUP 29 (VIIs-1)

Homestead silt loam, very shallow, steep, is the only soil in this group. This soil is extremely droughty and is extremely susceptible to erosion. It should be left in native vegetation, which consists mostly of paper birch, aspen, and a few white spruce trees. In addition, there are many patches of brushy vegetation that are excellent wildlife habitats.

If needed, this soil can be seeded to perennial grasses and used for pasture, but regular applications of fertilizer and careful management of grazing are required to maintain satisfactory stands and to control gullying. Even under careful management, average yields of forage are low.

#### MANAGEMENT GROUP 30 (VIIs-2)

This group consists of excessively drained sandy soils of the Anchorage series. For the most part, these soils are moderately steep, but some are hilly and some are steep. They are extremely droughty, and they blow readily if the surface is exposed. They are suitable for forests or for wildlife habitats.

#### MANAGEMENT GROUP 31 (VIIw-1)

Kalifonsky silt loam, strongly sloping to steep, is the only soil in this group. It is a somewhat poorly drained soil on north-facing slopes.

This soil remains cool and moist throughout the growing season because of seepage from adjoining slopes and insufficient sunlight. It is susceptible to erosion if the native vegetation is removed. In places the native vegetation can be used for light grazing, but forage yields are low. The trees consist mainly of slow-growing black spruce and have little commercial value.

MANAGEMENT GROUP 32 (VIIw-2)

This group consists of stony, poorly drained and very poorly drained soils of the Coal Creek, Jacobsen, and Slikok series. These soils are in low, nearly level areas and in gently sloping drainageways. They are too wet and stony for cultivated crops or improved pasture, and artificial drainage is not feasible. Some areas of native grasses can be used for light grazing, but these are widely scattered. Most areas support many kinds of vegetation that provides excellent food and cover for wildlife.

MANAGEMENT GROUP 33 (VIIw-3)

Mixed alluvial land is the only mapping unit in this group. This land type occurs along streams. It is frequently flooded and covered with deposits of medium-textured to coarse-textured sediments.

Generally, this land should be left in native vegetation, which provides excellent habitat for wildlife. In places the native grasses are suitable for grazing, but these are readily destroyed by overgrazing, and the forage yields are quite low.

Small areas of this land probably could be cleared and seeded to perennial grasses for pasture, but extensive improvements are not feasible.

MANAGEMENT GROUP 34 (VIIw-4)

This group consists of very poorly drained peat soils of the Clunie and Salamatof series. These soils are in muskegs. They are extremely acid and generally are waterlogged. Even if drained, they probably would not be suited to crops. They produce a few sparse stands of sedges and grasses that could be used for grazing, but yields are very low. Generally, these soils should be left in native vegetation.

MANAGEMENT GROUP 35 (VIIIs-1)

This group consists of Rough mountainous land, Sea cliffs, and Terrace escarpments. These lands are steep and shallow or are bare of soil. They are not suitable for farming. They support hardly any trees of merchantable size, but the vegetation in places is beneficial to wildlife. Landslides and other unstable areas are common. If the cover is removed or disturbed, erosion is likely to occur.

MANAGEMENT GROUP 36 (VIIIw-1)

In this group are Gravelly alluvial land and Tidal flats, which are frequently flooded and covered by sediments. These areas are not suitable for farming and do not support merchantable timber. The Tidal flats are nearly bare of vegetation, but on the Gravelly alluvial land there are patches of willows, grasses, and other plants beneficial to wildlife.

## *Wildlife* [5]

Big and small game animals, upland game birds, migratory waterfowl, furbearers, and many other mammals and birds frequent the Matanuska Valley Area. Trout, salmon, and Arctic grayling are in many of the lakes and streams.

The Alaska moose is the most significant big game animal in the Area. The moose population fluctuates according to the availability of browse and other habitat conditions. In 1964 there were about 2,400 moose in the Area. Willow, small paper birch, and quaking aspen provide most of their browse.

Black bears and a few Alaskan brown bears can be seen occasionally on the nearby mountain slopes when berries are ripe and along streams when salmon are running.

Spruce grouse and willow ptarmigan are the principal upland game birds. Ptarmigan generally prefer the higher elevations.

The Area is also a stopover and resting ground for migratory waterfowl. Goldeneye, mallard, and pintail are among the species of ducks that nest along the river bottoms, small streams, and lakes. A few whistling swans nest on several shallow lakes near the mouth of the Knik River. Sandhill cranes, yellowlegs, Wilson's snipe, loons, and other shore and water birds also nest in the Area.

Beaver are perhaps the most important furbearers. Other furbearers are land otter, muskrat, weasel, lynx, wolf, fox, marten at higher elevations, and a few wolverines.

Other small animals are snowshoe hare, red squirrel, and ground squirrel. Eagles, hawks, ravens, and numerous songbirds also occur in the Area.

Rainbow and Dolly Varden trout are in many of the lakes and small streams. A few of the lakes also have Arctic grayling and landlocked silver salmon. Annual spawning runs of king, silver, red, pink, and chum salmon occur in many of the rivers and streams during the summer.

The kinds and abundance of wildlife in different parts of the Area depend largely upon the type and condition of the habitat, which, in turn, are related to the kinds of soil and land use. Following are some statements about the distribution of wildlife in relation to the soil associations in the Matanuska Valley Area. These associations are described in another section of this survey and are delineated on the General Soil Map.

*Bodenburg association.*—This is the most intensively farmed and settled part of the Matanuska Valley Area, and the most common species of wildlife are those that frequent the open fields and brushy patches bordering woodlots. Fox, red squirrel, field mice, and songbirds are fairly numerous. Early in spring and fall, migrating flocks of ducks and sandhill cranes can be seen feeding in the open fields where small, temporarily ponded depressions are common. In the winter when snow is deep, moose often seek the more easily traveled roads, highways, and open land where they browse heavily on the patches of brush, and they occasionally feed on shocked grain left in the field over winter. There are no sizable lakes or streams in this association other than the Matanuska River, which flows along the eastern boundary and crosses a part of the association in the southeast. Although a few salmon run this river in the summer and early in fall, its waters are frequently laden with sediments that make it undesirable for sport fishing.

*Doone-Knik association.*—There are many scattered farms in this association, but the forest understory and

[5] This subsection is based upon the work of RHODE and BARKER (*10*) and upon information supplied by RONALD BATCHELOR, game biologist, Alaska Department of Fish and Game, Palmer, Alaska.

patches of brush provide moderate browse for moose. A few of these animals stay throughout the year, but by far the greatest numbers are present in the winter when deep snow at higher elevations forces them to come down. A few small ponds are occasionally used by ducks. Several of the small streams tributary to the Matanuska River support a few Dolly Varden trout, a few graylings, and small runs of spawning salmon. Most of these streams, however, provide little in the way of sport fishing because they have a rapidly fluctuating water level and often carry large quantities of silt.

*Homestead association.*—Most of this association is unsettled and is forested with stands of paper birch and white spruce that are nearing maturity. Consequently, the forest understory is sparse, except in scattered burned areas and around a few forest openings. This type of vegetation provides a small to moderate amount of browse for moose and limited cover for smaller animals. Spruce grouse and songbirds are numerous. Only a few scattered lakes and ponds are suitable for ducks. A few beavers also inhabit the lakes and some of the small streams. Except for one or two lakes that harbor rainbow trout, these waters generally are not suitable for fish. The insects in many fallen and mature trees and the scattered patches of wild berries are food for black bear that frequently travel through this part of the Area in spring and summer.

*Homestead-Knik association.*—With the exception of waterfowl and shore birds, this association is moderately populated with all species of wildlife common to the Matanuska Valley Area. The vegetation is typically forest, but many streams, wet places, small muskegs, and scattered lakes provide a variety of habitats for many large and small mammals. Rainbow trout, Dolly Varden trout, and grayling are common in many of the streams and scattered lakes, but only a few of the streams have small runs of spawning salmon.

*Homestead-Jacobsen association.*—Though other associations are similar to it, this association probably has the greatest variety of vegetation in the Matanuska Valley Area. The shallow, well-drained Homestead soils, which are dominant on uplands, support forests in all stages of growth, including many small tracts of young birch and willow brush, as shown in figure 14.

The associated, poorly drained mineral soils are commonly covered with patches of willow, alder, grass, and sedge. A few areas support solid stands of black spruce or a thick ground cover of moss. This variety in vegetation makes excellent year-round habitat for moose, black bear, fox, coyotes, rabbits, squirrels, spruce grouse, and other animals and birds.

Trout are fairly plentiful in most of the larger lakes and streams, many of which are spawning waters for substantial runs of salmon in summer and fall. In addition, there are many small lakes and ponds used by waterfowl. Beaver, mink, and other furbearers are also plentiful in and around these waters. The many muskegs, in which poorly drained peat soils are dominant, are used by terns, yellowlegs, sandhill cranes, and similar birds. Along Knik Arm are small tracts of Tidal marsh frequented by shore birds.

*Homestead-Nancy association.*—The wildlife habitat in this association is similar to that in the Homestead-Jacobsen association. Except that there are no shore birds, the kinds of wildlife also are similar.

*Knik-Coal Creek association.*—Except for a greater number of farms and the lack of frontage on Knik Arm, the habitat for wildlife in this association is comparable to that in the Homestead-Jacobsen association. Some of the lakes have been stocked with silver salmon, in addition to rainbow trout.

*Naptowne-Spenard association.*—The Naptowne soils, which are dominant in this association, support nearly mature stands of paper birch and white spruce. The density of most stands is fairly low, and consequently there is a heavy understory of brushy vegetation that is excellent habitat for moose, black bear, and many small animals. Several of the larger lakes have a good stock of rainbow trout, but only one or two streams are large enough for fish. A few ducks nest in the ponds and lakes, but the shoreline bordering Knik Arm consists mainly of a narrow, gravelly beach used mostly by a few shore birds.

*Salamatof-Jacobsen association.*—The peat soils in this association support a muskeg type of vegetation that provides little browse or cover suitable for moose and other animals. Bordering the muskegs, however, are poorly drained mineral soils that support willow and other brushy vegetation useful to many kinds of wildlife. In the small ponds in this association grow aquatic plants that supplement the diet of moose early in summer and provide food for certain species of ducks. The large, open muskegs are also chosen as nesting grounds by sandhill cranes.

*Torpedo Lake-Homestead association.*—This soil association is at higher elevations than most other parts of the Matanuska Valley Area. The complex pattern of poorly drained Torpedo Lake soils and well-drained Homestead soils supports an equally complex pattern of vegetation and wildlife habitat. Dense thickets of alder and willow, separated by many patches of grass and sedge, are common on the poorly drained sites. The well-drained soils on knolls and ridges support overmature stands of paper birch and white spruce, interspersed with large patches of grass and herbaceous plants. This type of habitat is especially suitable for moose, bear, spruce grouse, and ptarmigan, all of which are fairly abundant in this association. In winter the moose migrate to lower elevations, where the snow is not so deep.

This association has no suitable habitat for migratory waterfowl or shore birds. The streams, which are small and rapid, have only a few trout. Beaver, mink, wolf, and fox are fairly abundant.

*Tidal Marsh-Clunie association.*—These low, poorly drained, nearly level areas are almost treeless and are especially desirable as habitat for waterfowl and shore birds. Grass, sedge, and many kinds of aquatic plants grow on the extensive tracts of Tidal marsh. Large flocks of ducks, geese, sandhill cranes, and shore birds and a few small flocks of whistling swans use the marsh as a stopover place during spring and fall migrations; many also nest in the marsh.

*Susitna-Niklason association.*—Nearly all species of wildlife common to the Area can be found in this soil association. Moose are generally scarce in the summer but concentrate here in the winter.

*Figure 14.*—**Young stand of paper birch and willow on recently burned-over site provides browse for moose. Typical forest of paper birch and white spruce in background has escaped burning.**

## *Soils in Engineering*

This section contains information about the use of soils as material in construction. Most of the information is presented in three tables. Table 5, "Estimated properties of the soils," and table 6, "Engineering interpretations of the soil properties," are based partly on the test data shown in table 7. These tables, with the soil map and the information on soils given elsewhere in this survey, can be used by engineers to—

1. Make soil and land-use studies that will aid in selecting and developing sites for industrial, business, residential, and recreational purposes.
2. Make preliminary evaluations of soil conditions that will aid in selecting locations for highways, airports, piplines, and cables and in planning detailed soil surveys of the selected locations.
3. Develop information for the design of drainage and irrigation systems, farm ponds, and other structures for soil and water conservation.
4. Locate sources of sand and gravel.
5. Correlate performance of structures with soil mapping units, and thus develop information that can be useful in designing and maintaining new structures.
6. Determine the suitability of soils for off-road movement of vehicles and construction equipment.
7. Supplement information obtained from other published sources and make maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

With the use of the soil map for identification, the engineering estimates and interpretations reported here can be useful for many purposes. It should be emphasized that they may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some of the terms used in this report have special meanings in soil science that do not correspond with the meanings of the same terms in engineering. These terms are defined in the Glossary according to their meaning in soil science. For additional information about the soils, engineers may want to refer to "Descriptions of the Soils," "Formation and Classification of the Soils," and other sections of this survey.

## Engineering Soil Classification Systems

Most highway engineers classify soil material according to the system approved by the American Association of State Highway Officials (*2*). In this system, soil materials are classified in seven principal groups. The groups range from A-1, which consists of gravelly soil of high bearing capacity, to A-7, which consists of fine-grained soils having low strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group index number. These numbers range from 0 for the best material to 20 for the poorest. The group index number is shown in parentheses following the group classification symbol.

Some engineers prefer to use the Unified soil classification system (*16*). In this system, soil materials are identified as coarse grained (8 classes), fine grained (6 classes), or highly organic. An approximate classification of soils by this system can be made in the field.

## Estimated Properties of the Soils

The estimated properties in table 5, are based on test data in table 7.

Permeability, measured in inches per hour, was determined for soils without compaction and after the removal of free water.

Available water capacity is the approximate amount of capillary water in a soil that is wet to field capacity. It is the amount of water that will wet air-dry soil to a depth of 1 inch without deeper percolation. Poorly drained soils normally contain more than this amount of water before drainage.

Dispersion refers to the degree and rate of the breakdown, or slaking, of the soil structure in water.

The shrink-swell potential indicates the extent to which a soil will shink or swell with changes in moisture content.

## Engineering Interpretations of the Soil Properties

The interpretations of soil properties in table 6 are based on the estimates in table 5, on actual test data in table 7, and on field experience.

*Sources of gravel and sand.*—The Bodenburg, Doone, and Knik soils and nearly all of the other well-drained soils on river terraces and outwash plains are underlain by water-laid, loose very gravelly material. This material is free of silt and clay but commonly contains layers and pockets of sand. The gravel is rounded, and in places there are many cobblestones 3 to 6 inches in diameter. Gravel pits can be located almost anywhere in these areas, but the overburden of medium-textured wind-laid material is generally thicker near large rivers in the eastern part of the Area and in places near the tidal plains.

Sand and gravel can also be obtained in many places on the flood plains of major streams. Many of these areas, however, are subject to a seasonally high water table or to overflow, which may make excavation difficult.

Most of the well-drained soils on moraines are underlain by gravelly glacial drift that contains a varying amount of medium-grained and fine-grained particles. In places, there are many large stones and boulders. Generally, the Homestead and Nancy soils are underlain by gravelly drift that contains only a small quantity of fine particles and is fairly suitable for gravel. The Naptowne soils, which occur on moraines in the western part of the Area, are underlain by glacial drift that is usually less desirable or is unsuitable as a source of gravel because it contains a higher proportion of fine-grained particles. It also generally contains many large stones and boulders.

*Frost action.*—This is a major engineering problem in the Matanuska Valley. Most of the uplands are covered with a mantle of loess that is less than 10 inches thick in Homestead soils and more than 50 inches thick in Bodenburg soils; but it is commonly between 10 and 30 inches thick throughout the Area. This loess is susceptible to severe frost action and generally is not good material for construction. When wet, it is soft and slippery and may not support heavy equipment; when dry, it is dusty.

On the extensive river terraces, especially in the eastern part of the Area, the loess in the well-drained soils is underlain by water-laid gravel, which is nearly free of silt and clay and is not susceptible to frost action.

Moraines in the eastern part of the Area are made up of material nearly as coarse textured as that on the terraces, though there is generally a slight admixture of fine-grained particles. Most moraines in the central and western parts of the Area contain a higher proportion of fine-grained material, but susceptibility to frost action is still slight to moderate. In areas of Naptowne soils, however, the substratum contains lenses and pockets of fine material and is more susceptible to frost heaving. Large, angular boulders are fairly common throughout the moraines.

Most soils in depressions and on flood plains and the Torpedo Lake soils on hills in the north-central part of the Area are wet throughout summer and can be traversed in summer only by vehicles designed to operate in wet areas. These soils are highly susceptible to frost action in spring.

Peat soils in muskegs are common in the Matanuska Valley Area. These soils are nearly always wet to the surface, and the muskegs are difficult to drain. Peat has no value as construction material or as foundation material. If possible, it should be excavated before construction.

Because of the difficulty in maintaining proper control of moisture for compaction when soil is frozen, the construction of embankments and other earthworks with frost-susceptible material should be avoided in winter.

*Agricultural drainage.*—Drainage of the soils for agricultural purposes is physically possible, but it probably cannot be justified economically until a much greater proportion of the uplands is cleared. Drainage of peat soils for agriculture in the Area is not advisable.

TABLE 5.—*Estimated*

[Dashed lines indicate

| Soil name and map symbols | Depth from surface | Classification: USDA texture | Classification: Unified | Classification: AASHO |
|---|---|---|---|---|
| | *Inches* | | | |
| Anchorage sand (AcC, AcE). | 0 to 40 | Sand | SM | A–3 or A–2 |
| Anchorage silt loam (AhA). | 0 to 6 | Silt loam | ML | A–4 |
| | 6 to 12 | Fine sand | SP or SM | A–3 or A–2 |
| | 12 to 40 | Sand | SP or SM | A–3 or A–2 |
| Anchorage very fine sandy loam (AnB, AnC, AnD, AnE). | 0 to 6 | Very fine sandy loam | ML | A–4 |
| | 6 to 12 | Fine sand | SP or SM | A–3 or A–2 |
| | 12 to 40 | Sand | SP or SM | A–3 or A–2 |
| Bodenburg silt loam (BbA, BbB, BbC, BbD, BkF). (For Knik part of BkF, see Knik silt loam.) | 0 to 36 | Silt loam | ML | A–4 |
| | 36 to 48 | Very gravelly sand | GW or GP | A–1 |
| Bodenburg very fine sandy loam (BdA, BdB, BdC, BdD, BdE). | 0 to 48 | Very fine sandy loam | ML | A–4 |
| Chena silt loam (Ct). | 0 to 4 | Silt loam | ML | A–4 |
| | 4 to 18 | Very gravelly sand | GW or GP | A–1 |
| Clunie peat (Cl). | 0 to 25 | Peat | Pt | |
| | 25 to 36 | Silty clay loam | CL or CH | A–7 |
| Coal Creek silt loam (Co). | 0 to 9 | Silt loam | ML | A–4 |
| | 9 to 14 | Silty clay loam | CL | A–6 |
| | 14 to 28 | Silt loam | CL | A–6 |
| | 28 to 41 | Clay loam | CL | A–6 |
| Coal Creek stony silt loam (Cs). | 0 to 20 | Stony silt loam | ML or CL | A–4 or A–6 |
| | 20 to 30 | Stony loam | GM or GP–GM | A–1 |
| Doone silt loam (DeA, DeB, DeC, DkD, DkE, DkF). (For Knik part of DkD, DkE, and DkF, see Knik silt loam.) | 0 to 33 | Silt loam | ML | A–4 |
| | 33 to 40 | Very gravelly sand | GW or GP | A–1 |
| Flat Horn silt loam (FhA, FhB, FhC, FhE). | 0 to 8 | Silt loam | ML | A–4 |
| | 8 to 19 | Fine sandy loam | ML | A–4 |
| | 19 to 40 | Fine sand, very fine sand, and silt loam. | SM | A–4 |
| Gravelly alluvial land (Ga). | 0 to 60 | Very gravelly sand | GW or GP | A–1 |
| Gravel pits and Strip mines (Gp). | (1) | | | |
| Homestead silt loam (HoA, HoB, HoC, HoD, HoE, HoF). | 0 to 15 | Silt loam | ML | A–4 |
| | 15 to 30 | Very gravelly sand | GW, GP, or GM | A–1 |
| Homestead silt loam, very shallow (HsA, HsB, HsC, HsD, HsE, HsF). | 0 to 8 | Silt loam | ML | A–4 |
| | 8 to 30 | Very gravelly sand | GW, GP, or GM | A–1 |
| Jacobsen very stony silt loam (JaA, JaB). | 0 to 26 | Very stony silt loam or very stony loam. | GM | A–1 or A–2 |
| | 26 to 32 | Very stony sand | GW or GP | A–1 |
| Jim silt loam (JbD, JbF). (For Bodenburg part of JbD and JbF, see Bodenburg silt loam.) | 0 to 26 | Silt loam | ML | A–4 |
| | 26 | Bedrock | | |
| Kalifonsky silt loam (KaA, KaC, KaE). | 0 to 28 | Silt loam | ML or OL | A–4 or A–5 |
| | 28 to 40 | Very gravelly sand | GW or GP | A–1 |

See footnote at end of table.

*properties of the soils*

estimates were not made]

| Percentage passing sieve— No. 4 (4.76 mm.) | No. 10 (2 mm.) | No. 200 (0.074 mm.) | Permeability | Available water capacity | Reaction | Dispersion | Shrink-swell potential |
|---|---|---|---|---|---|---|---|
| | | | *Inches per hour* | *Inches per inch of soil* | *pH* | | |
| 100 | 80 to 90 | 10 to 15 | 5 to 10 | . 02 to . 04 | 5. 0 to 6. 0 | Low | Low. |
| 100 | 100 | 70 to 80 | 0. 5 to 0. 8 | . 25 to . 30 | 4. 5 to 5. 5 | High | Low. |
| 100 | 100 | 5 to 15 | 5 to 10 | . 04 to . 05 | 5. 0 to 5. 5 | Low | Low. |
| 100 | 90 to 100 | 5 to 10 | 5 to 10 | . 02 to . 04 | 5. 0 to 5. 5 | Low | Low. |
| 100 | 100 | 60 to 70 | 0. 8 to 1. 2 | . 20 to . 25 | 4. 0 to 5. 0 | Moderate to high | Low. |
| 100 | 100 | 5 to 15 | 5 to 10 | . 04 to . 05 | 5. 0 to 5. 5 | Low | Low. |
| 100 | 90 to 100 | 5 to 10 | 5 to 10 | . 02 to . 04 | 5. 0 to 5. 5 | Low | Low. |
| 100 | 100 | 80 to 90 | 0. 5 to 0. 8 | . 25 to . 30 | 5. 0 to 6. 0 | High | Low. |
| 40 to 50 | 25 to 40 | 5 to 10 | >10 | <. 02 | ------ | Low | Low. |
| 100 | 100 | 60 to 80 | 0. 8 to 1. 2 | . 20 to . 25 | 4. 5 to 6. 0 | Moderate to high | Low. |
| 100 | 100 | 80 to 90 | 0. 5 to 0. 8 | . 25 to . 30 | 4. 5 to 5. 5 | High | Low. |
| 40 to 50 | 25 to 40 | 5 to 10 | >10 | <. 02 | ------ | Low | Low. |
| ------ | ------ | ------ | ------ | ------ | 4. 5 to 5. 5 | ------ | |
| 100 | 100 | 85 to 95 | 0. 2 to 0. 5 | . 28 to . 32 | 4. 5 to 5. 5 | Moderate | High. |
| 100 | 100 | 80 to 90 | 0. 5 to 0. 8 | . 25 to . 30 | 4. 0 to 4. 5 | High | Low. |
| 100 | 100 | 85 to 95 | 0. 2 to 0. 5 | . 28 to . 32 | 4. 5 to 5. 0 | Moderate | Moderate. |
| 90 to 100 | 80 to 90 | 70 to 80 | 0. 2 to 0. 5 | . 25 to . 30 | 4. 5 to 5. 0 | High to moderate | Moderate. |
| 90 to 100 | 80 to 90 | 60 to 70 | 0. 2 to 0. 5 | . 28 to . 32 | 4. 5 to 5. 0 | Moderate | Moderate. |
| 80 to 90 | 70 to 80 | 50 to 60 | 0. 5 to 0. 8 | . 25 to . 30 | 4. 0 to 5. 0 | High | Low. |
| 40 to 50 | 20 to 30 | 5 to 15 | 5 to 10 | . 10 to . 14 | 4. 5 to 5. 0 | Low | Low. |
| 100 | 100 | 80 to 90 | 0. 5 to 0. 8 | . 25 to . 30 | 5. 0 to 6. 0 | High | Low. |
| 40 to 50 | 25 to 40 | 5 to 10 | >10 | <. 02 | ------ | Low | Low. |
| 100 | 100 | 80 to 90 | 0. 5 to 0. 8 | . 25 to . 30 | 4. 5 to 5. 5 | High | Low. |
| 100 | 100 | 50 to 60 | 0. 8 to 1. 2 | . 15 to . 20 | 5. 0 to 5. 5 | Low to moderate | Low. |
| 100 | 100 | 40 to 50 | 0. 8 to 1. 2 | . 15 to . 20 | 5. 0 to 6. 0 | Low | Low. |
| 60 to 75 | 40 to 50 | 5 to 10 | >10 | ------ | ------ | Low | Low. |
| ------ | ------ | ------ | ------ | ------ | ------ | ------ | |
| 100 | 90 to 100 | 65 to 75 | 0. 5 to 0. 8 | . 25 to . 30 | 4. 5 to 5. 5 | High | Low. |
| 40 to 50 | 25 to 40 | 0 to 20 | >10 | <. 02 | 5. 0 to 5. 5 | Low | Low. |
| 100 | 90 to 100 | 65 to 75 | 0. 5 to 0. 8 | . 25 to . 30 | 4. 5 to 5. 5 | High | Low. |
| 40 to 50 | 25 to 40 | 0 to 20 | >10 | <. 02 | 5. 0 to 5. 5 | Low | Low. |
| 50 to 60 | 40 to 50 | 20 to 30 | 0. 5 to 0. 8 | . 15 to . 20 | 4. 5 to 5. 5 | Low to moderate | Low. |
| 40 to 50 | 30 to 40 | 5 to 10 | 5 to 10 | . 02 to . 04 | 4. 5 to 5. 5 | Low | Low. |
| 100 | 100 | 80 to 90 | 0. 5 to 0. 8 | . 25 to . 30 | 5. 0 to 6. 0 | High | Low. |
| ------ | ------ | ------ | ------ | ------ | ------ | ------ | |
| 100 | 100 | 80 to 90 | 0. 5 to 0. 8 | . 25 to . 30 | 5. 0 to 6. 0 | High | Low. |
| 40 to 50 | 25 to 40 | 5 to 10 | >10 | <. 02 | ------ | Low | Low. |

TABLE 5.—*Estimated properties*

| Soil name and map symbols | Depth from surface | Classification | | |
|---|---|---|---|---|
| | | USDA texture | Unified | AASHO |
| | *Inches* | | | |
| Kenai silt loam (KeB). | 0 to 10 | Silt loam or loam | ML or CL | A–4 or A–6 |
| | 10 to 20 | Sandy clay loam | SC or CL | A–6 or A–7 |
| | 20 to 32 | Gravelly clay loam | SC | A–2 or A–6 |
| Knik silt loam (KnA, KnB, KnC, KnD, KnE, KnF). | 0 to 19 | Silt loam | ML | A–4 |
| | 19 to 32 | Very gravelly sand | GW, GM, or SP | A–1 or A–3 |
| Matanuska silt loam (Ma). | 0 to 9 | Silt loam | ML | A–4 |
| | 9 to 18 | Silty clay loam | CL | A–6 or A–7 |
| | 18 to 32 | Gravelly sand | GW or GM | A–1 |
| Mixed alluvial land (Ml). | (1) | | | |
| Moose River silt loam (Mr). | 0 to 6 | Silt loam | OL or ML | A–4 or A–5 |
| | 6 to 14 | Fine sand | SP | A–3 |
| | 14 to 38 | Fine sand and silt loam | ML or SM | A–2 or A–4 |
| | 38 to 48 | Very gravelly sand | GW or GP | A–1 |
| Nancy silt loam (NaA, NaB, NaC, NaD, NaE). | 0 to 21 | Silt loam | ML | A–4 |
| | 21 to 32 | Very gravelly sand | GW or GP | A–1 |
| Naptowne silt loam (NpA, NpB, NpC, NpD, NpE, NpF). | 0 to 19 | Silt loam | ML | A–4 |
| | 19 to 30 | Gravelly sandy loam | GM or SM | A–2 |
| Niklason silt loam (Ns). | 0 to 15 | Silt loam | ML | A–4 |
| | 15 to 30 | Very gravelly sand | GW or GP | A–1 |
| Niklason very fine sand (Nv). | 0 to 15 | Very fine sand and silt loam | SM or ML | A–2 or A–4 |
| | 15 to 30 | Very gravelly sand | GW or GP | A–1 |
| Reedy silt loam (Re). | 0 to 18 | Silt loam | ML | A–4 |
| | 18 to 40 | Silty clay loam | CL or CH | A–7 |
| Rough mountainous land (Rm). | (1) | | | |
| Salamatof peat (Sa, Sf). | 0 to 50 | Peat | Pt | |
| Schrock silt loam (ShA, ShB). | 0 to 22 | Silt loam | ML | A–4 |
| | 22 to 34 | Silt loam and very fine sandy loam. | ML | A–4 |
| | 34 to 52 | Gravelly sand | GM | A–1 |
| Sea cliffs (Sl). | (1) | | | |
| Slikok mucky silt loam (Sm). | 0 to 8 | Silt loam | OL | A–5 or A–4 |
| | 8 to 42 | Silt loam | OL–ML | A–5 or A–4 |
| Slikok stony mucky silt loam (Sn). | 0 to 20 | Stony silt loam | GM | A–1 or A–2 |
| Spenard silt loam (SpA, SpB). | 0 to 5 | Silt loam | OL or ML | A–5 or A–4 |
| | 5 to 14 | Sandy clay loam | SC, ML, or CL | A–4 or A–6 |
| | 14 to 31 | Gravelly silty clay loam | SM, SC, or ML | A–4 |
| Susitna silt loam (Su). | 0 to 15 | Silt loam | ML | A–4 |
| | 15 to 35 | Fine sand and silt loam | SM or ML | A–2 or A–4 |
| | 35 to 46 | Very gravelly sand | GW or GP | A–1 |
| Susitna very fine sand (Sv, SwA). (For Niklason part of SwA, see Niklason very fine sand.) | 0 to 30 | Very fine sand, fine sand, and silt loam. | SM or ML | A–2 or A–4 |
| | 30 to 48 | Very gravelly sand | GW or GP | A–1 |

See footnote at end of table.

