INDEX MAP SHOWING LOCATION OF KIGLUAIK MOUNTAINS STUDY AREA, SEWARD PENINSULA, ALASKA

Base form U.S. Geological Survey, 1:63,360, printing date 1950. Bendeleben (A-4), revised 1981; Nome (D-1, D-2, D-3), revised 1972, 1974, 1975, respectively; Solomon (D-6), revised 1973; Teller (A-1, A-2, A-3), revised 1973, 1972, 1970, respectively
Universal Transverse Mercator projection

SCALE 1:63 360

CONTOUR INTERVAL 50 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

AREA OF MAP

Geology by: D.M. Hopkins, 1967-73, 1983, 1985; R.E. Nelson, 1973-74; D.S. Kaufman, 1983-88; P.E. Calkin, 1984-87; B.J. Przybyl, 1986; W.B. Whitford, 1987; B.J. Peck, 1987

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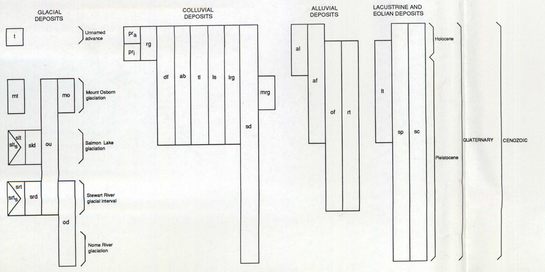
CORRELATION OF MAP UNITS*



*See "Description of Map Units" for specific age for map-units

DESCRIPTION OF MAP UNITS

GLACIAL DEPOSITS

t **Till (Holocene)**--Unsorted, very angular, bouldery debris and minor amount of matrix. Forms sharp-crested moraines that generally lack vegetation cover except for scattered lichens. Restricted to within 0.5 km of three small glacier fronts found (1) at head of central tributary to Grand Union Creek, (2) in perched cirque at head of Snow Gulch valley, and (3) in deep cirque located near shallow divide separating Cobblestone River drainage from eastern tributary to Glacial Lake

mt **Till of Mount Osborn age (latest Pleistocene)**--Poorly sorted, nonstratified ice-contact deposits; texture ranges from matrix-supported gravelly debris to stony silt; stones are subangular to subrounded, may larger than 2 m in diameter, and are abundant on moraine surfaces. Forms morphologically fresh lateral and end moraines that have sharp crests and steep flanking slopes; closed depressions, many filled with water, are common on hummocky surfaces. Found in most upper alpine valleys, especially those that display prominent trimlines and head in steep-walled cirques, many of which support tarns. Includes mass-wasted debris and small, lobate rock-glacier deposits particularly near steep valley walls

mo **Outwash of Mount Osborn age (latest Pleistocene)**--Moderately well sorted, stratified, coarse, sandy gravel. Marked by fresh, abandoned distributary channels cutting fresh surfaces that lack loess cover or periglacially altered mantle. Forms fans and low terraces downstream from many Mount Osborn moraines

ou **Outwash, undivided (late and middle Pleistocene)**--Sandy gravel as described for the outwash of Mount Osborn age (mo). Includes deposits left by glaciers of Stewart River, Salmon Lake, and Mount Osborn ages, as well as minor nonglacial alluvium and lacustrine deposits. Forms fans downstream of moraines and dissected surfaces near Windy Cove

slt **Till and ice-contact stratified drift comprising moraines of Salmon Lake age (late or middle Pleistocene)**--Poorly sorted, nonstratified debris similar to the till of Mount Osborn age (mt). However, stones are generally more well rounded and deposits better sorted, particularly at the mouths of major trunk valleys where glaciers flowed through wide troughs underlain by thick accumulations of alluvium. Surface boulders are