*of the soils*—Continued

| Percentage passing sieve— No. 4 (4.76 mm.) | No. 10 (2 mm.) | No. 200 (0.074 mm.) | Permeability | Available water capacity | Reaction | Dispersion | Shrink-swell potential |
|---|---|---|---|---|---|---|---|
| | | | *Inches per hour* | *Inches per inch of soil* | *pH* | | |
| 100 | 85 to 95 | 60 to 70 | 0.5 to 0.8 | .25 to .30 | 4.5 to 5.5 | High | Low to moderate. |
| 85 to 95 | 75 to 85 | 45 to 55 | 0.2 to 0.5 | .25 to .30 | 5.0 to 5.5 | Low to moderate | Moderate. |
| 60 to 70 | 40 to 50 | 30 to 40 | 0.2 to 0.5 | .20 to .25 | 5.0 to 5.5 | Low to moderate | Moderate. |
| 100 | 100 | 80 to 90 | 0.5 to 0.8 | .25 to .30 | 5.0 to 6.0 | High | Low. |
| 40 to 70 | 40 to 60 | 0 to 15 | >10 | <.02 | | Low | Low. |
| 100 | 100 | 80 to 90 | 0.5 to 0.8 | .25 to .30 | 5.0 to 6.0 | High | Low. |
| 80 to 90 | 70 to 80 | 60 to 70 | 0.2 to 0.5 | .28 to .32 | 5.0 to 6.0 | Moderate | Moderate. |
| 50 to 60 | 30 to 40 | 10 to 20 | >10 | <.02 | | Low | Low. |
| | | | | | | | |
| 100 | 100 | 80 to 100 | 0.5 to 0.8 | .25 to .30 | 4.0 to 4.5 | High | Low. |
| 90 to 100 | 80 to 90 | 5 to 10 | 5 to 10 | .02 to .04 | 4.0 to 4.5 | Low | Low. |
| 90 to 100 | 80 to 90 | 30 to 60 | 0.5 to 0.8 | .16 to .20 | 4.5 to 5.0 | Moderate | Low. |
| 40 to 50 | 25 to 40 | 5 to 10 | >10 | <.02 | 4.5 to 5.0 | Low | Low. |
| 100 | 100 | 80 to 90 | 0.5 to 0.8 | .25 to .30 | 4.5 to 5.5 | High | Low. |
| 40 to 50 | 25 to 40 | 5 to 10 | >10 | <.02 | | Low | Low. |
| 100 | 90 to 100 | 60 to 80 | 0.5 to 0.8 | .25 to .30 | 5.0 to 6.0 | High | Low. |
| 65 to 75 | 55 to 65 | 25 to 35 | 1.2 to 2.5 | .08 to .12 | 5.0 to 6.0 | Low | Low. |
| 100 | 100 | 70 to 80 | 0.5 to 0.8 | .25 to .30 | 5.0 to 6.0 | High | Low. |
| 40 to 50 | 25 to 40 | 5 to 10 | >10 | <.02 | | Low | Low. |
| 100 | 90 to 100 | 30 to 60 | 0.5 to 0.8 | .16 to .20 | 5.0 to 6.0 | Moderate | Low. |
| 40 to 50 | 25 to 40 | 5 to 10 | >10 | <.02 | | Low | Low. |
| 100 | 100 | 60 to 70 | 0.5 to 0.8 | .25 to .30 | 5.0 to 6.0 | High | Low. |
| 100 | 100 | 85 to 95 | 0.2 to 0.5 | .28 to .32 | 5.5 to 6.5 | Moderate | High. |
| | | | | | | | |
| | | | | | 4.0 to 5.0 | | |
| 100 | 100 | 80 to 90 | 0.5 to 0.8 | .25 to .30 | 4.0 to 5.0 | High | Low. |
| 100 | 100 | 70 to 80 | 0.5 to 0.8 | .25 to .30 | 5.0 to 5.5 | High | Low. |
| 50 to 60 | 30 to 40 | 10 to 20 | 5 to 10 | .02 to .04 | | Low | Low. |
| | | | | | | | |
| 100 | 100 | 80 to 90 | 0.5 to 0.8 | .28 to .32 | 5.0 to 5.5 | High | Low. |
| 90 to 100 | 80 to 90 | 60 to 70 | 0.5 to 0.8 | .25 to .30 | 5.0 to 5.5 | High | Low. |
| 50 to 60 | 40 to 50 | 25 to 35 | 0.5 to 0.8 | .20 to .25 | 5.0 to 5.5 | High | Low. |
| 80 to 100 | 70 to 90 | 55 to 65 | 0.5 to 0.8 | .25 to .30 | 4.0 to 4.5 | High | Low. |
| 75 to 85 | 65 to 75 | 40 to 60 | 0.2 to 0.5 | .25 to .30 | 4.5 to 5.0 | Moderate | Moderate. |
| 60 to 90 | 50 to 75 | 35 to 60 | 0.2 to 0.5 | .20 to .25 | 4.5 to 5.0 | Moderate | Low to moderate. |
| 100 | 100 | 70 to 80 | 0.5 to 0.8 | .25 to .30 | 5.0 to 6.0 | High | Low. |
| 100 | 90 to 100 | 30 to 60 | 0.5 to 0.8 | .12 to .16 | 5.0 to 6.0 | Low to moderate | Low. |
| 40 to 50 | 25 to 40 | 5 to 10 | >10 | <.02 | | Low | Low. |
| 100 | 90 to 100 | 30 to 60 | 0.5 to 0.8 | .16 to .20 | 5.0 to 6.0 | Moderate | Low. |
| 40 to 50 | 25 to 40 | 5 to 10 | >10 | <.02 | | Low | Low. |

TABLE 5.—*Estimated properties*

| Soil name and map symbols | Depth from surface | Classification | | |
|---|---|---|---|---|
| | | USDA texture | Unified | AASHO |
| | *Inches* | | | |
| Talkeetna silt loam (TaE). | 0 to 14 | Silt loam | ML | A-4 |
| | 14 to 21 | Gravelly sandy loam | GM | A-1 |
| | 21 to 30 | Stony sandy loam | GM | A-1 |
| Terrace escarpments (Te). | (1) | | | |
| Tidal flats (Tf). | (1) | | | |
| Tidal marsh (Tm). | 0 to 45 | Silty clay loam | CL or CH | A-7 |
| Torpedo Lake silt loam (ToA, ToB, ToC, ToD, TpB, TpC, TpD, TpE). | 0 to 12 | Silt loam | OL or ML | A-5 or A-4 |
| (For Homestead part of TpB, TpC, TpD, and TpE, see Homestead silt loam.) | 12 to 26 | Sandy clay loam | SC or CL | A-6 or A-7 |
| Wasilla silt loam (Wa). | 0 to 8 | Silt loam | ML or CL | A-4 or A-6 |
| | 8 to 22 | Sandy clay loam | SC or CL | A-6 or A-7 |
| | 22 to 48 | Sand and silt loam | SM | A-2 |

[1] Variable.

TABLE 6.—*Engineering interpretations*

| Soil series and map symbols | Suitability as source of— | | | | Potential frost action |
|---|---|---|---|---|---|
| | Topsoil | Sand | Gravel | Road fill | |
| Anchorage (AcC, AcE, AhA, AnB, AnC, AnD, AnE). | Poor | Fair; fine sand, some silt admixture. | Unsuitable | Good | Low |
| Bodenburg (BbA, BbB, BbC, BbD, BdA, BdB, BdC, BdD, BdE, BkF). (For Knik part of BkF, see Knik series.) | Good | Unsuitable above a depth of 36 inches; substratum gravelly. | Unsuitable above a depth of 36 inches; good in substratum. | Poor above a depth of 36 inches; substratum excellent. | High above a depth of 36 inches; low in substratum. |
| Chena (Ct) | Poor | Fair; strata of fine and medium sand interbedded with poorly graded gravel; many cobblestones and stones. | Good; some large stones and many cobblestones. | Good | Low |
| Clunie (Cl) | Unsuitable; peat material. | Unsuitable | Unsuitable | Unsuitable | High |
| Coal Creek (Co, Cs) | Surface layer good but usually wet. | Unsuitable | Unsuitable | Poor | High |

*of the soils*—Continued

| Percentage passing sieve— | | | Permeability | Available water capacity | Reaction | Dispersion | Shrink-swell potential |
|---|---|---|---|---|---|---|---|
| No. 4 (4.76 mm.) | No. 10 (2 mm.) | No. 200 (0.074 mm.) | | | | | |
| | | | *Inches per hour* | *Inches per inch of soil* | *pH* | | |
| 90 to 95 | 80 to 90 | 60 to 70 | 0.8 to 1.2 | .25 to .30 | 4.5 to 5.5 | High | Low. |
| 50 to 60 | 40 to 50 | 15 to 25 | 5 to 10 | .08 to .12 | 5.0 to 5.5 | Low | Low. |
| 40 to 50 | 30 to 40 | 15 to 25 | 5 to 10 | .08 to .12 | 5.0 to 5.5 | Low | Low. |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | |
| 100 | 100 | 85 to 95 | 0.2 to 0.5 | .28 to .32 | 5.5 to 6.5 | Moderate | High. |
| 100 | 100 | 70 to 80 | 0.5 to 0.8 | .28 to .32 | 5.0 to 5.5 | High | Low. |
| 80 to 90 | 70 to 80 | 45 to 55 | 0.2 to 0.5 | .20 to .25 | 5.0 to 5.5 | Moderate | Moderate. |
| 100 | 100 | 80 to 90 | 0.5 to 0.8 | .28 to .32 | 4.5 to 5.5 | High | Low to moderate. |
| 90 to 100 | 80 to 90 | 45 to 55 | 0.2 to 0.5 | .20 to .25 | 5.0 to 5.5 | Moderate | Moderate. |
| 90 to 100 | 75 to 80 | 20 to 30 | 0.5 to 0.8 | .12 to .16 | 5.0 to 5.5 | Low | Low. |

*of the soil properties*

| Soil features affecting— | | | | | |
|---|---|---|---|---|---|
| Highway location | Pond reservoirs | Pond embankments; dikes and levees | Agricultural drainage | Irrigation | Waterways |
| Wind drifting on cleared areas along roads; poor trafficability. | Rapid permeability; excessive seepage. | Excessive seepage | Not required | Low water-holding capacity and rapid intake rate; frequent irrigation required. | Low water-holding capacity. |
| Erodibility of exposed embankments. | Moderate permeability above a depth of 36 inches; porous substratum. | Poor stability; piping; porous substratum. | Soils erodible; shallow ditches or land smoothing needed to drain slight depressions. | Medium water-holding capacity; medium intake rate. | Moderate erodibility. |
| Excessive drainage; stoniness; stable subsoil and substratum. | Rapid permeability; excessive seepage. | Excessive seepage; porous material. | Not required | Very low water-holding capacity; rapid intake rate. | Not required. |
| Peat over clayey substratum; water table at or near surface. | Permanently high water table. | Poor stability; peat is porous. | Outlets generally lacking; very low fertility. | Not required | Not required. |
| Seasonal high water table; clayey subsoil. | Poor drainage; slow permeability of subsoil; stones in places. | Fair stability; clayey material; stoniness in places. | Seasonal high water table; slow permeability of subsoil; stones in places interfere with ditch construction. | Not required | Not required. |

TABLE 6.—*Engineering interpretations*

| Soil series and map symbols | Suitability as source of— Topsoil | Sand | Gravel | Road fill | Potential frost action |
|---|---|---|---|---|---|
| Doone (DeA, DeB, DeC, DkD, DkE, DkF). (For Knik part of DkD, DkE, and DkF, see Knik series.) | Good | Unsuitable above a depth of 30 inches; substratum gravelly. | Unsuitable above a depth of 30 inches; good below. | Poor above a depth of 30 inches; substratum excellent. | High above a depth of 30 inches; low in substratum. |
| Flat Horn (FhA, FhB, FhC, FhE) | Good | Unsuitable above a depth of 20 inches; substratum fair; fine sand interbedded with silt. | Unsuitable | Fair | Medium |
| Gravelly alluvial land (Ga) | Unsuitable | Fair; some layers of sand interbedded with gravel. | Good; subject to flooding. | Good | Low |
| Gravel pits and Strip mines (Gp) | Unsuitable | Fair; some layers of sand interbedded with gravel. | Good | Good | Low |
| Homestead (HoA, HoB, HoC, HoD, HoE, HoF, HsA, HsB, HsC, HsD, HsE, HsF). | Fair; gravel at a depth of 6 to 15 inches. | Fair; some sandy strata below a depth of 6 to 15 inches; cobblestones and stones. | Good; thin overburden of silt; many cobblestones and stones. | Good | High above a depth of 6 to 15 inches; low in substratum. |
| Jacobsen (JaA, JaB) | Unsuitable; very stony. | Unsuitable | Unsuitable | Poor; difficult to work because of stones; high water table. | High |
| Jim (JbD, JbF) (For Bodenburg part of JbD and JbF, see Bodenburg series.) | Good | Unsuitable | Unsuitable | Poor; bedrock below a depth of 20 to 30 inches. | High in silty material above bedrock. |
| Kalifonsky (KaA, KaC, KaE) | Good | Unsuitable | Unsuitable above a depth of 30 inches; substratum good. | Poor | High above a depth of 30 inches; low in substratum. |
| Kenai (KeB) | Fair; contains some stones; very shallow. | Unsuitable | Unsuitable | Fair | High |
| Knik (KnA, KnB, KnC, KnD, KnE, KnF). | Good; shallow to gravelly substratum. | Fair; sandy strata interbedded with gravelly material in places below a depth of 15 to 24 inches. | Good; overburden of silty material is 15 to 24 inches thick. | Poor above a depth of 15 to 24 inches; substratum excellent. | High above a depth of 15 to 24 inches; low in substratum. |
| Matanuska (Ma) | Good; shallow to clayey subsoil. | Fair below a depth of 20 inches; thin sandy strata interbedded with gravelly material. | Unsuitable above a depth of 20 inches; substratum good. | Poor above a depth of 20 inches; substratum good. | High above a depth of 20 inches; low in substratum. |

*of the soil properties*—Continued

| Soil features affecting— | | | | | |
|---|---|---|---|---|---|
| Highway location | Pond reservoirs | Pond embankments; dikes and levees | Agricultural drainage | Irrigation | Waterways |
| Erodibility of exposed embankments. | Moderate permeability above a depth of 30 inches; porous substratum. | Poor stability; piping; porous substratum. | Not required | Medium water-holding capacity; medium intake rate. | Moderate erodibility. |
| Severe erodibility of exposed embankments. | Rapid permeability of substratum; excessive seepage. | Excessive seepage; poor stability. | Not required | Medium water-holding capacity; medium intake rate. | High erodibility. |
| Subject to frequent flooding. | Rapid permeability | Porous material | Not required | Not required | Not required. |
| Deep fill | Rapid permeability | Porous material | Not required | Not required | Not required. |
| Stoniness; deep cuts and fills. | Rapid permeability of substratum; excessive seepage. | Excessive seepage | Not required | Low water-holding capacity; shallow or very shallow. | Shallowness or extreme shallowness to gravelly substratum; vegetation difficult to establish; low fertility. |
| Poor drainage; high water table. | Many stones; high water table. | Stoniness; fair stability; moderate permeability. | Stoniness | Not required | Not required. |
| Bedrock below a depth of 20 to 30 inches. | Seepage likely through cracks in bedrock. | Poor stability of silty mantle; piping; bedrock at a depth of 20 to 30 inches. | Not required | Hilly to steep slopes | High erodibility. |
| Seasonal high water table. | Seasonal high water table; excessive seepage in substratum. | Fair stability; piping; rapid permeability of substratum. | Seasonal high water table. | Not needed | Not needed. |
| Erodibility of exposed embankments; stones. | Slow permeability of substratum. | Fair stability; slow permeability; fair compaction. | Slow permeability of substratum; shallow ditches required for slight depressions. | Slow permeability | Stoniness; vegetation difficult to establish; deep cuts expose clayey material; erodibility. |
| Deep cuts and fills in places in hilly topography. | Shallowness over rapidly permeable substratum. | Poor stability of silty material; piping; excessive seepage through gravelly substratum. | Not required | Shallowness; medium water-holding capacity; medium intake rate. | Moderate erodibility; shallowness to gravelly substratum. |
| Clayey subsoil; cobblestones below a depth of 20 inches. | Slow permeability of clayey subsoil layer; shallowness to pervious material. | Slow permeability of clayey subsoil layer; fair stability; seepage through substratum. | Clayey subsoil; shallow to gravel. | Medium water-holding capacity; slow intake rate of clayey material. | Not required. |

TABLE 6.—*Engineering interpretations*

| Soil series and map symbols | Suitability as source of— | | | | Potential frost action |
|---|---|---|---|---|---|
| | Topsoil | Sand | Gravel | Road fill | |
| Mixed alluvial land (Ml) | Poor; variable texture. | Fair | Fair; seasonal high water table. | Fair | Low |
| Moose River (Mr) | Poor | Poor; seasonal high water table; sand interbedded with thin silty lenses. | Poor; seasonal high water table. | Fair; difficult to excavate when water table is high. | Medium to high |
| Nancy (NaA, NaB, NaC, NaD, NaE). | Good | Unsuitable above a depth of 20 inches; fair below; sandy strata interbedded with gravelly material. | Unsuitable above a depth of 20 inches; good in substratum. | Poor above a depth of 20 inches; substratum excellent. | High above a depth of 20 inches; low in substratum. |
| Naptowne (NpA, NpB, NpC, NpD, NpE, NpF). | Good | Poor; mixed with gravel and stones, also some silt. | Fair; substratum contains admixture of silt. | Poor above a depth of 20 inches; substratum good. | High above a depth of 20 inches; low in substratum. |
| Niklason (Ns, Nv) | Fair | Fair to poor; sandy subsoil contains silty lenses. | Good below a depth of 15 to 30 inches. | Poor in upper part; substratum good to excellent. | High to medium in upper part; low in substratum. |
| Reedy (Re) | Fair | Poor; very fine sandy, silty, and clayey materials. | Unsuitable | Poor | Medium to high |
| Rough mountainous land (Rm) | Poor | Poor | Unsuitable | Poor | Low |
| Salamatof (Sa, Sf) | Unsuitable; raw, acid peat. | Unsuitable | Unsuitable | Unsuitable | High |
| Schrock (ShA, ShB) | Good | Poor; stratified silty and fine sandy materials; gravelly substratum. | Unsuitable above a depth of 20 to 50 inches; substratum good. | Poor; thick silty overburden. | High |
| Sea cliffs (Sl) | Poor | Poor | Fair; contains strata of fine material. | Fair | Medium |
| Slikok (Sm, Sn) | Good but difficult to excavate because of high water table. | Unsuitable | Unsuitable | Poor | High |

*of the soil properties*—Continued

| Soil features affecting— | | | | | |
|---|---|---|---|---|---|
| Highway location | Pond reservoirs | Pond embankments; dikes and levees | Agricultural drainage | Irrigation | Waterways |
| Occasional flooding | Seasonal high water table; rapid permeability. | Stoniness; rapid permeability. | Not required | Not required | Not required. |
| Poor drainage | Fluctuating water table; excessive seepage. | Excessive seepage | Rapid permeability of subsoil and substratum; ditches needed to control water table. | Not required | Not required. |
| Erodibility of embankments. | Moderate permeability above a depth of 20 inches; rapid permeability of substratum. | Poor stability of silty material; porous, gravelly substratum. | Not required | Medium water-holding capacity; medium intake rate; low fertility. | Moderate erodibility. |
| Many cuts and fills in hilly topography; many stones in substratum. | Moderate permeability of substratum. | Poor stability of upper layers of silty material; moderately porous substratum; stoniness. | Not required | Medium water-holding capacity; medium intake rate; low fertility. | Moderate erodbility. |
| Flooding in places | Seepage in places | Moderate permeability of silty and very fine sandy material; seepage. | Not required | Medium water-holding capacity. | Not required. |
| Clayey substratum | Moderate permeability above a depth of 20 inches; slow permeability of substratum. | Poor stability of upper layers; clayey substratum difficult to compact. | Slowly permeable substratum. | Medium water-holding capacity; medium intake rate; clayey substrata. | Not required. |
| Exposed bedrock; deep cuts and fills. | Exposed bedrock | Bedrock | Not required | Not required | Not required. |
| Very poor drainage of peat; water table always near surface. | Peat material porous. | Peat material porous. | Outlets generally lacking; very low fertility. | Not required | Not required. |
| Erodibility of exposed embankments. | Moderate permeability above a depth of 20 to 50 inches; rapid permeability of substratum. | Poor stability of silty material when wet; excessive seepage through substratum. | Not required | Medium water-holding capacity; medium intake rate. | Moderate erodibility. |
| Very steep slopes; high erodibility. | Very steep slopes | Very steep slopes | Not required | Not required | Very steep slopes; high erodibility. |
| Poor drainage; high content of organic matter. | High content of organic matter; stoniness in places. | High content of organic matter; stoniness in places. | Moderate permeability; drainage ditches required to lower water table but not feasible in stony areas. | Not required | Not required. |

TABLE 6.—*Engineering interpretations*

| Soil series and map symbols | Suitability as source of— Topsoil | Sand | Gravel | Road fill | Potential frost action |
|---|---|---|---|---|---|
| Spenard (SpA, SpB) | Fair | Unsuitable | Unsuitable | Poor | High |
| Susitna (Su, Sv, SwA) (For Niklason part of SwA, see Niklason series.) | Good | Fair to poor; sandy subsoil contains silty lenses. | Good below a depth of 2½ to 4 feet. | Poor in upper part; substratum good to excellent. | High to medium in upper part; low in substratum. |
| Talkeetna (TaE) | Fair | Poor; mixed with silt and gravel. | Fair; contains silty material. | Good to fair | High |
| Terrace escarpments (Te) | Poor | Fair | Good | Good to fair | Low |
| Tidal flats (Tf) | Poor | Poor | Unsuitable | Unsuitable | High |
| Tidal marsh (Tm) | Fair to poor | Poor | Unsuitable | Unsuitable | High |
| Torpedo Lake (ToA, ToB, ToC, ToD, TpB, TpC, TpD, TpE). (For Homestead part of TpB, TpC, TpD, and TpE, see Homestead series.) | Fair; stony in places. | Unsuitable | Unsuitable | Poor | High |
| Wasilla (Wa) | Good | Poor | Poor | Poor | High |

TABLE 7.—*Engineering*

[Tests performed by the Alaska Department of Highways under a cooperative agreement with the U.S. Department of Commerce, Bureau

| Soil name and location | Parent materia | Report No. | Depth | Horizon | Moisture-density data [1] Maximum dry density | Optimum moisture |
|---|---|---|---|---|---|---|
| | | | *In.* | | *Lb. per cu. ft.* | *Pct.* |
| Homestead silt loam: SE¼NW¼ sec. 5, T. 15 N., R. 4 W. (modal) | Silty loess over loose sand and gravel. | 64F1012 | 2 to 5 | B22 | | |
| | | 64F1013 | 5 to 11 | B3 | | |
| | | 64F1014 | 11 to 20 | IIC | 139 | 7 |
| SE¼SE¼ sec. 34, T. 18 N., R. 1 E. (nonmodal—sandy substratum) | Silty loess over fine sand underlain by very gravelly coarse sand. | 64F1023 | 2 to 12 | B21 | 92 | 23 |
| | | 64F1024 | 17 to 20 | B2b | 104 | 14 |
| | | 64F1025 | 23 to 30 | IIC2 | 131 | 6 |
| NE¼SW¼ sec. 26, T. 18 N., R. 3 W. (nonmodal—gravelly sandy loam till substratum) | Silty loess over coarse glacial till. | 64F1026 | 2 to 5 | B21 | 92 | 24 |
| | | 64F1027 | 5 to 10 | B22 | 100 | 20 |
| | | 64F1028 | 14 to 22 | IIC | 131 | 7 |

See footnotes at end of table.

*of the soil properties*—Continued

| Soil features affecting— | | | | | |
|---|---|---|---|---|---|
| Highway location | Pond reservoirs | Pond embankments; dikes and levees | Agricultural drainage | Irrigation | Waterways |
| Impeded drainage; clayey subsoil and substratum; seasonal high water table. | Slow permeability of subsoil and substratum; seasonal high water table. | Good stability; slow permeability; fair compaction. | Slow permeability; ditches needed to lower water table. | Not required | Clayey subsoil. |
| Flooding in places | Excessive seepage | Moderate permeability of silty and very fine sandy material; seepage. | Not required | Moderate water-holding capacity. | Not required. |
| Steepness of slopes | Porous substratum; steep slopes. | Steep slopes | Not required | Not required | High erodibility; stony in places. |
| Very steep slopes | Very steep slopes; porous material. | Very steep slopes; porous material. | Not required | Not required | High erodibility; very steep slopes. |
| Frequent inundation by high tides. | Frequent inundation by high tides. | Poor stability | Too low for outlet ditches. | Not required | Not required. |
| Occasional flooding | High water table | Fair stability; clayey material. | Clayey substratum; occasional flooding. | Not required | Not required. |
| Poor drainage; clayey substratum. | High water table; slow permeability of substrata. | Fair stability; slow permeability of substratum. | Slow permeability | Not required | Stoniness; clayey substratum. |
| Poor drainage; seasonal high water table. | Slow permeability of clayey subsoil layer; seepage through sandy layers. | Slow permeability of clayey layer. | Seasonal high water table; ditches needed to control water table. | Not required | Not required. |

*test data*

of Public Roads; tests performed in accordance with standard procedures of the American Association of State Highway Officials (*2*)]

| Mechanical analysis [2] | | | | | | | | | | | | | | Liquid limit | Plasticity index | Classification | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Percentage passing sieve— | | | | | | | | | | Percentage smaller than— | | | | | | | |
| 3-in. | 2-in. | 1½-in. | 1-in. | ¾-in. | ⅜-in. | No. 4 (4.76 mm.) | No. 10 (2.0 mm.) | No. 40 (0.42 mm.) | No. 200 (0.074 mm.) | 0.05 mm. | 0.02 mm. | 0.005 mm. | 0.002 mm. | | | AASHO | Unified |
| ------ | ------ | ------ | ------ | ------ | ------ | ------ | 100 | 95 | 72 | 55 | 28 | 6 | 3 | 53 | [3] NP | A-5(10) | MH. |
| ------ | ------ | ------ | ------ | 100 | 97 | 96 | 95 | 91 | 77 | 55 | 34 | 6 | 3 | 43 | NP | A-5(9) | ML. |
| ------ | 100 | 94 | 80 | 69 | 52 | 39 | 26 | 7 | 2 | ------ | ------ | ------ | ------ | [4] NV | NP | A-1-a(0) | GW. |
| ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 100 | 74 | ------ | 39 | 8 | 3 | 37 | NP | A-4(8) | ML. |
| ------ | ------ | ------ | ------ | ------ | ------ | ------ | 100 | 98 | 15 | 7 | 4 | 1 | ------ | NV | NP | A-2-4(0) | SM. |
| 72 | 69 | 65 | 53 | 46 | 34 | 27 | 22 | 9 | 1 | ------ | ------ | ------ | ------ | NV | NP | A-1-a(0) | GW. |
| ------ | ------ | ------ | ------ | ------ | ------ | 100 | 98 | 92 | 63 | 55 | 25 | 5 | 1 | 38 | 5 | A-4(6) | ML. |
| ------ | ------ | ------ | ------ | 100 | 96 | 94 | 94 | 88 | 73 | ------ | 30 | 4 | 1 | 47 | NP | A-4(8) | ML. |
| 82 | ------ | 75 | 72 | 70 | 59 | 53 | 44 | 34 | 19 | 15 | 10 | 3 | 1 | NV | NP | A-1-b(0) | GM. |

TABLE 7.—*Engineering*

| Soil name and location | Parent material | Report No. | Depth | Horizon | Moisture-density data [1] | |
|---|---|---|---|---|---|---|
| | | | | | Maximum dry density | Optimum moisture |
| | | | *In.* | | *Lb. per cu. ft.* | *Pct.* |
| Knik silt loam: | | | | | | |
| SE¼SW¼ sec. 29, T. 18 N., R. 1 E. (modal) | Silty loess over loose gravelly coarse sand. | 64F1029 | 0 to 4 | A2 | 82 | 27 |
| | | 64F1030 | 11 to 17 | C2 | 107 | 17 |
| | | 64F1031 | 19 to 30 | IIC4 | 112 | 11 |
| SE¼SE¼ sec. 34, T. 18 N., R. 1 E. (nonmodal—sandy substratum) | Silty loess over medium sand underlain by gravelly coarse sand. | 64F1032 | 1½ to 7 | B | 97 | 21 |
| | | 64F1033 | 9 to 15 | C2 | 100 | 18 |
| | | 64F1034 | 15 to 30 | IIC3 | 107 | 13 |
| SW¼SE¼ sec. 22, T. 18 N., R. 2 E. (nonmodal—finer textured substratum) | Silty loess over gravelly loam. | 64F1035 | 0 to 4 | A2 | 78 | 30 |
| | | 64F1036 | 10 to 18 | C2 | 94 | 23 |
| | | 64F1037 | 18 to 30 | IIC3 | 130 | 8 |
| Naptowne silt loam: | | | | | | |
| NE¼SE¼ sec. 26, T. 16 N., R. 4 W. (modal) | Silty loess over moderately firm gravelly sandy loam till. | 64F1009 | 5 to 10 | B3 | --- | --- |
| | | 64F1010 | 10 to 15 | C1 | 114 | 12 |
| | | 64F1011 | 15 to 24 | IIC2 | 135 | 8 |
| SE¼NE¼ sec. 4, T. 15 N., R. 3 W. (nonmodal—sandy substratum) | Silty loess over very fine sandy loam material underlain by moderately firm gravelly sandy loam till. | 64F1017 | 3½ to 8 | B22 | 100 | 19 |
| | | 64F1018 | 12 to 19 | C1 | 108 | 14 |
| | | 64F1019 | 19 to 30 | IIC2 | 138 | 7 |
| NW¼SW¼ sec. 30, T. 18 N., R. 2 W. (nonmodal—shallower, coarser textured substratum) | Silty loess over very gravelly sandy loam till. | 64F1020 | 1½ to 6 | B21 | 91 | 22 |
| | | 64F1021 | 6 to 9 | B22 | 106 | 19 |
| | | 64F1022 | 12 to 22 | IIC1 | 132 | 7 |
| Spenard silt loam: | | | | | | |
| SW¼SE¼ sec. 16, T. 18 N., R. 3 W. (modal) | Silty loess or colluvium over firm, moderately fine textured glacial till. | 64F1015 | 5 to 14 | IIC1g | 106 | 17 |
| | | 64F1016 | 14 to 31 | IIC2g | 124 | 11 |
| NW¼NE¼ sec. 20, T. 18 N., R. 3 W. (nonmodal—finer textured substratum) | Loamy colluvium over firm clay loam till. | 64F1038 | 0 to 12 | C1g | 102 | 18 |
| | | 64F1039 | 12 to 24 | C2g | 118 | 13 |
| NW¼SE¼ sec. 23, T. 18 N., R. 3 W. (nonmodal—coarser textured substratum) | Silty loess or colluvium over moderately firm sandy loam till. | 64F1040 | 0 to 4 | C1g | 88 | 22 |
| | | 64F1041 | 4 to 12 | C2g | 123 | 11 |
| | | 64F1042 | 22 to 30 | C4 | 125 | 10 |

[1] Based on AASHO Designation: T 180-57, Method D (*2*); dashes indicate horizon was not tested.
[2] Mechanical analyses were made according to AASHO Designation: T 88-57 (*2*). Results by this procedure may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method

*Erosion.*—Although heavy showers are not common in the Area, sloping silty soils of the uplands are subject to erosion after the vegetation is removed. Erosion generally can be controlled, however, by stripcropping, cultivating on the contour, and keeping waterways in sod. Terraces, dams, and similar structures generally are not needed unless steep slopes are cleared and farmed. Grass seeding is needed to control washing from highway cuts.

## Soil Test Data

Profiles of soils in four extensive soil series were tested according to standard procedures (*2*), as shown in table 7. Samples were chosen to indicate the range in physical properties of each series. For each series there are test data on three soil profiles. One profile represents the modal, or typical, characteristics of the soil series; the other two profiles are within the allowable range of variation for the series but differ from the modal profile in texture, consistence, or some other property significant in engineering.

Moisture-density tests were made to determine the greatest density to which the soils could be compacted. If a soil is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material will *test data*—Continued

| Mechanical analysis [2] | | | | | | | | | | | | | | Liquid limit | Plasticity index | Classification | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Percentage passing sieve— | | | | | | | | | | Percentage smaller than— | | | | | | AASHO | Unified |
| 3-in. | 2-in. | 1½-in. | 1-in. | ¾-in. | ⅜-in. | No. 4 (4.76 mm.) | No. 10 (2.0 mm.) | No. 40 (0.42 mm.) | No. 200 (0.074 mm.) | 0.05 mm. | 0.02 mm. | 0.005 mm. | 0.002 mm. | | | | |
| ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 100 | 92 | 60 | 37 | 7 | 4 | 44 | 1 | A-5(9) | ML. |
| ------ | ------ | ------ | ------ | 100 | 98 | 97 | 96 | 84 | 69 | ------ | 32 | 8 | 3 | 30 | NP | A-4(7) | ML. |
| ------ | ------ | ------ | ------ | 100 | 94 | 90 | 86 | 53 | 4 | 2 | 1 | 0 | 0 | NV | NP | A-3(0) | SP. |
| ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 100 | 89 | ------ | 24 | 5 | 2 | 39 | NP | A-4(8) | ML. |
| ------ | ------ | ------ | ------ | ------ | ------ | ------ | 100 | 98 | 89 | ------ | 35 | 6 | 1 | 32 | NP | A-4(8) | ML. |
| ------ | ------ | ------ | ------ | 100 | 99 | 99 | 98 | 59 | 3 | 1 | 1 | 0 | 0 | NV | NP | A-3(0) | SP. |
| ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 100 | 94 | 69 | 40 | 8 | 2 | 55 | NP | A-5(11) | MH. |
| ------ | ------ | ------ | ------ | ------ | ------ | 100 | 99 | 96 | 83 | ------ | 41 | 10 | 3 | 42 | NP | A-5(8) | ML. |
| ------ | 100 | 86 | 86 | 71 | 62 | 55 | 44 | 30 | 15 | 12 | 6 | 1 | 0 | NV | NP | A-1-a(0) | GM. |
| ------ | ------ | ------ | ------ | ------ | ------ | ------ | 100 | 99 | 76 | 56 | 19 | 5 | 2 | 32 | 4 | A-4(8) | ML. |
| ------ | ------ | ------ | ------ | ------ | ------ | 100 | 99 | 96 | 63 | 40 | 13 | 4 | 1 | 22 | 3 | A-4(6) | ML. |
| ------ | ------ | 100 | 94 | 87 | 80 | 72 | 62 | 50 | 32 | 43 | 20 | 10 | 3 | 16 | NP | A-2-4(0) | SM. |
| ------ | ------ | ------ | ------ | ------ | ------ | 100 | 99 | 97 | 58 | 46 | 22 | 5 | 3 | 31 | NP | A-4(5) | ML. |
| ------ | ------ | ------ | ------ | ------ | ------ | ------ | ------ | 100 | 80 | 50 | 11 | 2 | 0 | 25 | NP | A-4(8) | ML. |
| ------ | ------ | 100 | 94 | 87 | 79 | 71 | 65 | 53 | 30 | 22 | 16 | 6 | 3 | 15 | NP | A-2-4(0) | SM. |
| ------ | ------ | ------ | ------ | ------ | 100 | 98 | 96 | 89 | 67 | 53 | 35 | 8 | 4 | 56 | NP | A-4(6) | MH. |
| ------ | ------ | 100 | 91 | 91 | 84 | 79 | 72 | 53 | 24 | 20 | 10 | 3 | 1 | 45 | NP | A-2-4(0) | SM. |
| ------ | 100 | 88 | 88 | 82 | 73 | 66 | 56 | 44 | 26 | 20 | 13 | 4 | 2 | 14 | NP | A-2-4(0) | SM. |
| ------ | ------ | 100 | 94 | 93 | 88 | 84 | 80 | 73 | 54 | 49 | 30 | 12 | 6 | 33 | 3 | A-4(3) | ML. |
| ------ | ------ | 100 | 97 | 95 | 91 | 86 | 80 | 69 | 39 | 35 | 24 | 11 | 8 | 21 | NP | A-4(0) | SM. |
| ------ | ------ | ------ | ------ | 100 | 93 | 90 | 88 | 83 | 57 | 47 | 32 | 9 | 2 | 39 | NP | A-4(4) | OL or ML. |
| ------ | ------ | ------ | 100 | 97 | 95 | 93 | 91 | 84 | 64 | ------ | 43 | 25 | 17 | 29 | 5 | A-4(6) | ML. |
| ------ | 100 | 81 | 73 | 69 | 67 | 65 | 61 | 59 | 48 | ------ | 25 | 6 | 2 | 41 | NP | A-4(3) | GM or OL. |
| ------ | ------ | ------ | ------ | 100 | 97 | 94 | 91 | 83 | 54 | 47 | 36 | 18 | 13 | 26 | 1 | A-4(4) | ML. |
| ------ | ------ | ------ | ------ | 100 | 99 | 98 | 96 | 87 | 36 | 30 | 21 | 12 | 8 | 19 | NP | A-4(0) | SM. |

and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

[3] NP=Nonplastic.

[4] NV=No value.

increase until the optimum moisture content is reached. After that, density decreases as moisture content increases. The highest density reached is referred to as "maximum dry density," and the corresponding moisture content is the "optimum moisture content." Moisture-density relationships are important in earthwork, for as a rule optimum stability of soil material is obtained if the material is compacted to maximum dry density, and this is most easily done at the optimum moisture content.

Mechanical analyses were made to determine the percentages of clay and coarser material in the soils. The analyses were made by a combination of the sieve and hydrometer methods. Percentages of clay determined by the hydrometer method should not be used in naming soil textural classes.

Liquid limit and plastic limit tests measure the effect of water on the consistence of soil material. As the moisture content of a clayey soil increases from a dry state, the material changes from a semisolid to a plastic state. As the moisture content further increase, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It

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indicates the range of moisture content within which a soil material is in a plastic condition.

# *Formation and Classification of the Soils*

Soils are natural, three-dimensional bodies on the earth's surface that contain living matter and support plants or are capable of supporting plants (*15*).

## Factors of Soil Formation

Five major factors influence the formation of soil (*6*). They are climate, living organisms, parent material, topography, and time. The nature and characteristics of any given soil are dependent upon the combined influence of these factors, plus the effects of man.

Climate, apart from its direct influence on soil properties, also determines to a large extent the kind of living organisms in a particular area. Living organisms, in turn, influence the characteristics of the soil. Local variations in relief affect the nature and intensity of soil formation. For example, in low-lying areas a permanent high water table may cause the formation of a different kind of soil than is formed in well-drained uplands within the same general region. The composition of the parent material determines the kind of soil that can be formed. Time, along with the other factors, determines the extent to which parent material is modified. The length of time a soil has been developing is reflected in the depth of the soil and in differences in the layers of the profile.

### *Parent material*

Most soils on uplands of the Matanuska Valley Area formed in silty wind-laid material, or loess, that has been deposited over gravelly terrace material, glacial till, or bedrock. This loessal deposit ranges from more than 60 inches in thickness to less than 10 inches. It is thicker near the Matanuska and Knik Rivers and thinner in the western part of the Area and at higher elevations. The underlying terrace material consists mostly of rounded gravel and coarse sand. Generally, the glacial till is gravelly but contains a somewhat higher proportion of fine-grained material than the terrace deposits.

Other soils formed in sandy material along Knik Arm and the major rivers, in shale and sandstone sediments near Houston, and in stratified sandy and silty material on alluvial plains and on some stream terraces. On flood plains of the smaller streams and in depressions on the uplands, the soils formed in material washed from surrounding slopes. Most of these soils are silty, but some are sandy.

Peat soils that formed mostly from remains of mosses, sedges, and other low-growing plants fill many depressions and also occur on a few steep, north-facing slopes. The peat bogs, or muskegs, range from less than an acre in size to several square miles.

### *Climate*

The Matanuska Valley Area is characterized by cool summers and moderately cold winters. The annual rainfall is only about 16 inches, but since the rates of evaporation and of transpiration are low, much of the rainfall percolates through the soil and is effective in leaching. This action results in acid soils that are low in the major nutrient elements.

### *Living organisms*

In this climate, the well-drained soils of the uplands generally support a forest in which white spruce, paper birch, and quaking aspen are dominant. The somewhat poorly drained and poorly drained soils commonly have a forest cover of black spruce and willow. Black spruce also grows in many of the muskegs, but in large tracts of muskeg, there is only a dense mat of low-growing shrubs. Sedges are dominant on tidal soils. A more detailed description of the vegetation of the Area is given in the section "General Nature of the Area."

### *Relief*

On these comparatively young soils, the effect of relief and topographic position is not so great as on older soils. Thickness of the loess, for example, is related more to distance from the river flood plains than to steepness of slope, and soil development is about as far advanced on the steep uplands as on the level or gently sloping uplands. Most depressions and low areas, however, are not well drained, and the soils in them ordinarily exhibit characteristics associated with wet conditions.

### *Time*

All of the soils developed in the relatively short time since the recession of the ice sheet that covered the Matanuska Valley Area. Loess is still being deposited over parts of the Area, and soils there show only weak horizon differentiation. In most of the Area, profile development is not so far advanced as in other parts of the Cook Inlet-Susitna Lowland.

## Classification of the Soils

Soils are classified so that we may more easily identify their significant characteristics. Classification enables us to assemble knowledge about soils, to see their relationships to one another and to the whole environment, and to understand their behavior and their response to use. Thus, through classification, and then through the use of soil maps, we can apply our knowledge of soils to specific tracts of land.

In the system of soil classification adopted for use by the National Cooperative Soil Survey in 1965 (*15*), soils are placed in six categories. Beginning with the highest, these are the order, suborder, great group, subgroup, family, and series. The soil series are classified in table 8 by order, subgroup, and family. Soil families in the Matanuska Valley Area are separated on the basis of texture and, in the case of those in the Entisol order, degree of acidity.

Table 8 also shows great soil group and order for the soil series according to the system of classification used before 1965 (*14*). In that system and its later modification (*12*), soils were also placed in six categories—order, suborder, great soil group, family, series, and type. That

TABLE 8.—*Classification of soil series according to the current and the 1938 systems of classification*

| Series | Current classification | | | 1938 classification | |
|---|---|---|---|---|---|
| | Family | Subgroup | Order | Great soil group | Order |
| Anchorage | Sandy, mixed | Entic Cryorthod | Spodosol | Podzol | Zonal. |
| Bodenburg | Coarse-silty over sandy or sandy-skeletal, mixed, nonacid. | Typic Cryorthent | Entisol | Regosol | Azonal. |
| Chena | Sandy-skeletal, mixed, nonacid | Typic Cryopsamment | Entisol | Regosol | Azonal. |
| Clunie | | | Histosol [1] | Bog | Intrazonal. |
| Coal Creek | Coarse-silty, mixed, nonacid | Humic Cryaquept | Inceptisol | Humic Gley | Intrazonal. |
| Doone | Coarse-silty over sandy or sandy-skeletal, mixed, acid. | Typic Cryorthent | Entisol | Regosol | Azonal. |
| Flat Horn | Coarse-loamy, mixed | Typic Cryorthod | Spodosol | Podzol | Zonal. |
| Homestead | Loamy-skeletal, mixed | Typic Cryorthod | Spodosol | Podzol | Zonal. |
| Jacobsen | Loamy-skeletal, mixed, acid | Histic Cryaquept | Inceptisol | Humic Gley | Intrazonal. |
| Jim | Coarse-silty, mixed, nonacid | Typic Cryorthent | Entisol | Regosol | Azonal. |
| Kalifonsky | Coarse-silty over sandy or sandy-skeletal, mixed, acid. | Typic Cryaquept | Inceptisol | Low-Humic Gley | Intrazonal. |
| Kenai | Coarse-silty, mixed | Typic Cryorthod | Spodosol | Podzol | Zonal. |
| Knik | Coarse-silty over sandy or sandy-skeletal, mixed, acid. | Typic Cryorthent | Entisol | Regosol | Azonal. |
| Matanuska | Fine-silty over sandy or sandy-skeletal, mixed, nonacid. | Typic Cryorthent | Entisol | Regosol | Azonal. |
| Moose River | Sandy, mixed, nonacid | Typic Cryaquent | Entisol | Low-Humic Gley | Intrazonal. |
| Nancy | Coarse-silty over sandy or sandy-skeletal, mixed. | Typic Cryorthod | Spodosol | Podzol | Zonal. |
| Naptowne | Coarse-loamy, mixed | Typic Cryorthod | Spodosol | Podzol | Zonal. |
| Niklason | Coarse-loamy over sandy or sandy-skeletal, mixed, nonacid. | Typic Cryofluvent | Entisol | Alluvial | Azonal. |
| Reedy | Fine-silty, mixed, nonacid | Typic Cryaquept | Inceptisol | Alluvial | Azonal. |
| Salamatof | | | Histosol [1] | Bog | Intrazonal. |
| Schrock | Coarse-loamy, mixed | Typic Cryorthod | Spodosol | Brown Podzolic | Zonal. |
| Slikok | Coarse-silty, mixed, acid | Histic Cryaquept | Inceptisol | Humic Gley | Intrazonal. |
| Spenard | Fine-loamy, mixed, acid | Humic Cryaquept | Inceptisol | Low-Humic Gley | Intrazonal. |
| Susitna | Coarse-loamy, mixed, nonacid | Typic Cryofluvent | Entisol | Alluvial | Azonal. |
| Talkeetna | Loamy-skeletal, mixed | Cryic Humic Fragiorthod | Spodosol | Podzol | Zonal. |
| Torpedo Lake | Fine-loamy, mixed, acid | Histic Cryaquept | Inceptisol | Humic Gley | Intrazonal. |
| Wasilla | Fine-loamy, mixed, acid | Typic Cryaquept | Inceptisol | Low-Humic Gley | Intrazonal. |

[1] The classification of Histosols below the order has not yet been established.

system was replaced because it was incomplete and did not sufficiently emphasize characteristics of the soil in determining its classification.

Following are brief definitions of the orders and subgroups in the current classification, as represented in the Matanuska Valley Area.

### *Entisols*

Entisols have few, if any, clearly expressed characteristics. In the Matanuska Valley Area, Entisols occur in material recently deposited by wind or water. They are represented by the *Typic Cryaquents*, which are poorly drained, by the *Typic Cryopsamments*, which are well drained and coarse textured, by the *Typic Cryorthents*, which are well drained and medium textured or fine textured, and by the *Typic Cryofluvents*, which are well drained and consist of stratified, moderately coarse textured and finer textured materials.

### *Histosols*

Histosols are composed primarily of organic material. The classification of these soils in categories below the order has not yet been established.

### *Inceptisols*

Inceptisols are soils in which there has been modification of the parent material in place. In the Matanuska Valley Area, the only Inceptisols that are recognized are soils that developed under cold, wet conditions. These soils, the Cryaquepts, are characterized by gray, olive, or greenish colors with brown or reddish-brown mottles and streaks. In *Typic Cryaquepts*, no dark upper horizon has developed, and no thick mat of moss has accumulated on the surface. *Humic Cryaquepts* have a thick, dark-colored surface horizon. *Histic Cryaquepts* have a fairly thick deposit of peat or muck on the surface.

### *Spodosols*

These are soils in which leaching (eluviation) has caused an accumulation of organic carbon, together with iron and aluminum, in an illuvial horizon of the profile. This horizon generally is dark brown or reddish brown. Above the illuvial horizon, a gray eluvial layer also commonly occurs at the surface of the mineral soil, but it may not occur in young Spodosols. Between the main illuvial horizon and the unaltered parent material, there is a transitional horizon. As a rule, the entire solum is less than 16 inches thick. During the process of formation, most basic cations are replaced by hydrogen ions. As a result the solum is strongly acid.

The Spodosols in the Matanuska Valley Area are comparatively young and formed under only moderate precipitation. Because of this, and because the parent material of most of the soils is silty rather than sandy, the Spodosols in this Area are not so highly developed as those in southeastern Alaska or those in parts of the northeastern United States. The illuvial horizons are not so dark as in some of those soils, and they do not normally contain concretions of iron oxide.

*Typic Cryorthods* are well-drained Spodosols that occur in cold regions and have a moderate amount of organic matter in the illuvial horizon. *Entic Cryorthods* are like the *Typic*, except that they contain less than 2 percent organic matter in the uppermost 4 inches of the illuvial horizon. *Cryic Humic Fragiorthods* are well-drained Spodosols that occur in cold regions, have a large amount of organic matter in the illuvial horizon, and have a firm substratum.

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## Glossary

**Acidity.** See Reaction, soil.

**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.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

*Loose.*—Noncoherent; will not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle to moderate pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.

*Sticky.*—When wet, adheres to other material; tends to stretch somewhat and pull apart, rather than pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard and brittle; little affected by moistening.

**Drainage, soil.** The relative rapidity and extent of removal of water, under natural conditions, from the surface and within the soil. Terms commonly used to describe drainage are as follows:

*Very poorly drained.*—Water is removed so slowly that the soil remains wet most of the time, and water ponds on the surface frequently. The water table is at the surface most of the time.

*Poorly drained.*—Water is removed so slowly that the soil remains wet for much of the time. The water table is at or near the surface during a considerable part of the year.

*Somewhat poorly drained.*—Water is removed so slowly that the soil is wet for significant periods but not all the time.

*Moderately well drained.*—Water is removed somewhat slowly, and the soil is wet for a small but significant part of the time.

*Well drained.*—Water is removed readily but not rapidly.

*Somewhat excessively drained.*—Water is removed so rapidly that only a small part is available to plants. Only a narrow range of crops can be grown, and yields are usually low unless the soil is irrigated.

*Excessively drained.*—Water is removed very rapidly. Enough precipitation commonly is lost to make the soil unsuitable for ordinary crops.

**Eluviation.** The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes and that differs in one or more ways from adjacent horizons in the same profile.

**Loam.** A textural class that includes soil that is 7 to 20 percent clay, 28 to 50 percent silt, and less than 52 percent sand. The word "loam" is also used as part of other textural class names; for example, silt loam, a class name that indicates textural properties between those of loam and those of silt.

**Moisture-supplying capacity, or available moisture capacity.** The capacity of a soil to hold water in a form available to plants.

The amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

**Mottled.** Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. 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 these: *fine*, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

**Native vegetation.** The vegetation under which the soil formed.

**Nurse crop.** A companion crop grown to protect some other crop sown with it, as small grain is sometimes seeded with clover.

**Permeability, soil.** The quality of a soil that enables water or air to move through it. Terms used to describe permeability are as follows: *Very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

**pH.** See Reaction, soil.

**Reaction, soil.** The degree of acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction, because it is neither acid nor alkaline. Degrees of acidity or alkalinity are expressed as follows:

| | *pH* |
|---|---|
| Extremely acid | Below 4.5 |
| 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 |

**Sand.** As a soil separate, individual rock or mineral fragments ranging from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be of any mineral composition. As a textural class, any soil that contains 85 percent or more sand and not more than 10 percent clay.

**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 textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Solum, soil.** The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying parent material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

**Structure, soil.** The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. 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 (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

**Subsoil.** Technically, the B horizon; roughly, the part of the profile below plow depth.

**Substratum.** Any layer beneath the solum or true soil; the C or R horizon.

**Surface layer.** A term used in nontechnical soil descriptions for one or more layers above the subsoil. It includes the A horizon and part of the B horizon; has no depth limit.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. (See also Clay, Sand, and Silt.) The basic textural classes, in order of increasing proportions of fine particles, are as follows: 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 into coarse, fine, or very fine.

**Tilth, soil.** The condition of the soil, especially the structure, in relation to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

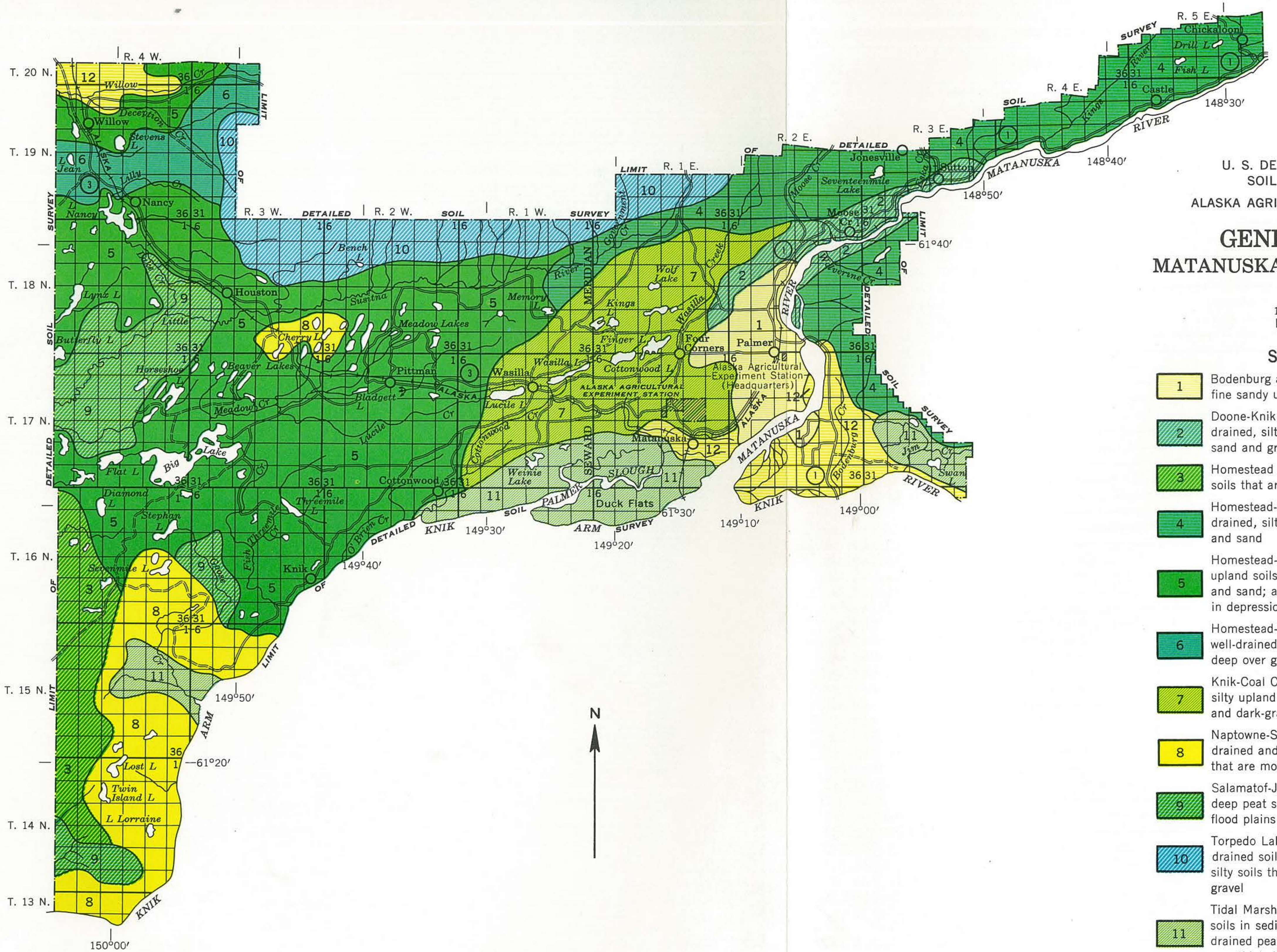
## GUIDE TO MAPPING UNITS

[For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs.

[See table 3, page 13, for approximate acreage and proportionate extent of soils; table 4, page 37, for estimated yields; tables 5, 6, and 7, pages 50, 54, and 60, for engineering properties of soils]

| Map symbol | Mapping unit | Described on page | Management group Number | Management group Page |
|---|---|---|---|---|
| AcC | Anchorage sand, undulating to rolling | 15 | 16 | 44 |
| AcE | Anchorage sand, hilly to steep | 15 | 30 | 45 |
| AhA | Anchorage silt loam, nearly level | 15 | 16 | 44 |
| AnB | Anchorage very fine sandy loam, undulating | 16 | 16 | 44 |
| AnC | Anchorage very fine sandy loam, rolling | 16 | 16 | 44 |
| AnD | Anchorage very fine sandy loam, hilly | 16 | 23 | 45 |
| AnE | Anchorage very fine sandy loam, moderately steep | 16 | 30 | 45 |
| BbA | Bodenburg silt loam, nearly level | 16 | 2 | 41 |
| BbB | Bodenburg silt loam, undulating | 16 | 4 | 42 |
| BbC | Bodenburg silt loam, rolling | 16 | 6 | 42 |
| BbD | Bodenburg silt loam, hilly | 17 | 13 | 43 |
| BdA | Bodenburg very fine sandy loam, nearly level | 17 | 1 | 41 |
| BdB | Bodenburg very fine sandy loam, undulating | 17 | 3 | 42 |
| BdC | Bodenburg very fine sandy loam, rolling | 17 | 5 | 42 |
| BdD | Bodenburg very fine sandy loam, hilly | 17 | 13 | 43 |
| BdE | Bodenburg very fine sandy loam, moderately steep | 17 | 20 | 44 |
| BkF | Bodenburg and Knik silt loams, steep | 18 | 28 | 45 |
| Cl | Clunie peat | 18 | 34 | 46 |
| Co | Coal Creek silt loam | 19 | 18 | 44 |
| Cs | Coal Creek stony silt loam | 19 | 32 | 46 |
| Ct | Chena silt loam | 18 | 22 | 44 |
| DeA | Doone silt loam, nearly level | 19 | 2 | 41 |
| DeB | Doone silt loam, undulating | 19 | 4 | 42 |
| DeC | Doone silt loam, rolling | 20 | 6 | 42 |
| DkD | Doone and Knik silt loams, hilly | 20 | 13 | 43 |
| DkE | Doone and Knik silt loams, moderately steep | 20 | 20 | 44 |
| DkF | Doone and Knik silt loams, steep | 20 | 28 | 45 |
| FhA | Flat Horn silt loam, nearly level | 20 | 1 | 41 |
| FhB | Flat Horn silt loam, undulating | 20 | 3 | 42 |
| FhC | Flat Horn silt loam, rolling | 20 | 5 | 42 |
| FhE | Flat Horn silt loam, hilly to steep | 20 | 20 | 44 |
| Ga | Gravelly alluvial land | 21 | 36 | 46 |
| Gp | Gravel pits and Strip mines (not in a management group) | 21 | -- | -- |
| HoA | Homestead silt loam, nearly level | 21 | 8 | 43 |
| HoB | Homestead silt loam, undulating | 21 | 7 | 42 |
| HoC | Homestead silt loam, rolling | 22 | 7 | 42 |
| HoD | Homestead silt loam, hilly | 22 | 14 | 43 |
| HoE | Homestead silt loam, moderately steep | 22 | 20 | 44 |
| HoF | Homestead silt loam, steep | 22 | 28 | 45 |
| HsA | Homestead silt loam, very shallow, nearly level | 22 | 15 | 44 |
| HsB | Homestead silt loam, very shallow, undulating | 22 | 15 | 44 |
| HsC | Homestead silt loam, very shallow, rolling | 22 | 15 | 44 |
| HsD | Homestead silt loam, very shallow, hilly | 22 | 21 | 44 |
| HsE | Homestead silt loam, very shallow, moderately steep | 23 | 21 | 44 |
| HsF | Homestead silt loam, very shallow, steep | 23 | 29 | 45 |
| JaA | Jacobsen very stony silt loam, nearly level | 23 | 32 | 46 |
| JaB | Jacobsen very stony silt loam, gently sloping | 23 | 32 | 46 |
| JbD | Jim and Bodenburg silt loams, hilly | 23 | 13 | 43 |
| JbF | Jim and Bodenburg silt loams, steep | 23 | 28 | 45 |
| KaA | Kalifonsky silt loam, nearly level | 24 | 11 | 43 |
| KaC | Kalifonsky silt loam, gently to moderately sloping | 24 | 11 | 43 |

| Map symbol | Mapping unit | Described on page | Management group Number | Management group Page |
|---|---|---|---|---|
| KaE | Kalifonsky silt loam, strongly sloping to steep | 24 | 31 | 45 |
| KeB | Kenai silt loam, undulating | 25 | 15 | 44 |
| KnA | Knik silt loam, nearly level | 25 | 8 | 43 |
| KnB | Knik silt loam, undulating | 25 | 7 | 42 |
| KnC | Knik silt loam, rolling | 26 | 7 | 42 |
| KnD | Knik silt loam, hilly | 26 | 14 | 43 |
| KnE | Knik silt loam, moderately steep | 26 | 20 | 44 |
| KnF | Knik silt loam, steep | 26 | 28 | 45 |
| Ma | Matanuska silt loam | 26 | 10 | 43 |
| Ml | Mixed alluvial land | 26 | 33 | 46 |
| Mr | Moose River silt loam | 27 | 27 | 45 |
| NaA | Nancy silt loam, nearly level | 27 | 2 | 41 |
| NaB | Nancy silt loam, undulating | 27 | 4 | 42 |
| NaC | Nancy silt loam, rolling | 27 | 6 | 42 |
| NaD | Nancy silt loam, hilly | 27 | 13 | 43 |
| NaE | Nancy silt loam, moderately steep | 28 | 20 | 44 |
| NpA | Naptowne silt loam, nearly level | 28 | 2 | 41 |
| NpB | Naptowne silt loam, undulating | 28 | 4 | 42 |
| NpC | Naptowne silt loam, rolling | 28 | 6 | 42 |
| NpD | Naptowne silt loam, hilly | 28 | 13 | 43 |
| NpE | Naptowne silt loam, moderately steep | 28 | 20 | 44 |
| NpF | Naptowne silt loam, steep | 29 | 28 | 45 |
| Ns | Niklason silt loam | 29 | 9 | 43 |
| Nv | Niklason very fine sand | 29 | 9 | 43 |
| Re | Reedy silt loam | 29 | 10 | 43 |
| Rm | Rough mountainous land | 30 | 35 | 46 |
| Sa | Salamatof peat | 30 | 34 | 46 |
| Sf | Salamatof peat, ever frozen variant | 30 | 34 | 46 |
| ShA | Schrock silt loam, nearly level | 30 | 1 | 41 |
| ShB | Schrock silt loam, undulating | 31 | 3 | 42 |
| Sl | Sea cliffs | 31 | 35 | 46 |
| Sm | Slikok mucky silt loam | 31 | 18 | 44 |
| Sn | Slikok stony mucky silt loam | 31 | 32 | 46 |
| SpA | Spenard silt loam, nearly level | 32 | 17 | 44 |
| SpB | Spenard silt loam, gently sloping | 32 | 17 | 44 |
| Su | Susitna silt loam | 32 | 1 | 41 |
| Sv | Susitna very fine sand | 32 | 1 | 41 |
| SwA | Susitna and Niklason very fine sands, overflow, 0 to 3 percent slopes | 32 | 19 | 44 |
| TaE | Talkeetna silt loam, moderately steep to steep | 33 | 28 | 45 |
| Te | Terrace escarpments | 33 | 35 | 46 |
| Tf | Tidal flats | 33 | 36 | 46 |
| Tm | Tidal marsh | 33 | 24 | 45 |
| ToA | Torpedo Lake silt loam, nearly level | 33 | 25 | 45 |
| ToB | Torpedo Lake silt loam, gently sloping | 34 | 25 | 45 |
| ToC | Torpedo Lake silt loam, moderately sloping | 34 | 25 | 45 |
| ToD | Torpedo Lake silt loam, strongly sloping | 34 | 25 | 45 |
| TpB | Torpedo Lake-Homestead silt loams, undulating | 34 | 26 | 45 |
| TpC | Torpedo Lake-Homestead silt loams, rolling | 34 | 26 | 45 |
| TpD | Torpedo Lake-Homestead silt loams, hilly | 34 | 26 | 45 |
| TpE | Torpedo Lake-Homestead silt loams, moderately steep | 34 | 26 | 45 |
| Wa | Wasilla silt loam | 35 | 12 | 43 |




U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ALASKA AGRICULTURAL EXPERIMENT STATION

# GENERAL SOIL MAP
## MATANUSKA VALLEY AREA, ALASKA

SCALE IN MILES
1 0 1 2 3 4 5

### SOIL ASSOCIATIONS

1 Bodenburg association: Gray, well-drained, silty or very fine sandy upland soils that are deep over sand and gravel

2 Doone-Knik association: Brown to grayish-brown, well-drained, silty upland soils that are deep to shallow over sand and gravel

3 Homestead association: Brown, well-drained, silty upland soils that are shallow over sand and gravel

4 Homestead-Knik association: Brown to grayish-brown, well-drained, silty upland soils that are shallow over gravel and sand

5 Homestead-Jacobsen association: Brown, well-drained, silty upland soils that are shallow or very shallow over gravel and sand; and dark-gray, very poorly drained stony soils in depressions

6 Homestead-Nancy association: Brown to reddish-brown, well-drained, silty upland soils that are shallow or moderately deep over gravel and sand

7 Knik-Coal Creek association: Grayish-brown, well-drained, silty upland soils that are shallow over sand and gravel; and dark-gray, poorly drained soils in depressions

8 Naptowne-Spenard association: Brown and dark-gray, well-drained and somewhat poorly drained, silty upland soils that are moderately deep to very shallow over glacial till

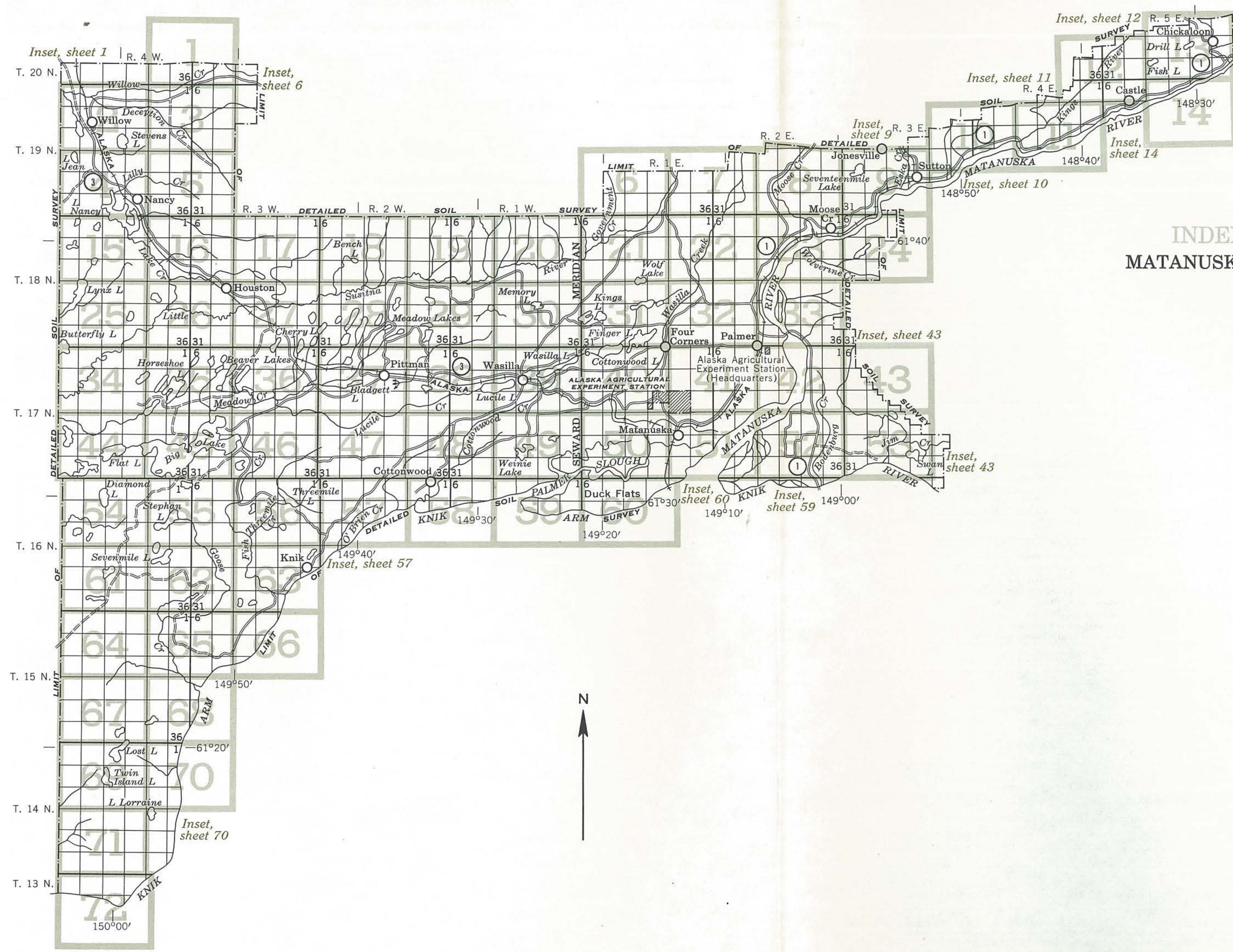
9 Salamatof-Jacobsen association: Very poorly drained, deep peat soils; and stony, very poorly drained soils on flood plains

10 Torpedo Lake-Homestead association: Dark-colored, poorly drained soils along drainageways; and brown, well-drained, silty soils that are shallow or very shallow over sand and gravel

11 Tidal Marsh-Clunie association: Gray, poorly drained soils in sediments on tidal plains; and very poorly drained peat soils that are shallow or moderately deep over tidal silt and clay

12 Susitna-Niklason association: Dark-gray, well-drained, silty or fine sandy soils that are shallow or moderately deep over coarser sediments on alluvial plains

June 1967




INDEX TO MAP SHEETS

**MATANUSKA VALLEY AREA, ALASKA**

SCALE IN MILES

1 0 1 2 3 4 5

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MATANUSKA VALLEY AREA, ALASKA

ALASKA AGRICULTURAL EXPERIMENT STATION

## SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Most symbols without a slope letter are those of nearly level soils or land types, but some are for land types that have a considerable range in slope.

| SYMBOL | NAME |
|---|---|
| AcC | Anchorage sand, undulating to rolling |
| AcE | Anchorage sand, hilly to steep |
| AhA | Anchorage silt loam, nearly level |
| AnB | Anchorage very fine sandy loam, undulating |
| AnC | Anchorage very fine sandy loam, rolling |
| AnD | Anchorage very fine sandy loam, hilly |
| AnE | Anchorage very fine sandy loam, moderately steep |
| BbA | Bodenburg silt loam, nearly level |
| BbB | Bodenburg silt loam, undulating |
| BbC | Bodenburg silt loam, rolling |
| BbD | Bodenburg silt loam, hilly |
| BdA | Bodenburg very fine sandy loam, nearly level |
| BdB | Bodenburg very fine sandy loam, undulating |
| BdC | Bodenburg very fine sandy loam, rolling |
| BdD | Bodenburg very fine sandy loam, hilly |
| BdE | Bodenburg very fine sandy loam, moderately steep |
| BkF | Bodenburg and Knik silt loams, steep |
| Cl | Clunie peat |
| Co | Coal Creek silt loam |
| Cs | Coal Creek stony silt loam |
| Ct | Chena silt loam |
| DeA | Doone silt loam, nearly level |
| DeB | Doone silt loam, undulating |
| DeC | Doone silt loam, rolling |
| DkD | Doone and Knik silt loams, hilly |
| DkE | Doone and Knik silt loams, moderately steep |
| DkF | Doone and Knik silt loams, steep |
| FhA | Flat Horn silt loam, nearly level |
| FhB | Flat Horn silt loam, undulating |
| FhC | Flat Horn silt loam, rolling |
| FhE | Flat Horn silt loam, hilly to steep |
| Ga | Gravelly alluvial land |
| Gp | Gravel pits and Strip mines |
| HoA | Homestead silt loam, nearly level |
| HoB | Homestead silt loam, undulating |
| HoC | Homestead silt loam, rolling |
| HoD | Homestead silt loam, hilly |
| HoE | Homestead silt loam, moderately steep |
| HoF | Homestead silt loam, steep |
| HsA | Homestead silt loam, very shallow, nearly level |
| HsB | Homestead silt loam, very shallow, undulating |
| HsC | Homestead silt loam, very shallow, rolling |
| HsD | Homestead silt loam, very shallow, hilly |
| HsE | Homestead silt loam, very shallow, moderately steep |
| HsF | Homestead silt loam, very shallow, steep |
| JaA | Jacobsen very stony silt loam, nearly level |
| JaB | Jacobsen very stony silt loam, gently sloping |
| JbD | Jim and Bodenburg silt loams, hilly |
| JbF | Jim and Bodenburg silt loams, steep |
| KaA | Kalifonsky silt loam, nearly level |
| KaC | Kalifonsky silt loam, gently to moderately sloping |
| KaE | Kalifonsky silt loam, strongly sloping to steep |
| KeB | Kenai silt loam, undulating |
| KnA | Knik silt loam, nearly level |
| KnB | Knik silt loam, undulating |
| KnC | Knik silt loam, rolling |
| KnD | Knik silt loam, hilly |
| KnE | Knik silt loam, moderately steep |
| KnF | Knik silt loam, steep |
| Ma | Matanuska silt loam |
| Ml | Mixed alluvial land |
| Mr | Moose River silt loam |
| NaA | Nancy silt loam, nearly level |
| NaB | Nancy silt loam, undulating |
| NaC | Nancy silt loam, rolling |
| NaD | Nancy silt loam, hilly |
| NaE | Nancy silt loam, moderately steep |
| NpA | Naptowne silt loam, nearly level |
| NpB | Naptowne silt loam, undulating |
| NpC | Naptowne silt loam, rolling |
| NpD | Naptowne silt loam, hilly |
| NpE | Naptowne silt loam, moderately steep |
| NpF | Naptowne silt loam, steep |
| Ns | Niklason silt loam |
| Nv | Niklason very fine sand |
| Re | Reedy silt loam |
| Rm | Rough mountainous land |
| Sa | Salamatof peat |
| Sf | Salamatof peat, ever frozen variant |
| ShA | Schrock silt loam, nearly level |
| ShB | Schrock silt loam, undulating |
| Sl | Sea cliffs |
| Sm | Slikok mucky silt loam |
| Sn | Slikok stony mucky silt loam |
| SpA | Spenard silt loam, nearly level |
| SpB | Spenard silt loam, gently sloping |
| Su | Susitna silt loam |
| Sv | Susitna very fine sand |
| SwA | Susitna and Niklason very fine sands, overflow, 0 to 3 percent slopes |
| TaE | Talkeetna silt loam, moderately steep to steep |
| Te | Terrace escarpments |
| Tf | Tidal flats |
| Tm | Tidal marsh |
| ToA | Torpedo Lake silt loam, nearly level |
| ToB | Torpedo Lake silt loam, gently sloping |
| ToC | Torpedo Lake silt loam, moderately sloping |
| ToD | Torpedo Lake silt loam, strongly sloping |
| TpB | Torpedo Lake—Homestead silt loams, undulating |
| TpC | Torpedo Lake—Homestead silt loams, rolling |
| TpD | Torpedo Lake—Homestead silt loams, hilly |
| TpE | Torpedo Lake—Homestead silt loams, moderately steep |
| Wa | Wasilla silt loam |

## CONVENTIONAL SIGNS

### WORKS AND STRUCTURES

Highways and roads

- Good motor
- Poor motor
- Trail

Highway marker, state

Railroad, single track

Buildings

- School
- Church

Mines and Quarries

Pits, gravel or other

Cemetery

### BOUNDARIES

National or state

County

Project area

Land division corners

Reservation

Land grant

Small park, cemetery, airport

### DRAINAGE

Streams, double-line

- Perennial
- Intermittent

Streams, single-line

- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Unclassified

CANAL

Canals and ditches

Lakes and ponds

- Perennial (water) (w)
- Intermittent

Wells, water — flowing

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

### RELIEF

Escarpments

- Bedrock
- Other

Prominent peak

Depressions, unclassified — Large — Small

### SOIL SURVEY DATA

Soil boundary and symbol (Dx)

Gravel

Stony, very stony

Rock outcrops

Chert fragments

Clay spot

Sand spot

Gumbo or scabby spot

Made land

Severely eroded spot

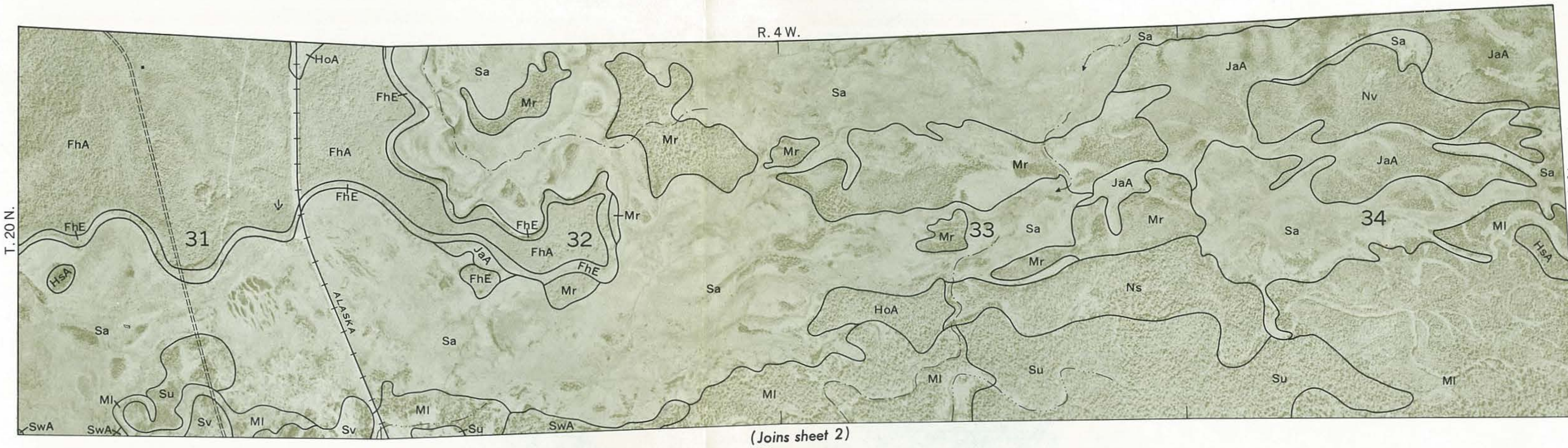
Blowout, wind erosion

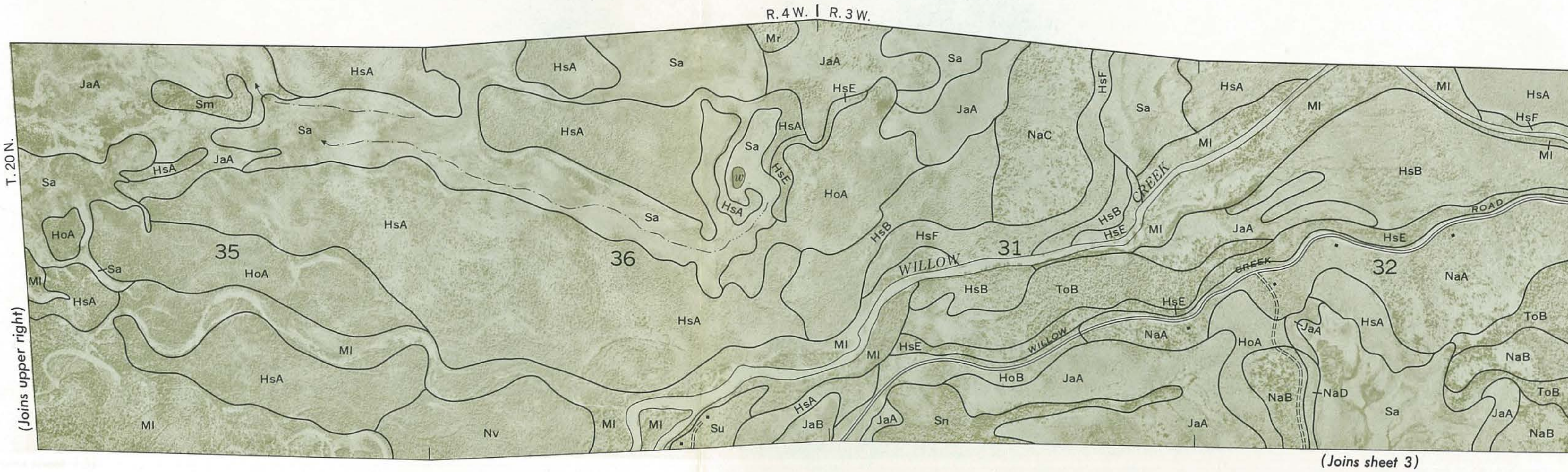
Gully

Soil map constructed 1966 by Cartographic Division, Soil Conservation Service, USDA, from 1958 aerial photographs. Controlled mosaic on universal transverse Mercator projection based upon Clarke 1866 spheroid, 1927 North American datum.

1

N




0 ½ 1 Mile Scale 1:20000 0 5000 Feet

2

N

(Joins inset, sheet 1)

R. 4 W.


(Joins sheet 4)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 2)

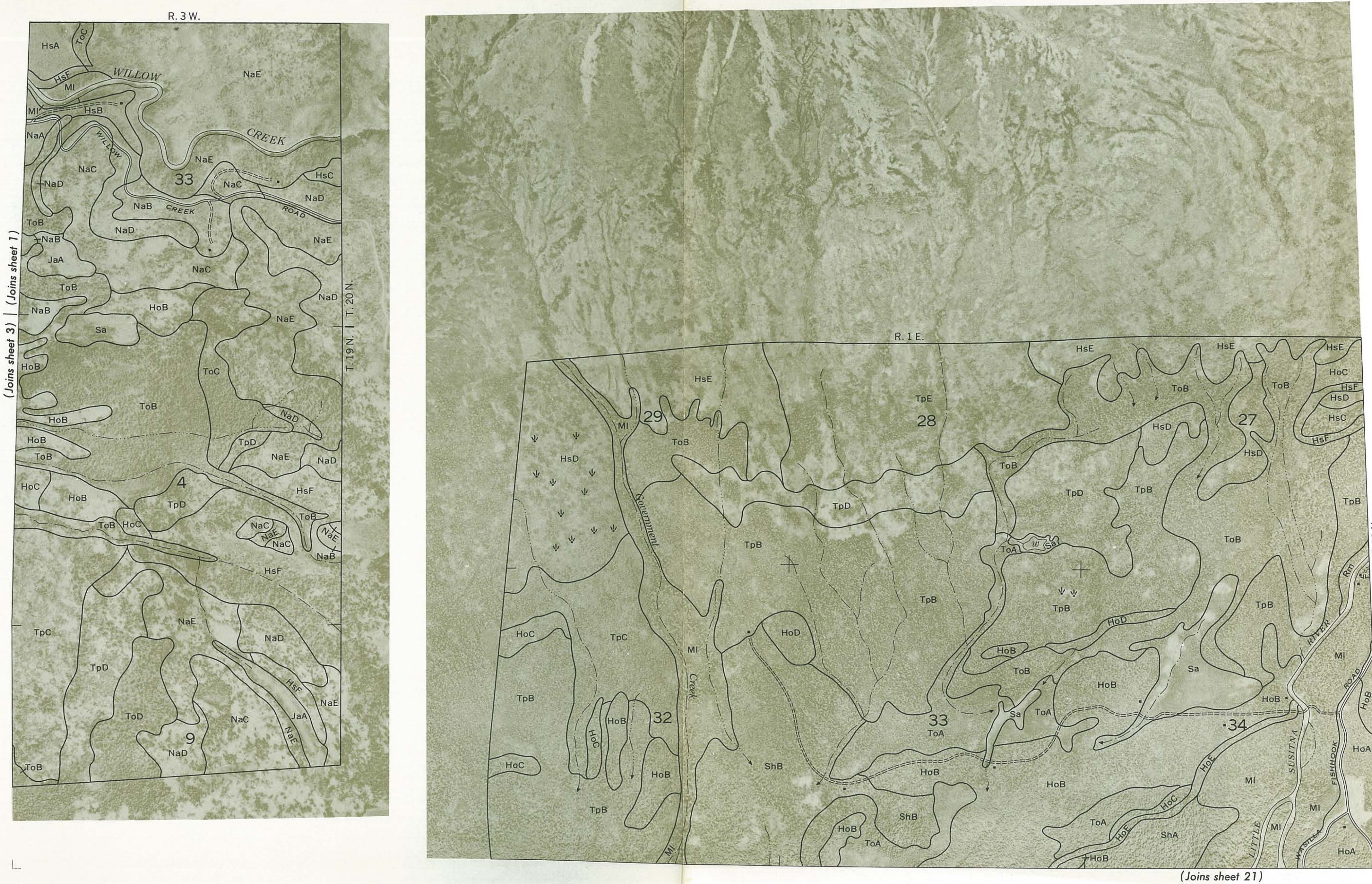

(Joins sheet 15)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

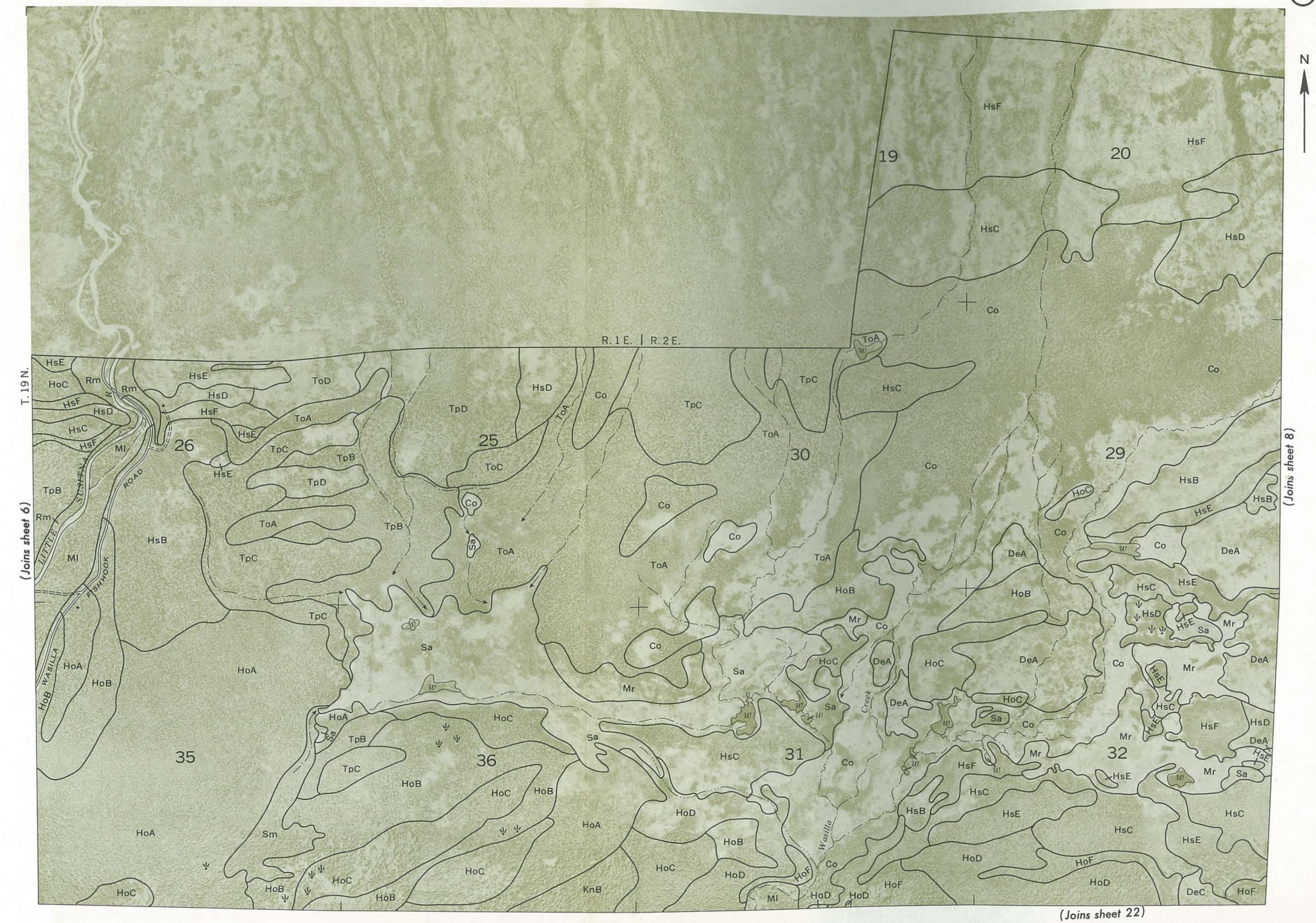

(Joins sheet 3)
5
N
R. 4 W. | R. 3 W.
T. 19 N.
(Joins sheet 4)
(Joins sheet 16)
19
20
23
24
25
26
29
30
31
32
35
36
Lilly Creek
Deception Creek
0
½
1 Mile
Scale 1:20000
0
5000 Feet

6

N




0 ½ 1 Mile Scale 1:20000 0 5000 Feet




0 ½ 1 Mile Scale 1:20000 0 5000 Feet

MATANUSKA VALLEY AREA, ALASKA — SHEET NUMBER 8

MATANUSKA VALLEY AREA, ALASKA — SHEET NUMBER 9


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

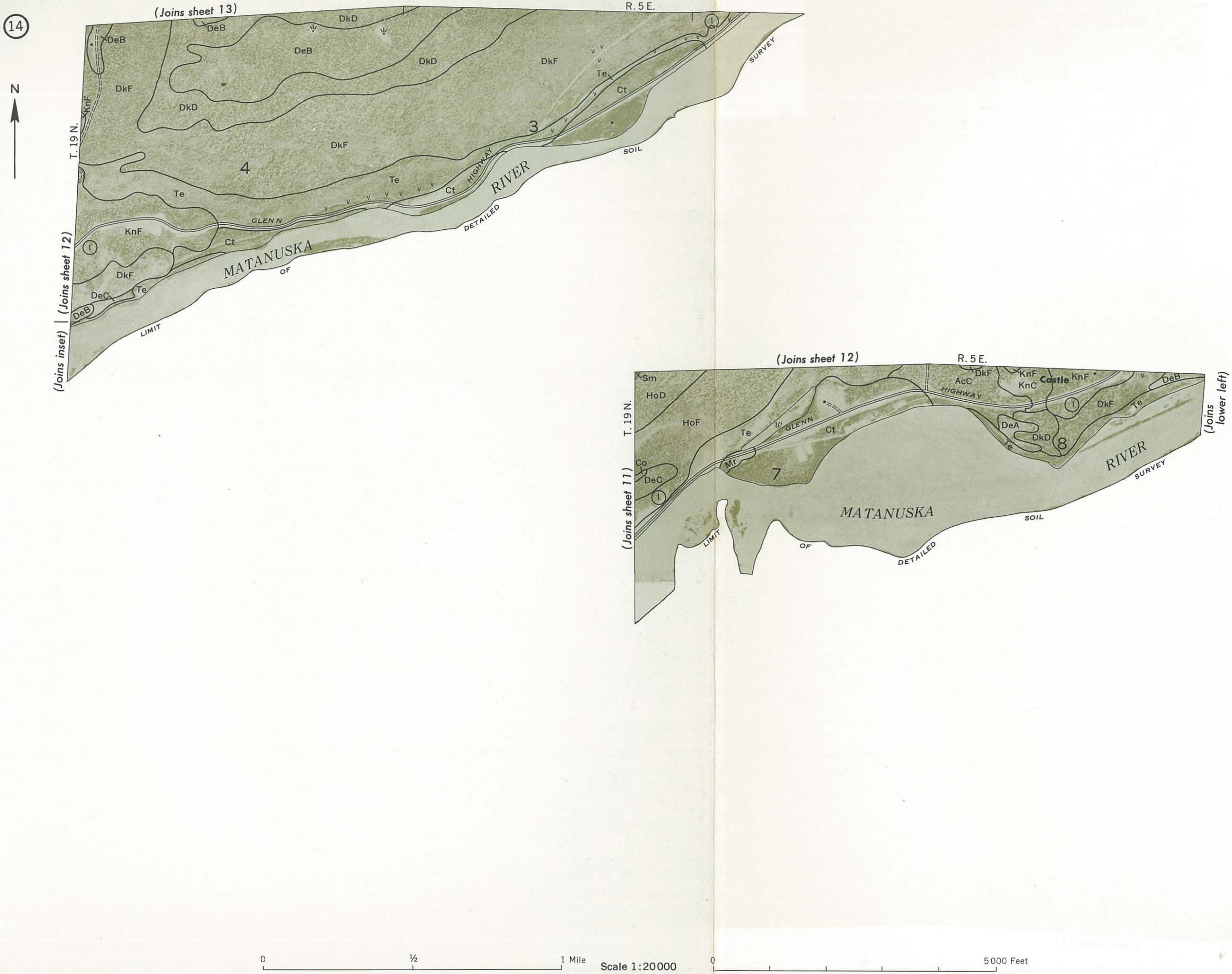

10
N
R.3E. | R.4E.
T. 19 N.
(Joins sheet 9) | (Joins inset, sheet 9)
(Joins sheet 11)
(Joins inset)
Granite
Creek
Little
GRANITE
CREEK
GLENN
HIGHWAY
MATANUSKA
RIVER
LIMIT OF SURVEY
(Joins lower left)
R. 3 E
T. 19 N.
(Joins sheet 9)
GRANITE CR
GLENN
HIGHWAY
MATANUSKA
RIVER
LIMIT OF SURVEY
0
½
1 Mile
Scale 1:20000
0
5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

MATANUSKA VALLEY AREA, ALASKA — SHEET NUMBER 12

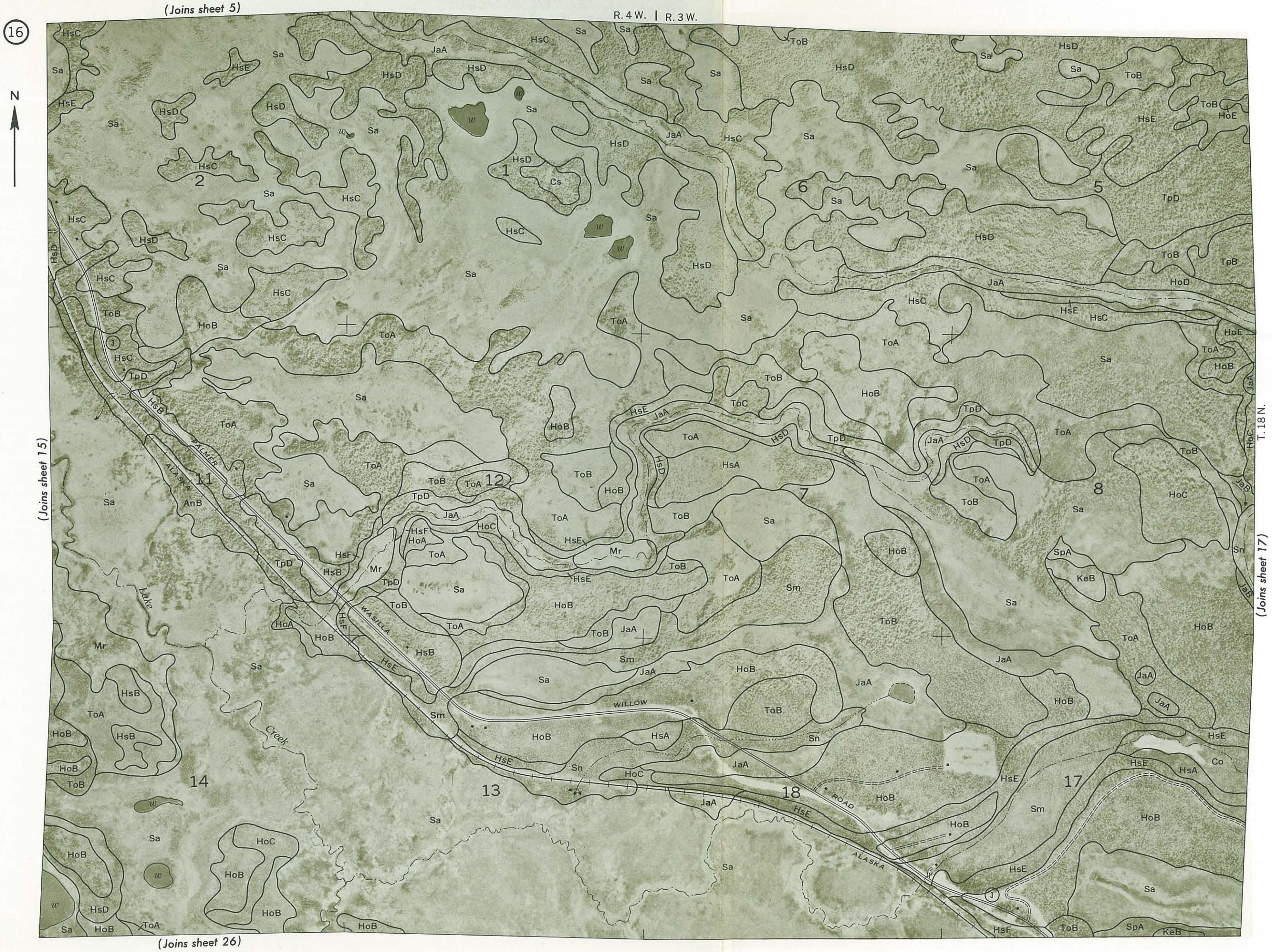

N
R. 5 E.
T. 20 N.
(Joins sheet 12)
(Inset, sh 12)
(Joins sheet 14)
21
22
23
24
25
26
27
28
33
34
35
36
California
Creek
CHICKALOON
Chickaloon Roadhouse
CHICKALOON
CREEK
MATANUSKA
RIVER
GLENN
HIGHWAY
LIMIT OF DETAILED SOIL SURVEY
Drill Lake
Harrison Lake
Fish Lake
HsF
ToC
HoD
ToD
HsB
HsD
HsC
HsE
Sa
HoC
ToB
Ml
Ct
KnB
KnA
KnD
KnF
Co
DeB
DeA
DeC
DkF
DkD
DkE
Ma
Sv
Te
Gp
Wa
w
0
½
1 Mile
Scale 1:20000
0
5000 Feet

14


(Joins sheet 13)
R. 5 E.
N
T. 19 N.
(Joins inset) | (Joins sheet 12)
DeB
DkD
DkF
KnF
DeC
Te
Ct
4
3
GLENN HIGHWAY
MATANUSKA RIVER
LIMIT OF DETAILED SOIL SURVEY
(Joins sheet 12)
R. 5 E.
T. 19 N.
(Joins sheet 11)
(Joins lower left)
Sm
HoD
HoF
Co
Mr
AcC
KnC
Castle
DeA
7
8
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

15


0 ½ 1 Mile Scale 1:20000 0 5000 Feet




0 ½ 1 Mile Scale 1:20000 0 5000 Feet

MATANUSKA VALLEY AREA, ALASKA NO. 16


0 ½ 1 Mile Scale 1:20000 0 5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

20
N
R. 1 W.
T. 18 N.
(Joins sheet 19)
(Joins sheet 21)
(Joins sheet 30)
LITTLE SUSITNA RIVER
SCHROCK ROAD
1
2
3
4
9
10
11
12
13
14
15
16
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

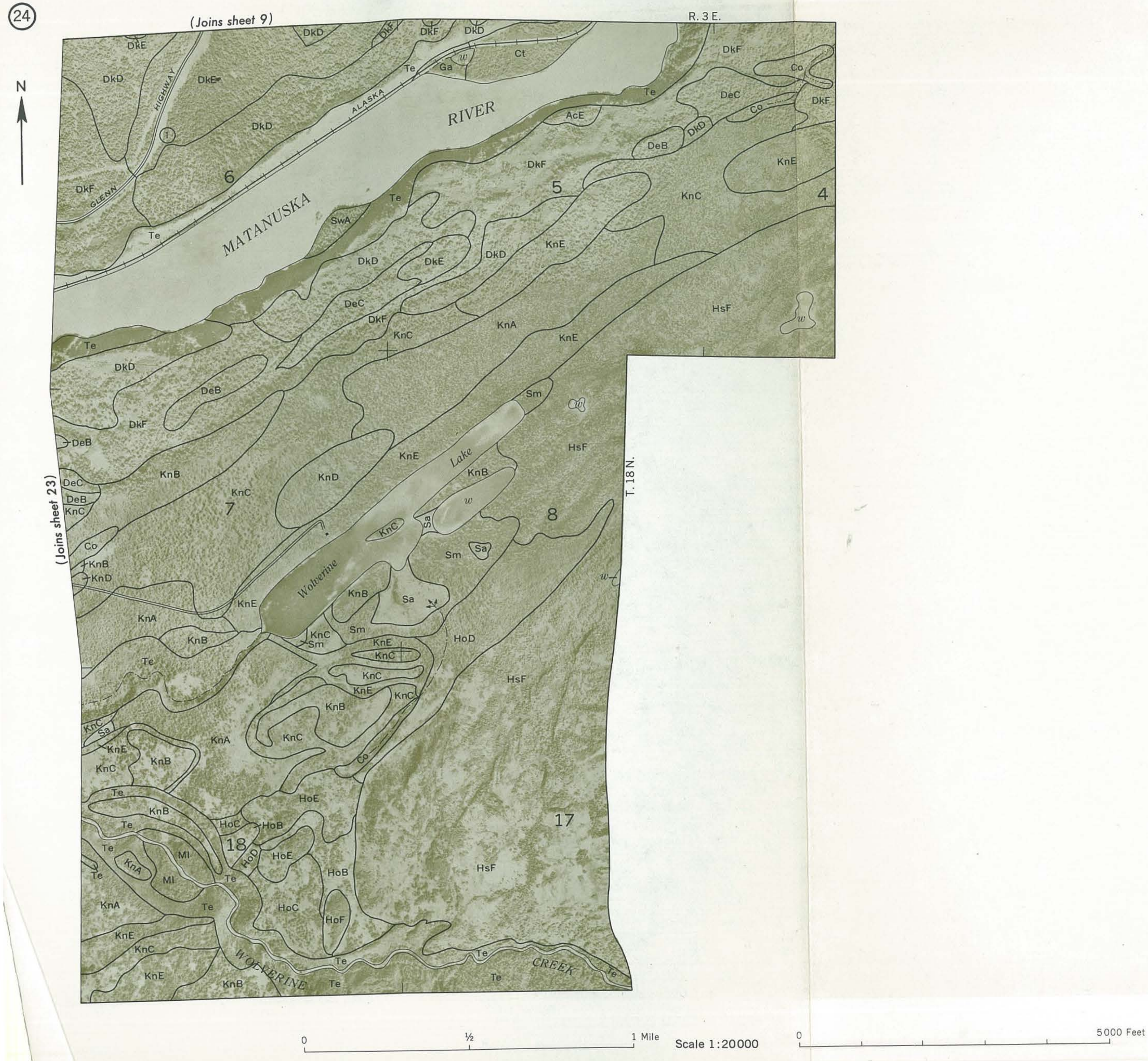
21

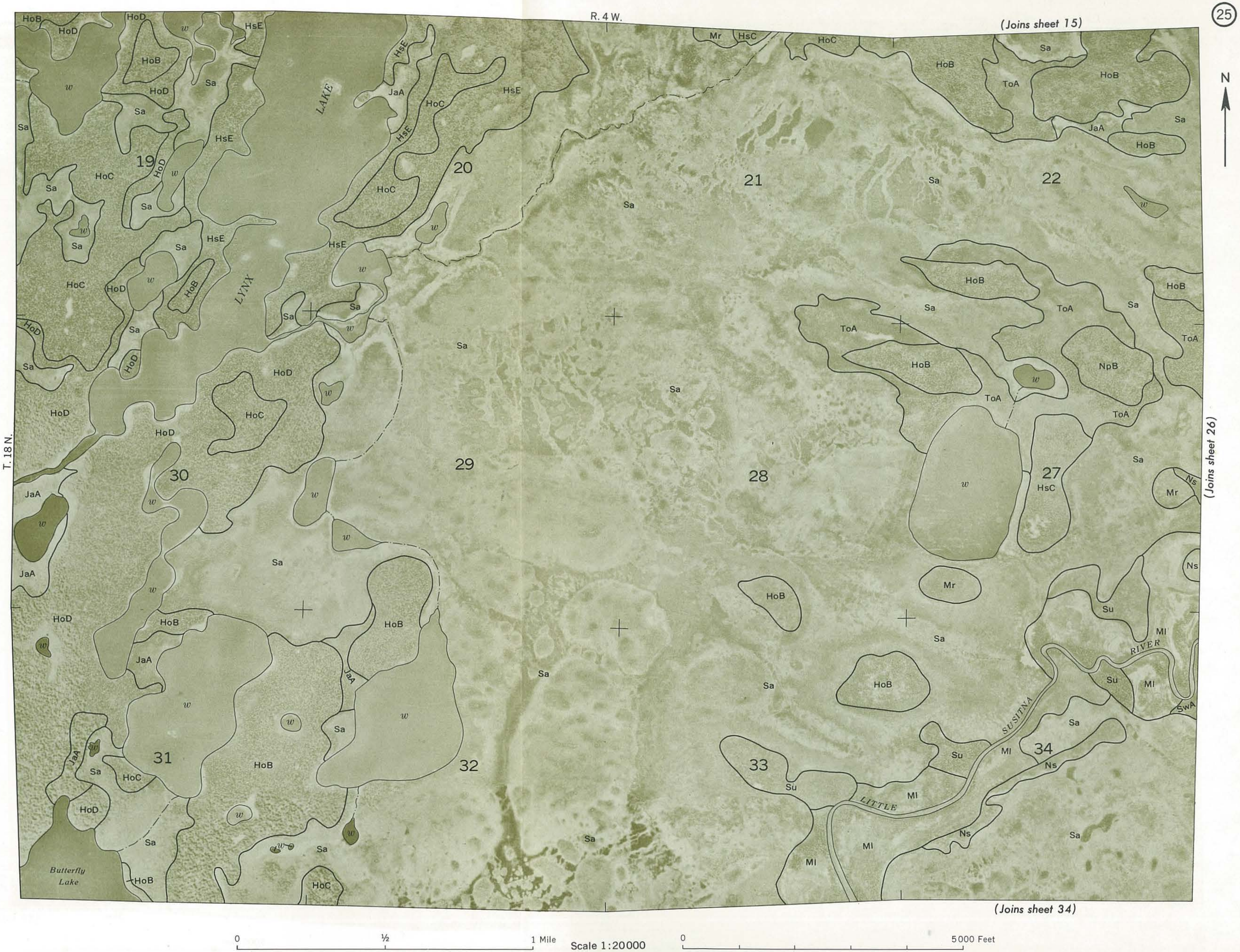
N


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

22
N
(Joins sheet 7)
R.1E. | R.2E.
T.18 N.
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 32)
FISHHOOK ROAD
Wasilla Creek
FARM LOOP ROAD
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet


24
N
(Joins sheet 9)
(Joins sheet 23)
R. 3 E.
T. 18 N.
MATANUSKA
RIVER
GLENN HIGHWAY
ALASKA
Wolverine Lake
WOLVERINE CREEK
4
5
6
7
8
17
18
0
½
1 Mile
Scale 1:20000
0
5000 Feet


25
R. 4 W.
(Joins sheet 15)
N
T. 18 N.
(Joins sheet 26)
(Joins sheet 34)
LYNX LAKE
Butterfly Lake
LITTLE SUSITNA RIVER
19
20
21
22
27
28
29
30
31
32
33
34
0
½
1 Mile
Scale 1:20000
0
5000 Feet

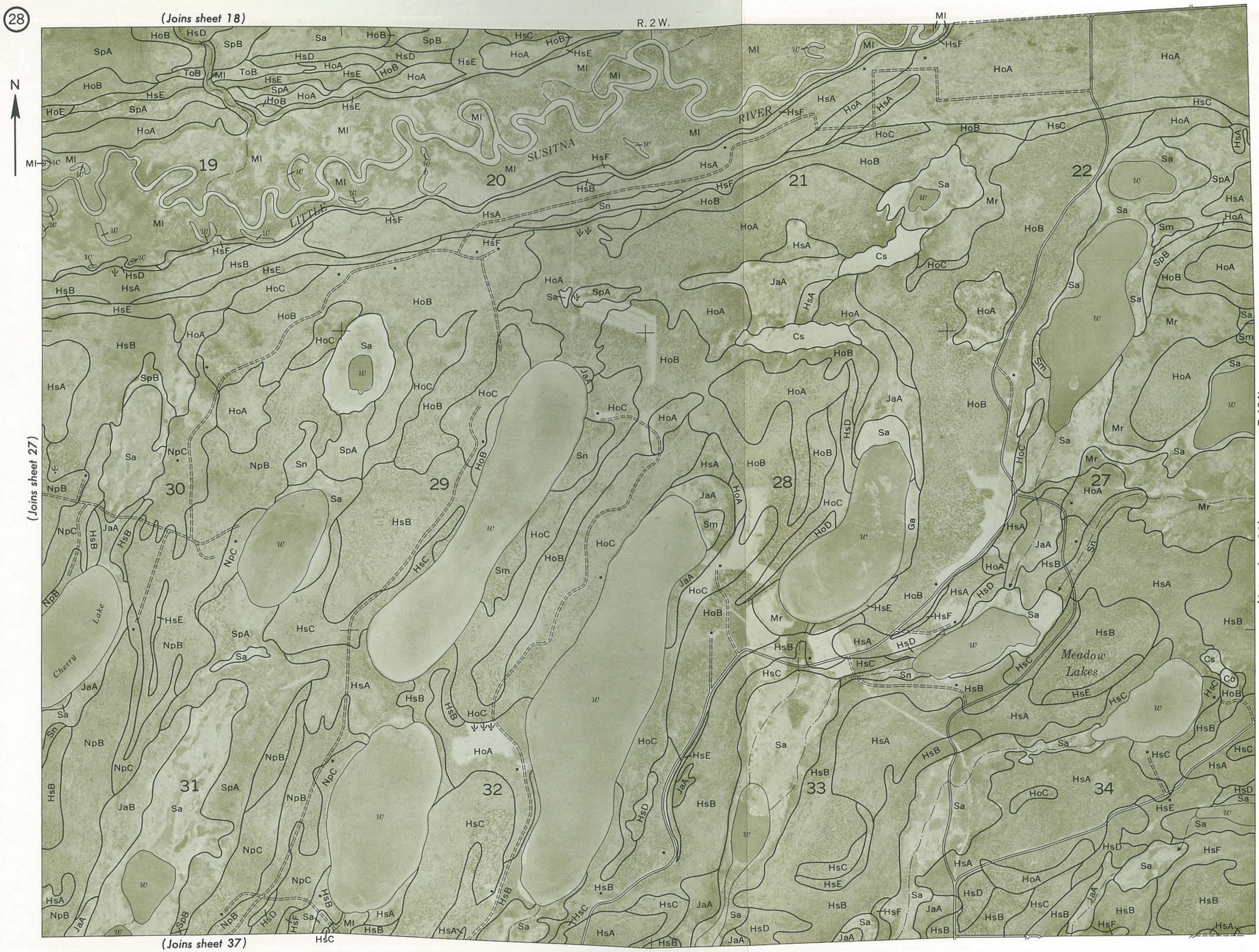
(26)


0 ½ 1 Mile Scale 1:20000 0 5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(28)

(Joins sheet 18)




(Joins sheet 27)

(Joins sheet 29)

(Joins sheet 37)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

30

(Joins sheet 20)

R. 1 W.


N

(Joins sheet 29)

T. 18 N.

(Joins sheet 31)

(Joins sheet 39)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

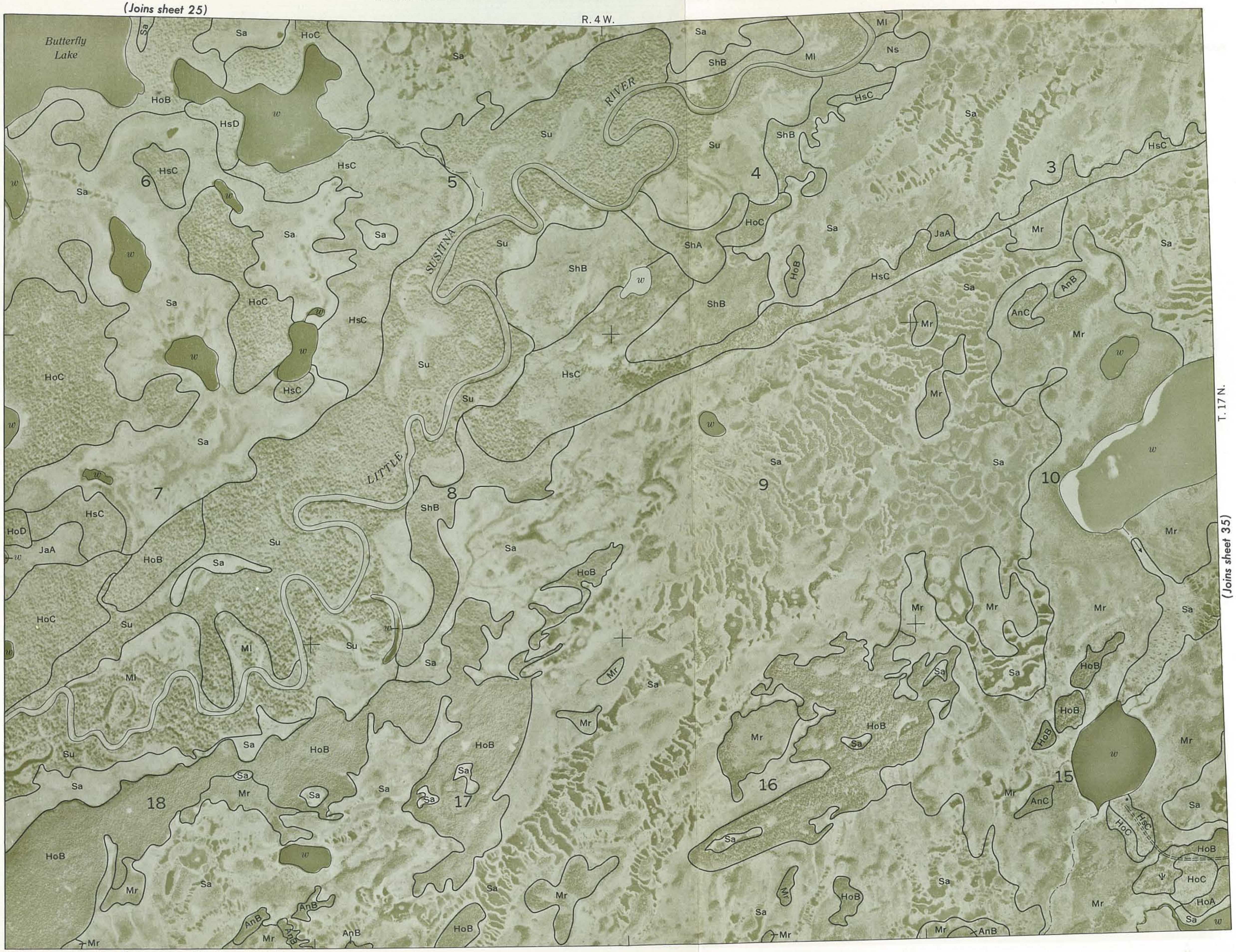

0 ½ 1 Mile Scale 1:20000 0 5000 Feet


32
(Joins sheet 22)
(Joins sheet 31)
(Joins sheet 33)
(Joins sheet 41)
R.1E. | R.2E.
T. 18 N.
N
FISHHOOK ROAD
TRUNK ROAD
FARM LOOP ROAD
GLENN HIGHWAY
SCOTT ROAD
PALMER WASILLA
WILLOW ROAD
Fishhook Junction
PALMER
Wasilla Creek
Carnegie
Brasil Springs
Gooding Lake
MATANUSKA
23
24
19
20
26
25
30
29
35
36
31
32
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(34)

(Joins sheet 25)




(Joins sheet 35)

(Joins sheet 44)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

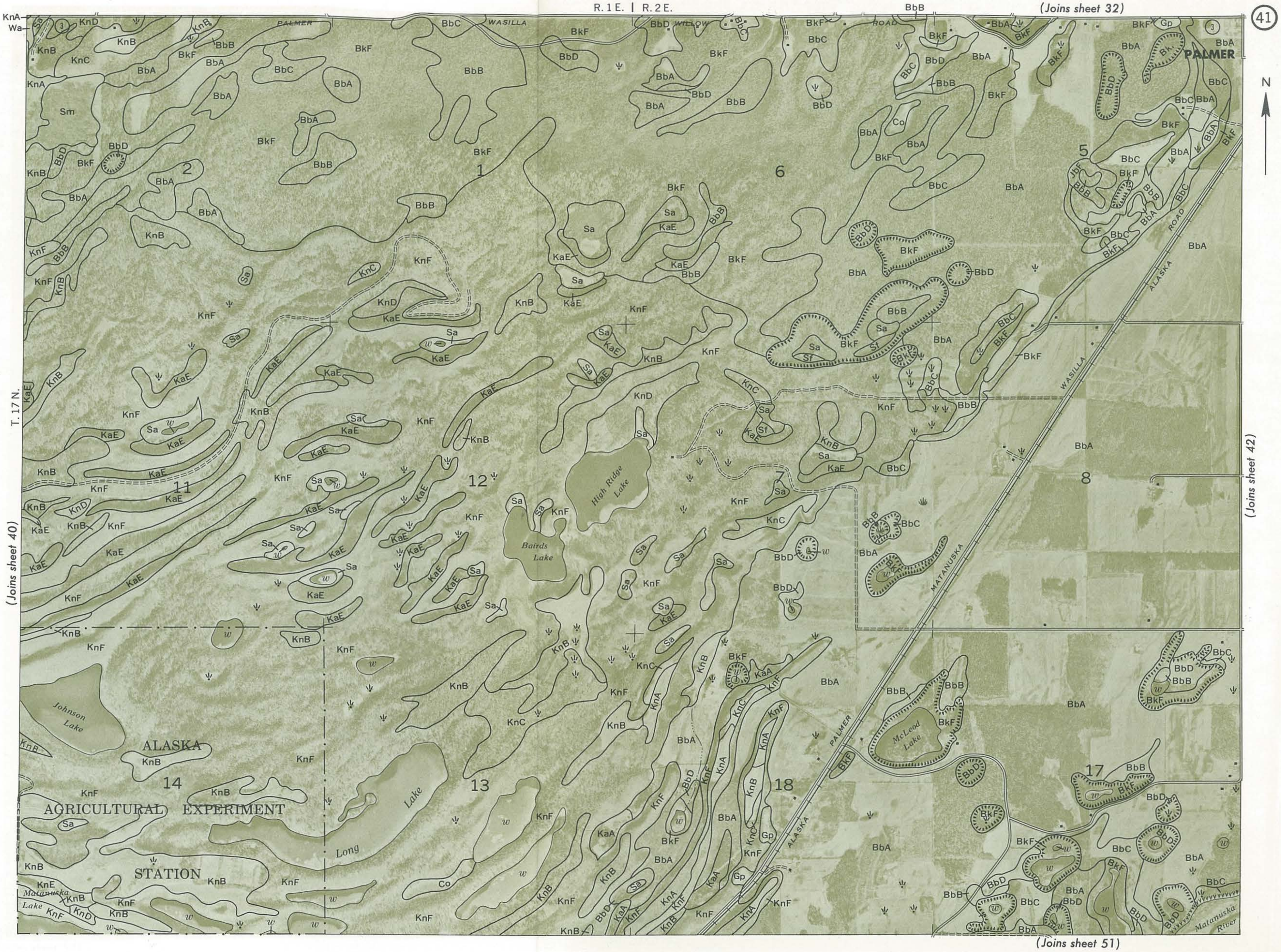

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

38


0 ½ 1 Mile Scale 1:20000 0 5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet


40
(Joins sheet 31)
R. 1 E.
N
Cottonwood Lake
Finger Lake
Four Corners
WILLOW ROAD
WASILLA ROAD
PALMER
Wasilla Creek
Creek
Black Lake
HYER
ROAD
TRUNK ROAD
MATANUSKA
ALASKA AGRICULTURAL EXPERIMENT STATION
ALASKA AGRIC EXP STATION
WASILLA ROAD
PALMER ALASKA RD
FAIRVIEW
Matanuska Lake
T. 17 N.
(Joins sheet 39)
(Joins sheet 41)
(Joins sheet 50)
3 4 5 6 7 8 9 10 15 16 17 18
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

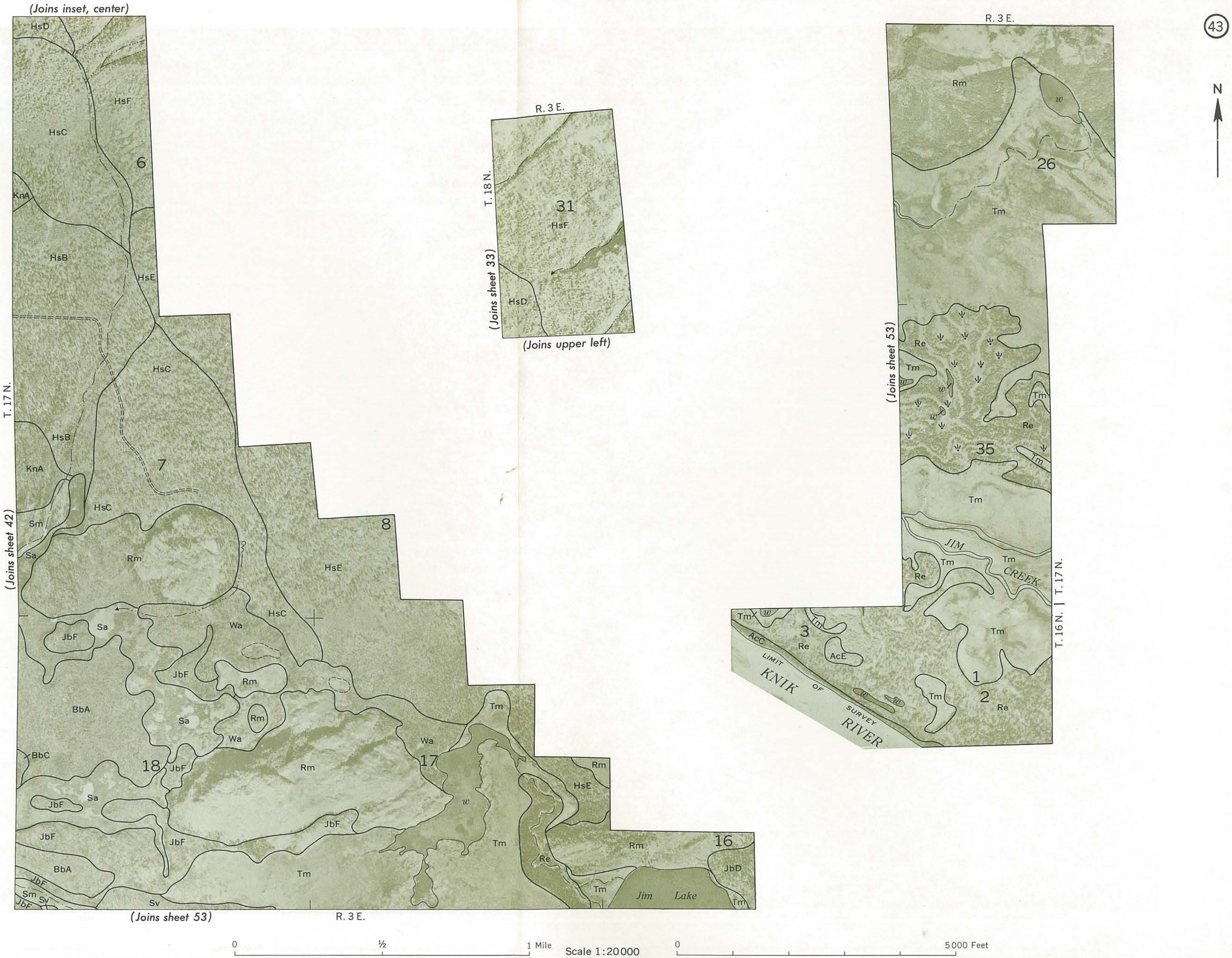



0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

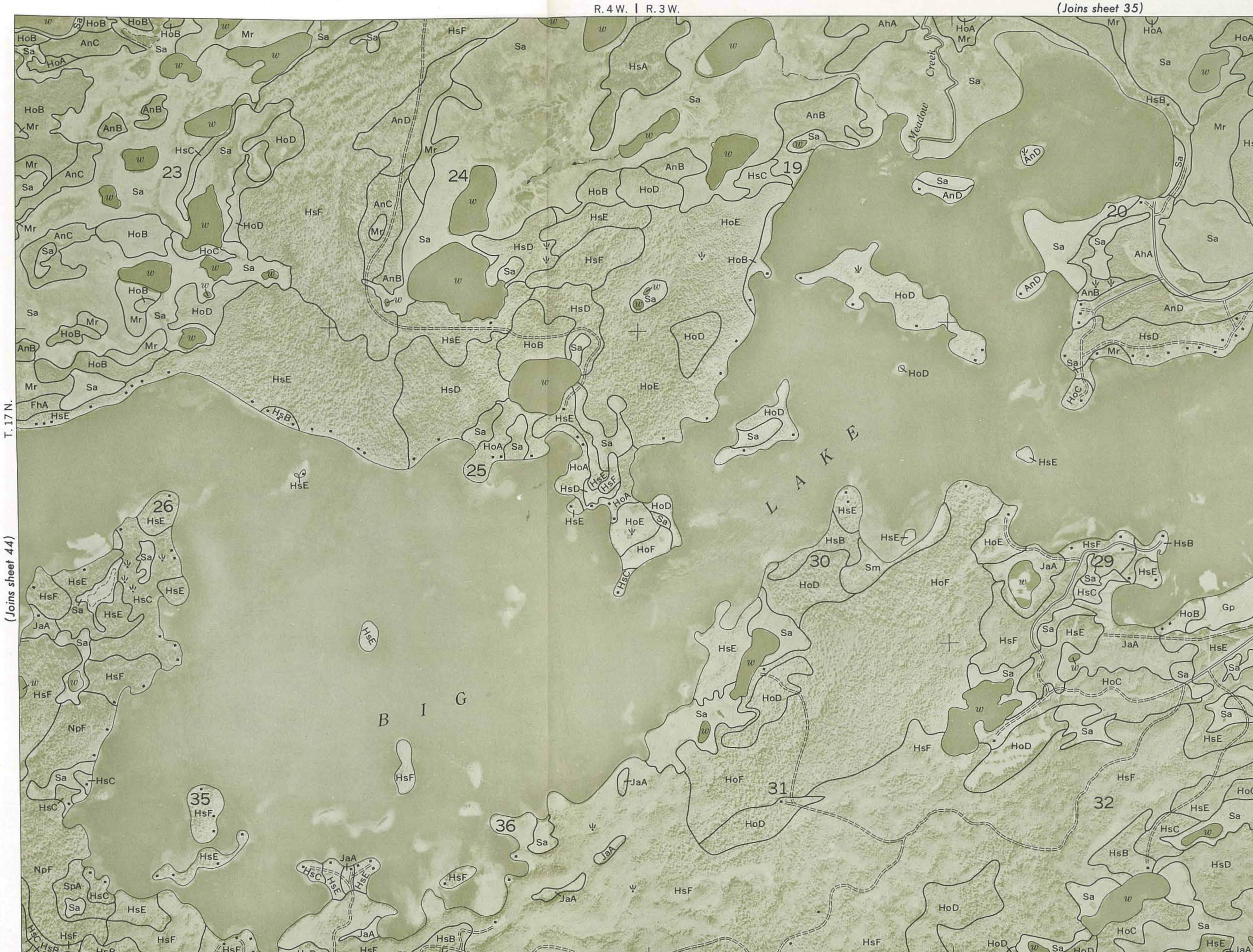

42
(Joins sheet 33)
R. 2 E.
PALMER
ALASKA AGRIC EXP STATION
HEADQUARTERS
PALMER MUNICIPAL AIRPORT
N
(Joins sheet 41)
(Joins sheet 43)
(Joins sheet 52)
T. 17 N.
LOOP ROAD
SPRINGER
GLENN HIGHWAY
Bodenburg
MATANUSKA RIVER
1
2
3
4
9
10
11
12
13
14
15
16
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet


(Joins inset, center)
(Joins sheet 42)
(Joins sheet 53)
(Joins sheet 33)
(Joins upper left)
(Joins sheet 53)
R. 3 E.
T. 17 N.
T. 18 N.
T. 16 N.
43
N
HsD
HsF
HsC
HsB
HsE
KnA
Sm
Sa
Sv
Rm
Wa
JbF
JbD
BbA
BbC
Tm
Re
AcC
AcE
w
Jim Lake
JIM CREEK
KNIK RIVER
LIMIT OF SURVEY
1
2
3
6
7
8
16
17
18
26
31
35
0
½
1 Mile
Scale 1:20000
5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

MATANUSKA VALLEY AREA, ALASKA NO. 44

45



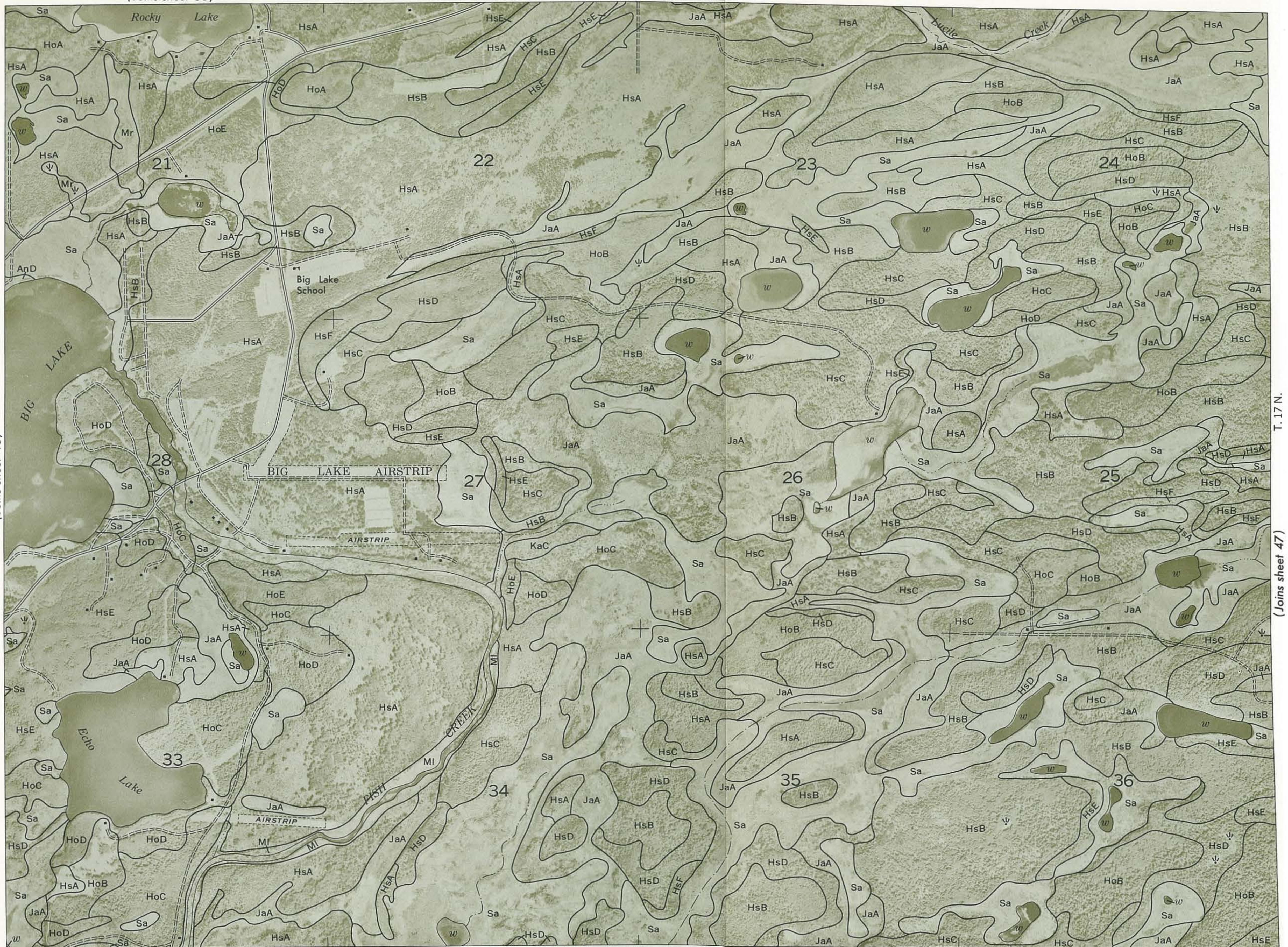

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(46)

(Joins sheet 36)

R. 3 W.

N




(Joins sheet 45)

T. 17 N.

(Joins sheet 47)

(Sh 55) | (Joins sheet 56)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

47

R. 2 W.

(Joins sheet 37)


T. 17 N.

(Joins sheet 46)

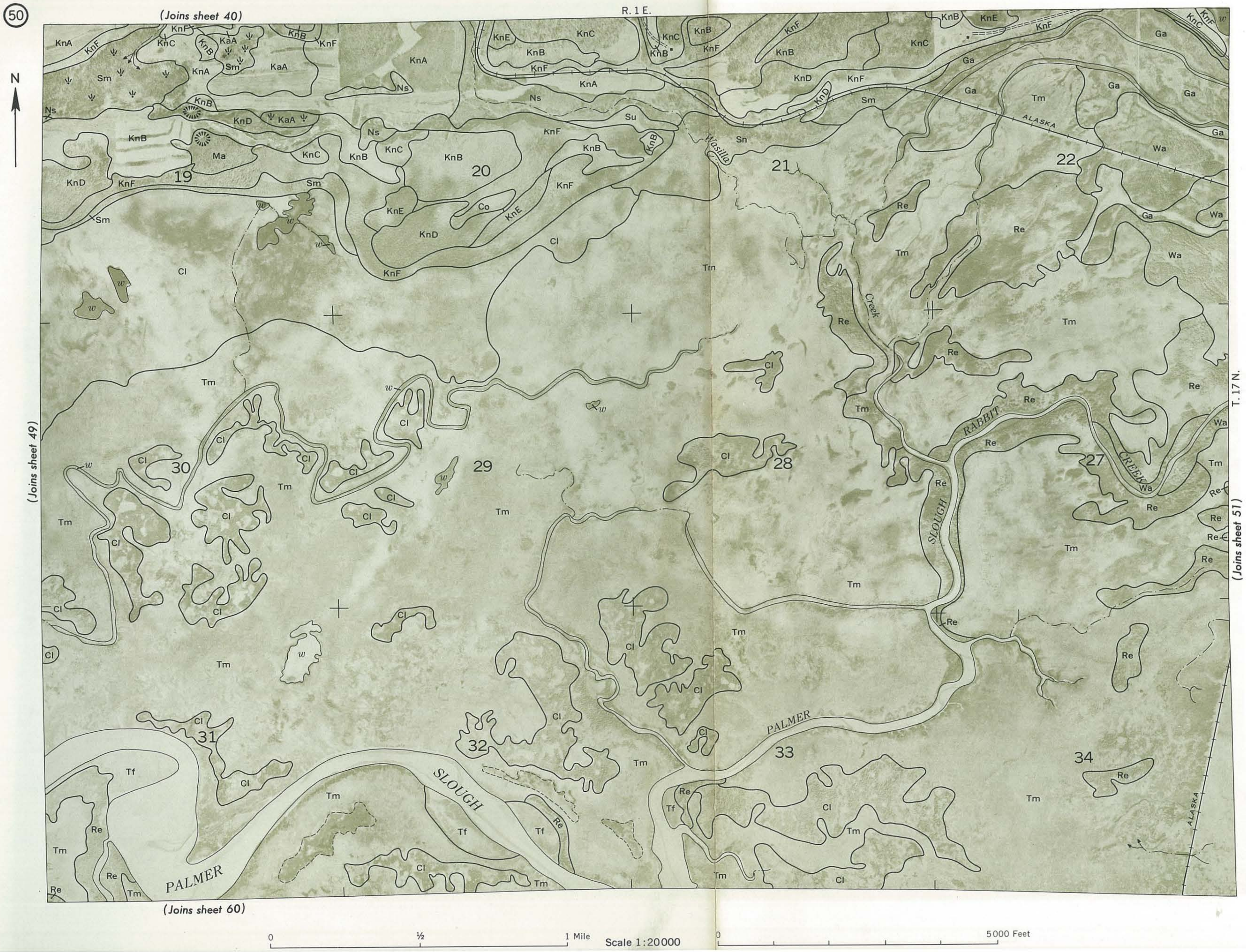
(Joins sheet 48)

(56) | (Joins sheet 57)

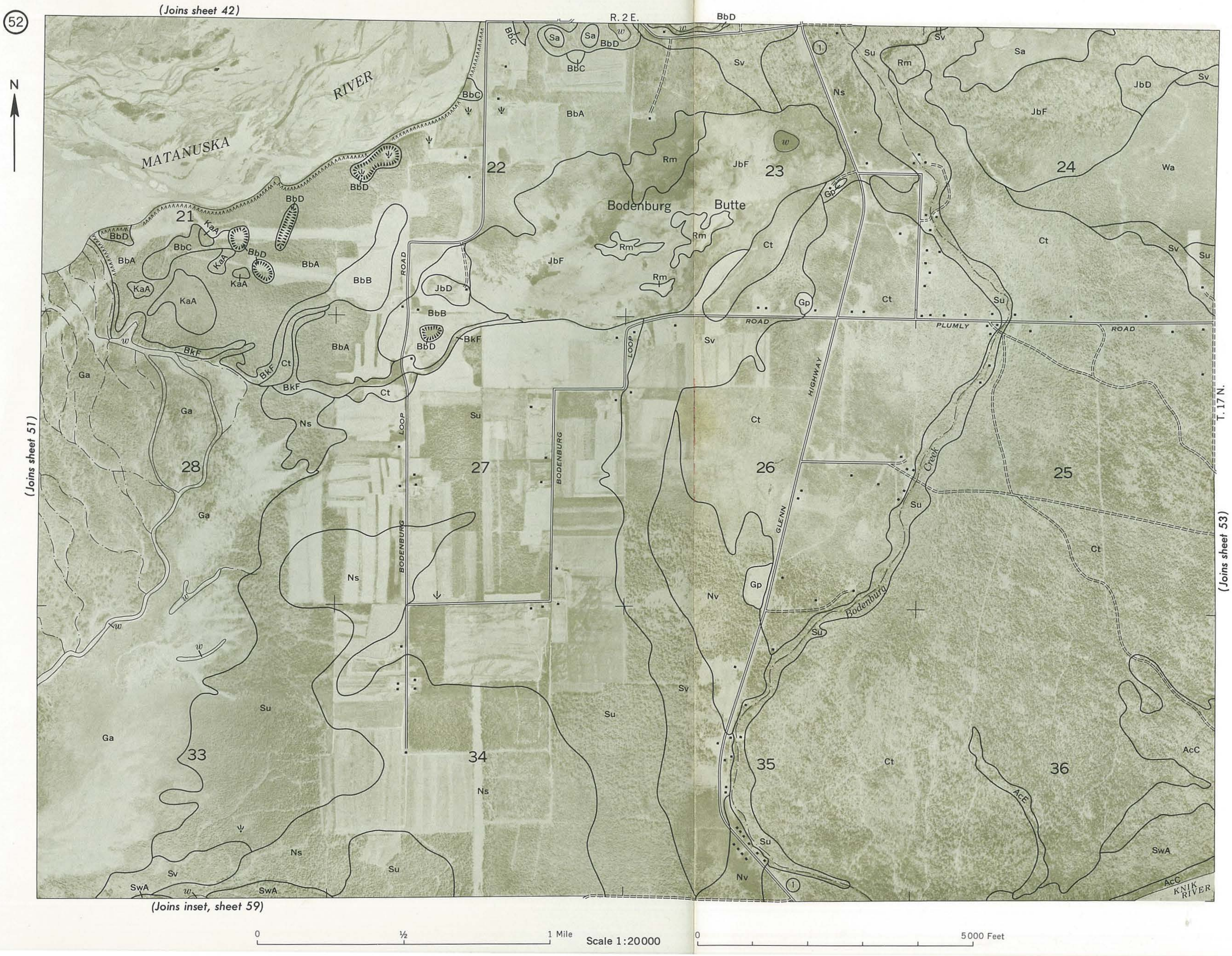
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

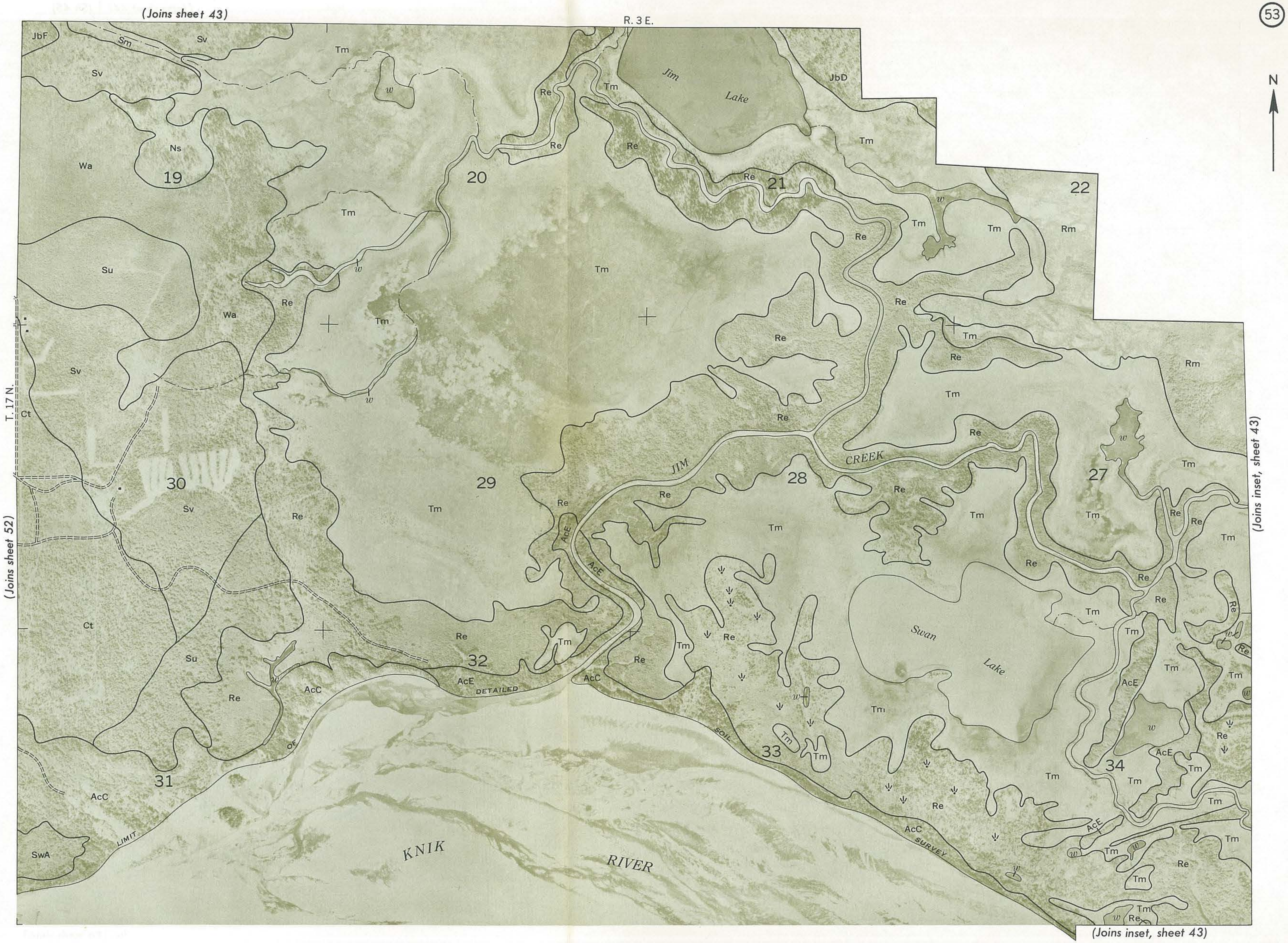

48
N
(Joins sheet 38)
R. 2 W. | R. 1 W.
(Joins sheet 47)
(Joins sheet 49)
T. 17 N.
(57)|(Joins sheet 58)
ROAD
Cottonwood Creek
Cottonwood Slough
Lucy Lake
Cottonwood
23
24
19
20
26
25
30
29
35
36
31
32
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet


49
(Joins sheet 39)
R. 1 W.
N
FAIRVIEW ROAD
T. 17 N.
(Joins sheet 48)
(Joins sheet 50)
(Joins sheet 59)
21
22
23
24
25
26
27
28
33
34
35
36
Cottonwood Slough
Reedy Lake
Weinie Lake
PALMER SLOUGH
LIMIT OF SURVEY
KnA
KnB
KnC
KnD
KnE
KnF
KaA
KaC
Sa
Sm
Wa
Ns
Cs
Gp
Cl
Tm
Tf
Re
w
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet


50
N
(Joins sheet 40)
R. 1 E.
T. 17 N.
(Joins sheet 49)
(Joins sheet 51)
(Joins sheet 60)
19
20
21
22
27
28
29
30
31
32
33
34
Wasilla
Creek
RABBIT
CREEK
SLOUGH
PALMER
SLOUGH
PALMER
ALASKA
ALASKA
KnA
KnB
KnC
KnD
KnE
KnF
KaA
Sm
Ns
Ma
Co
Su
Sn
Ga
Wa
Tm
Re
Cl
Tf
w
0
½
1 Mile
Scale 1:20000
0
5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet


52
N
(Joins sheet 42)
R. 2 E.
(Joins sheet 51)
(Joins sheet 53)
T. 17 N.
(Joins inset, sheet 59)
MATANUSKA RIVER
Bodenburg Butte
PLUMLY ROAD
LOOP ROAD
BODENBURG LOOP
BODENBURG
GLENN HIGHWAY
Bodenburg Creek
KNIK RIVER
21
22
23
24
25
26
27
28
33
34
35
36
BbD
BbC
BbA
BbB
Sa
Sv
Su
Rm
Ns
Nv
JbD
JbF
Wa
Ct
Gp
KaA
BkF
Ga
SwA
AcC
AcE
0
½
1 Mile
Scale 1:20000
0
5000 Feet




0 ½ 1 Mile Scale 1:20000 0 5000 Feet

54

R. 4 W.

(Joins sheet 44) | (Sh 45)

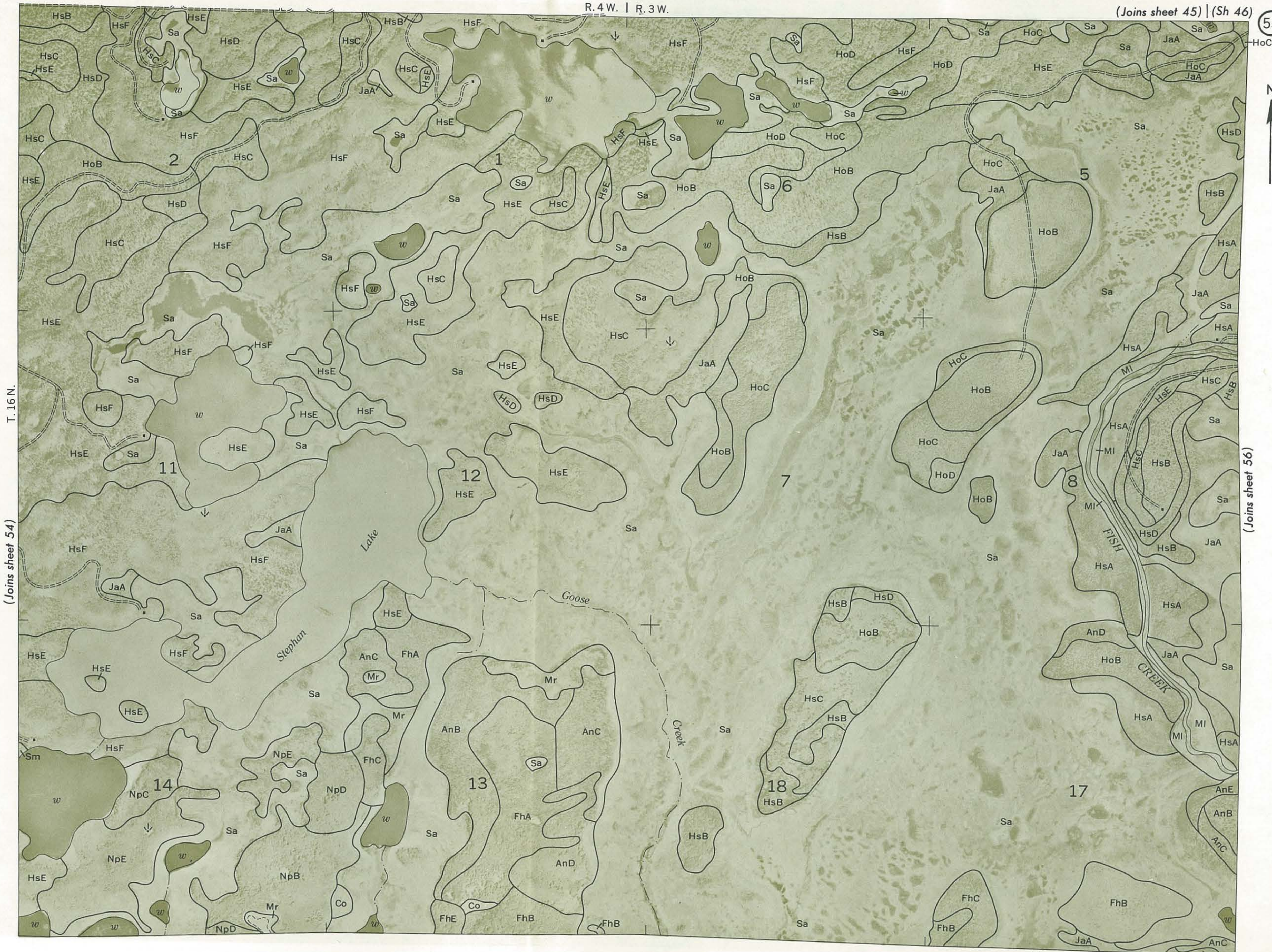
N


T. 16 N.

(Joins sheet 55)

(Joins sheet 61)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

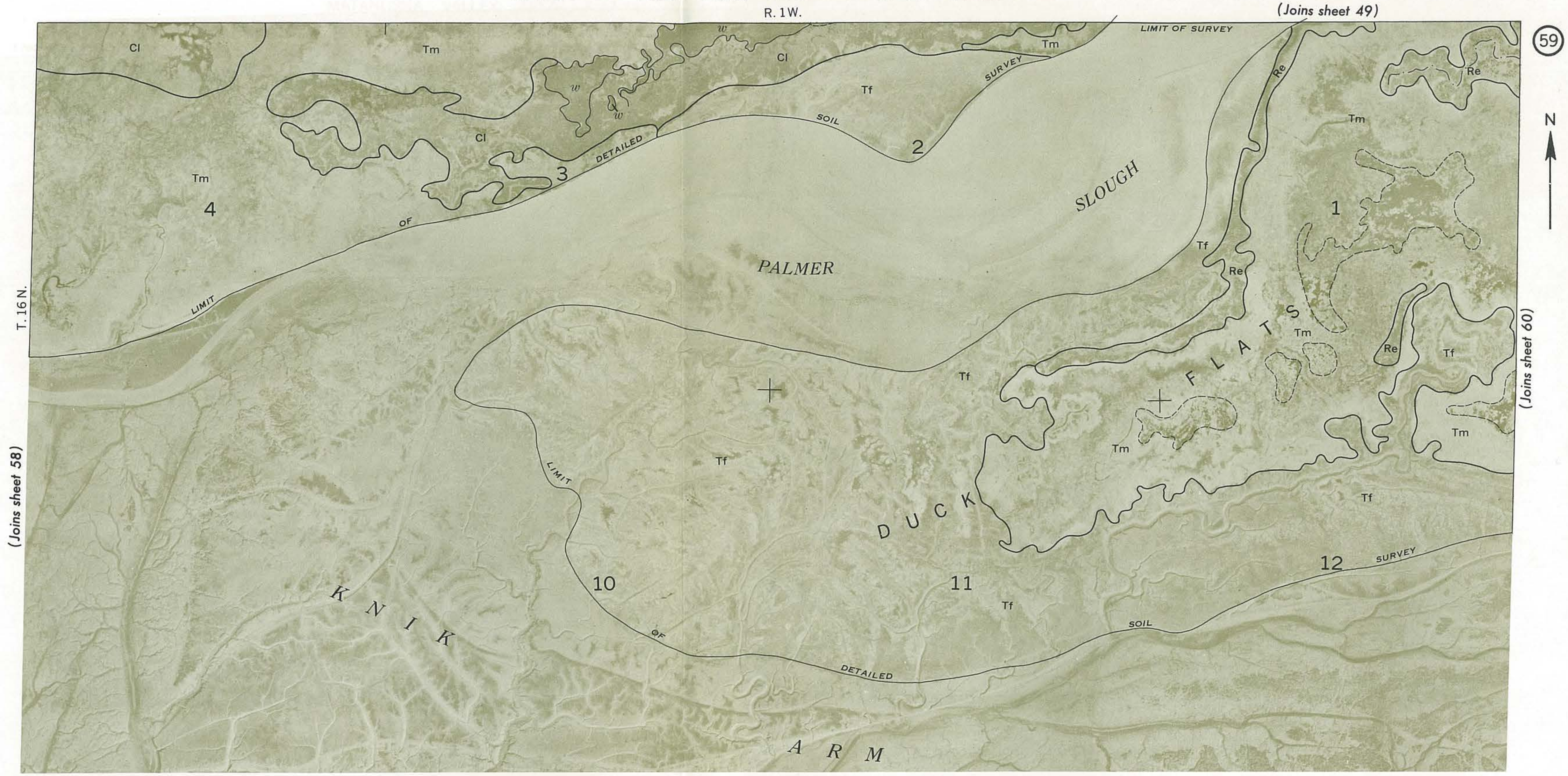


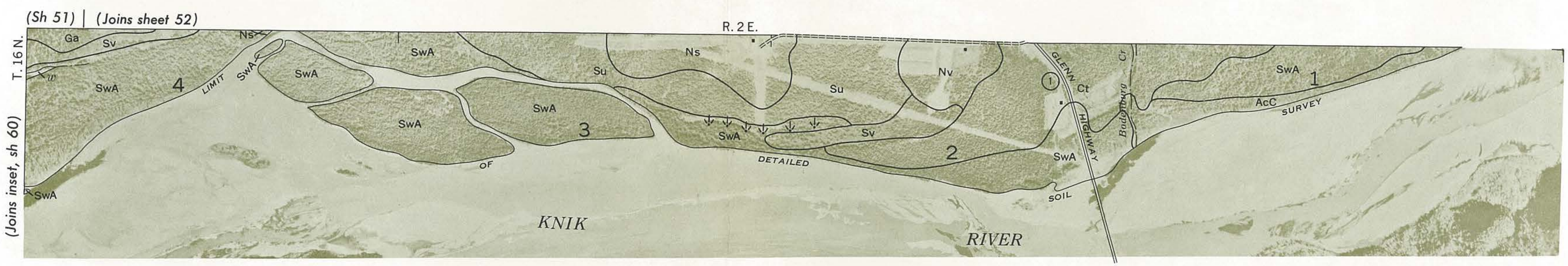

0 ½ 1 Mile Scale 1:20000 0 5000 Feet


56
R. 3 W.
(Joins sheet 46) | (47)
N
(Joins sheet 55)
(Joins sheet 57)
(Joins sheet 63)
T. 16 N.
Threemile Lake
Threemile Creek
FISH CREEK
1
2
3
4
9
10
11
12
13
14
15
16
0
½
1 Mile
Scale 1:20000
0
5000 Feet


R. 2 W.
(Joins sheet 47) | (48)
57
N
T. 16 N.
(Joins sheet 56)
(Joins sheet 58)
(Joins inset)
Crocker Creek
O'Brien Creek
DETAILED SOIL SURVEY LIMIT OF
KNIK ARM
R. 2 W.
(Joins lower left)
T. 16 N.
(Joins sheet 63)
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

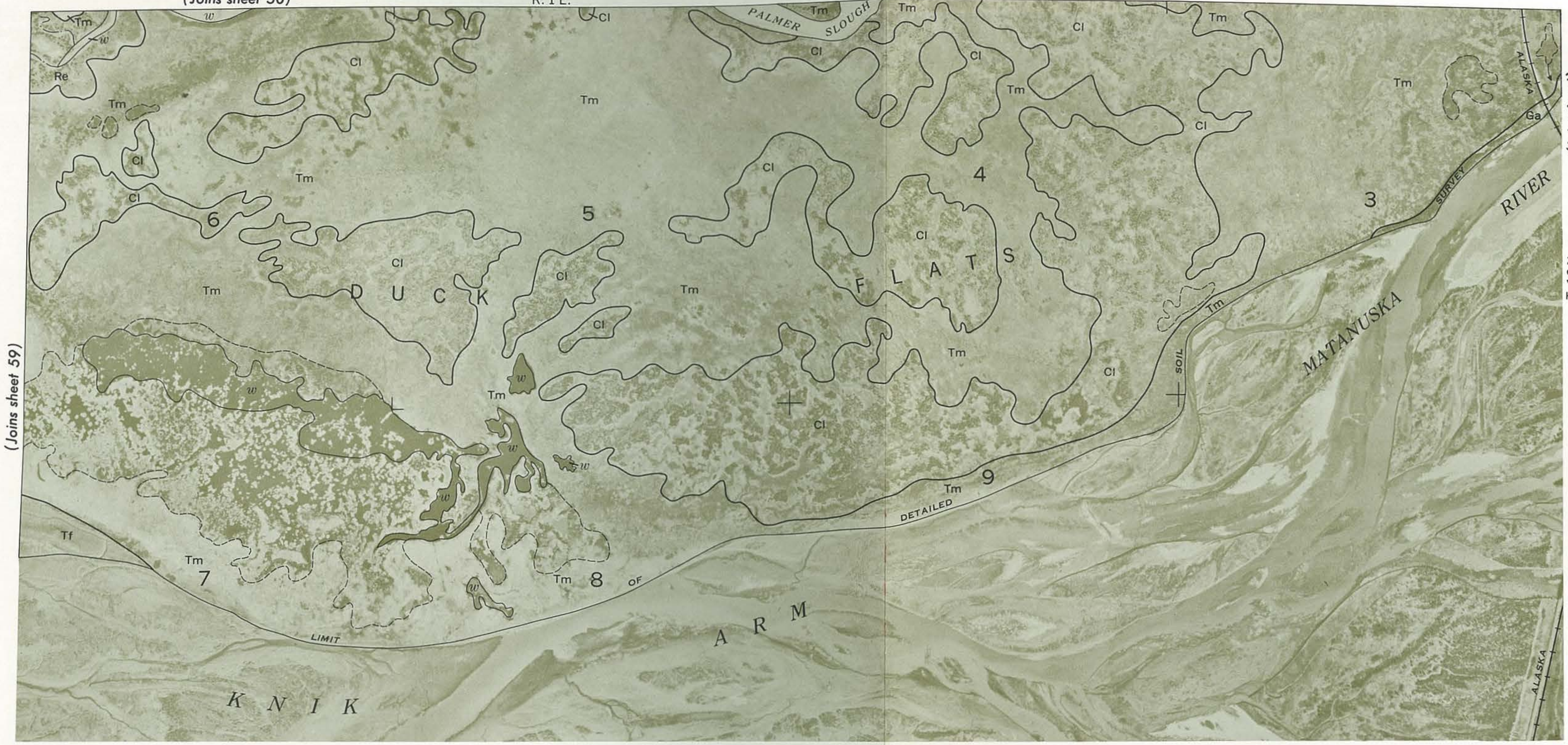

0 ½ 1 Mile Scale 1:20000 0 5000 Feet



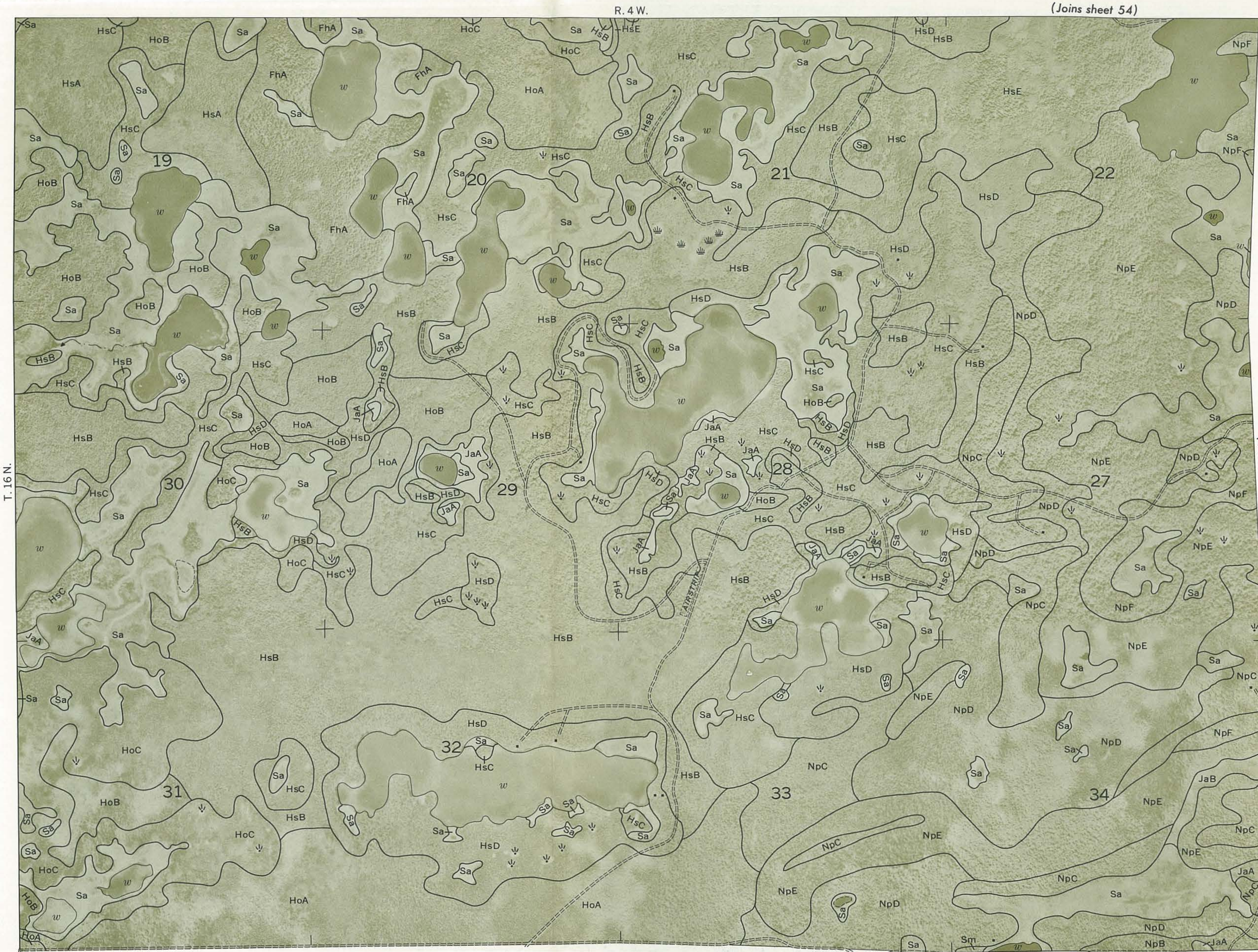

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(60)





0 ½ 1 Mile
Scale 1:20000
0 5000 Feet




0 ½ 1 Mile Scale 1:20000 0 5000 Feet

62

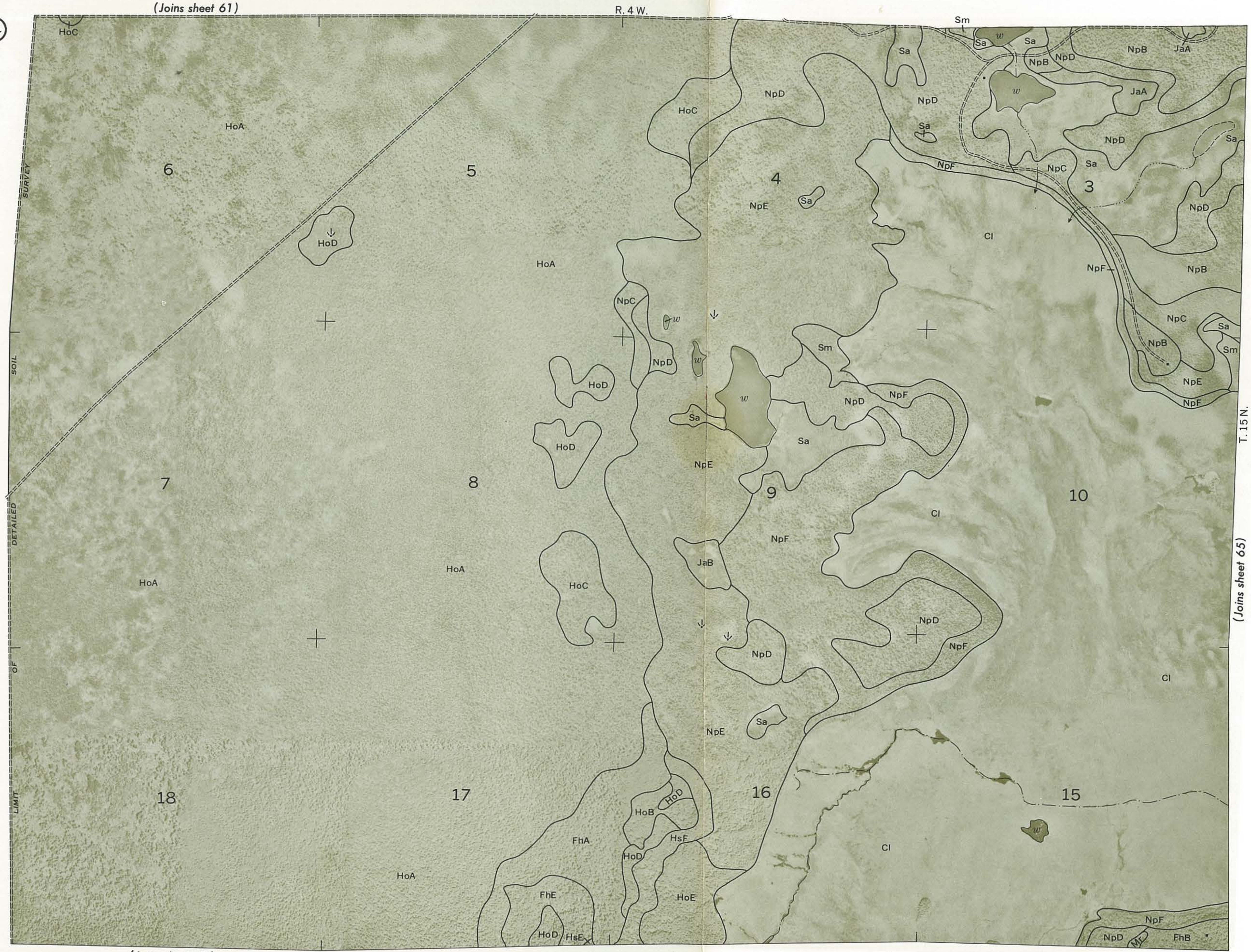

(Joins sheet 55)
R.4W. | R.3W.
N
Sevenmile Lake
Goose
Creek
T. 16 N.
(Joins sheet 61)
(Joins sheet 63)
(Joins sheet 65)
23
24
19
20
26
25
30
29
35
36
31
32
0
½
1 Mile
Scale 1:20000
0
5000 Feet

63
R. 3 W.
(Joins sheet 56)
(Joins inset, sheet 57)
(Joins sheet 62)
(Joins sheet 66)
T. 16 N.
N
FISH CREEK
Knik Lake
KNIK
White Lake
Caves Lake
Lake Beth
KNIK ARM
DETAILED SOIL SURVEY
LIMIT OF
21
22
23
24
25
26
27
28
33
34
35
0
½
1 Mile
Scale 1:20000
0
5000 Feet

(64)

(Joins sheet 61)

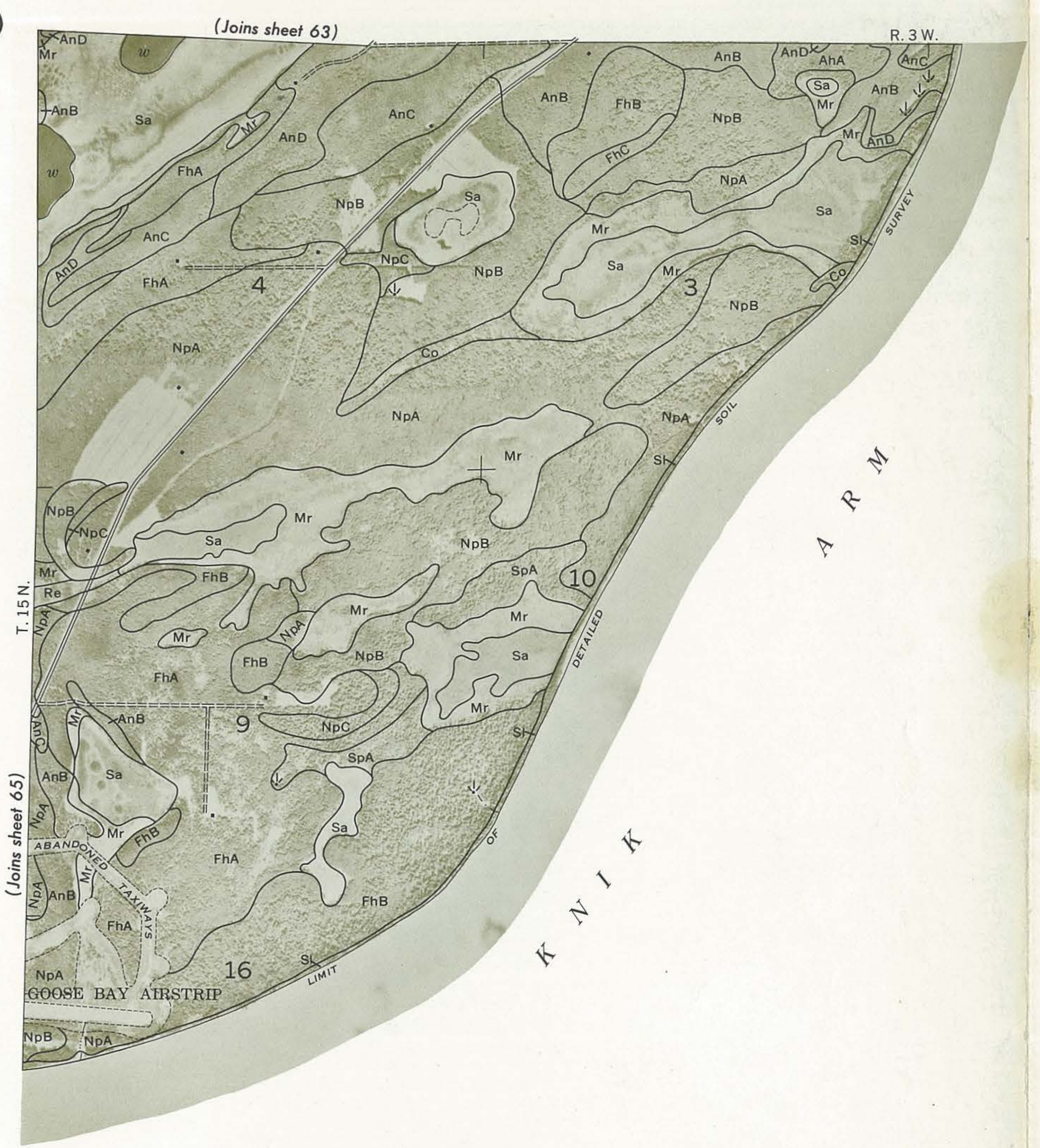
R. 4 W.




(Joins sheet 67)

0 ½ 1 Mile
Scale 1:20000
0 5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

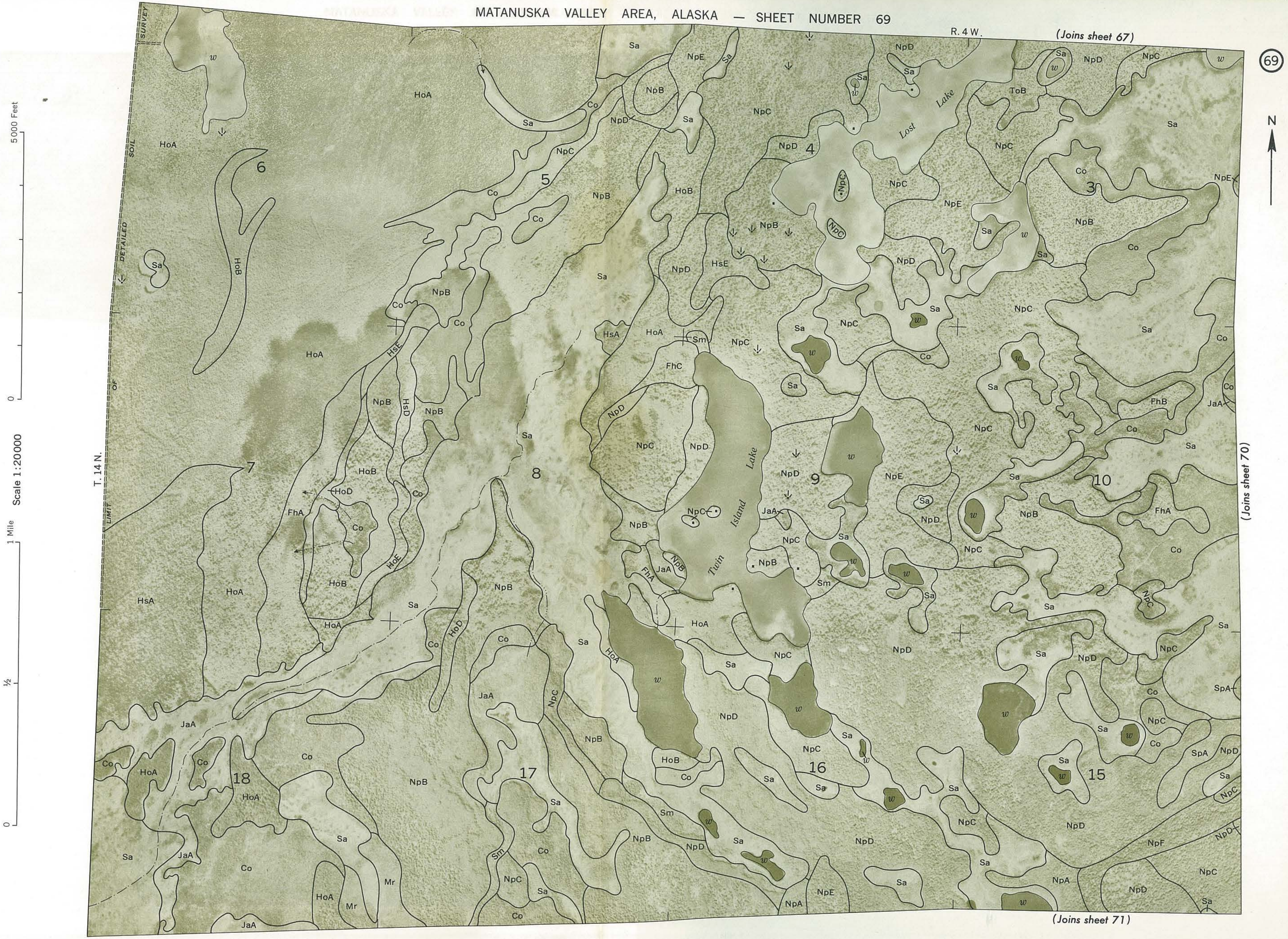


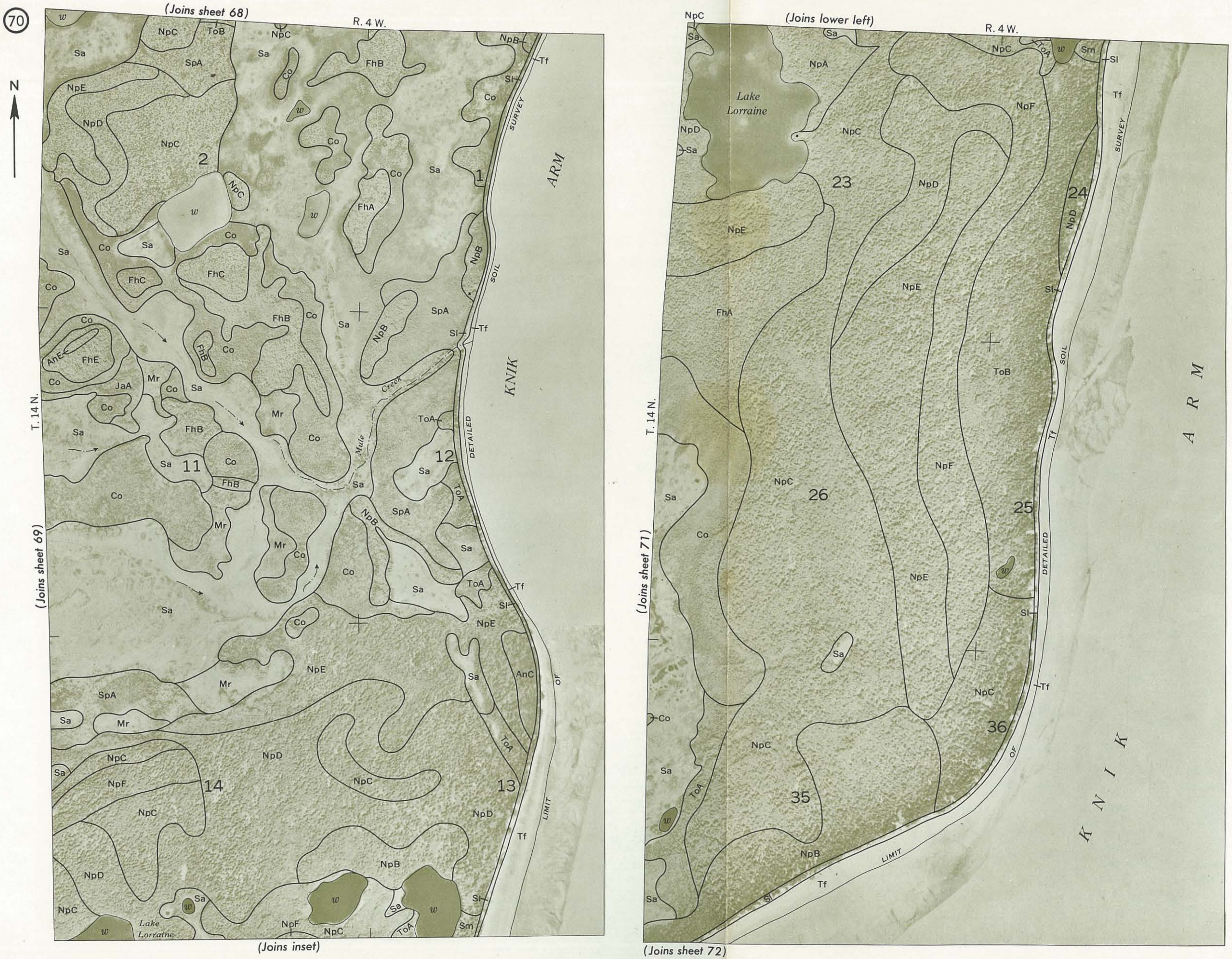

0 ½ 1 Mile Scale 1:20000 0 5000 Feet


R. 4 W.
(Joins sheet 64)
67
N
T. 15 N.
LIMIT OF DETAILED SOIL SURVEY
(Joins sheet 68)
(Joins sheet 69)
19
20
21
22
27
28
29
30
31
32
33
34
HoA
HoB
HoC
HoD
HoE
FhA
FhB
FhC
FhE
HsA
HsB
HsE
HsF
Cl
NpB
NpC
NpD
NpE
NpF
Sa
Sm
Mr
w
Lost Lake
0
½
1 Mile
Scale 1:20000
0
5000 Feet

(68)


0 ½ 1 Mile Scale 1:20000 0 5000 Feet

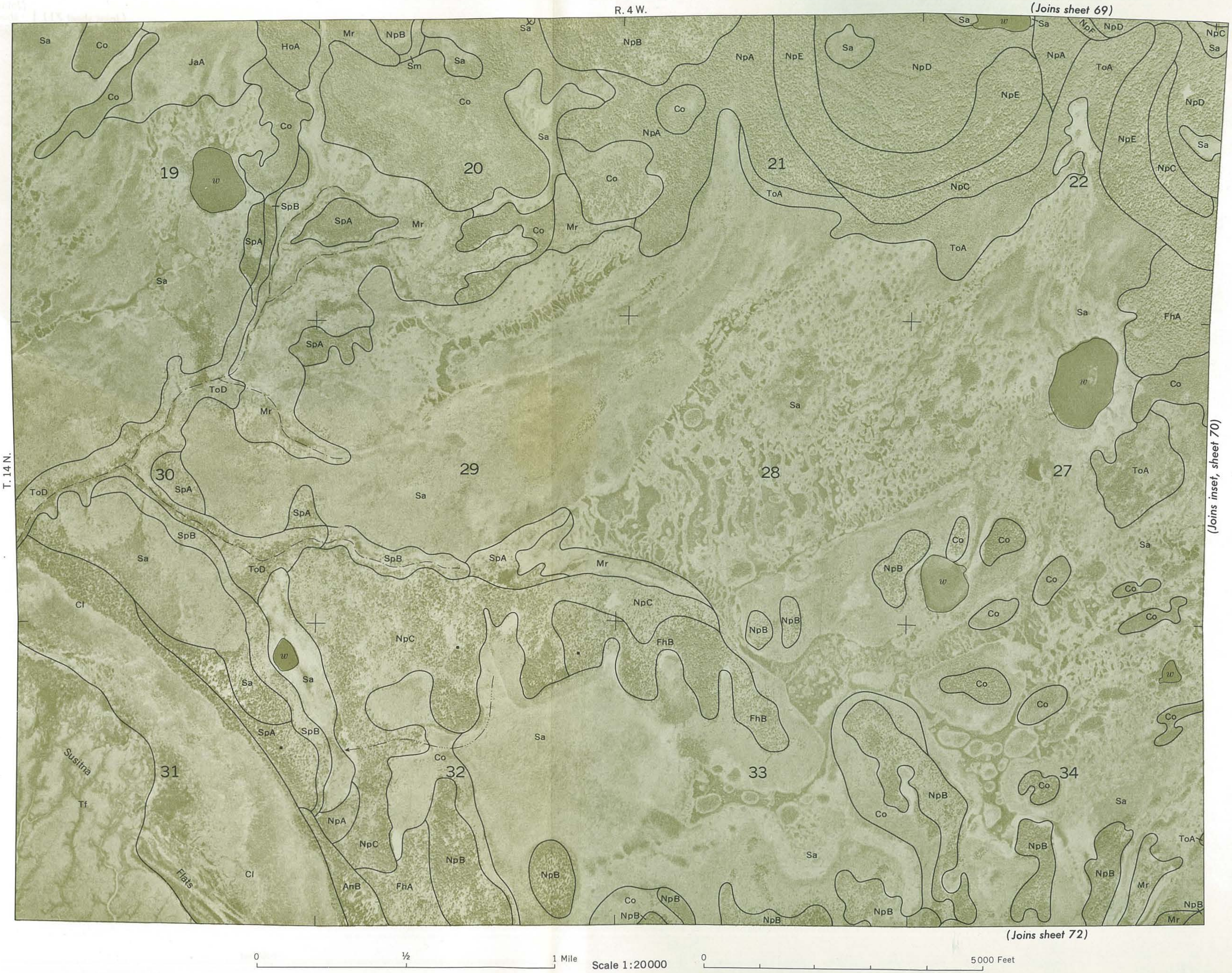

(Joins sheet 67)
R. 4 W.
69
N
T. 14 N.
LIMIT OF DETAILED SOIL SURVEY
Lost Lake
Twin Island Lake
(Joins sheet 70)
(Joins sheet 71)
Scale 1:20000
1 Mile
½
0
5000 Feet
0




0 ½ 1 Mile

Scale 1:20000

0 5000 Feet


R. 4 W.
(Joins sheet 69)
71
N
T. 14 N.
(Joins inset, sheet 70)
(Joins sheet 72)
19
20
21
22
27
28
29
30
31
32
33
34
Susitna
Flats
Sa
Co
JaA
HoA
Mr
NpB
Sm
NpA
NpE
NpD
NpC
NpF
ToA
SpB
SpA
ToD
FhA
FhB
Cl
Tf
AnB
w
0
½
1 Mile
Scale 1:20000
0
5000 Feet


0 ½ 1 Mile Scale 1:20000 0 5000 Feet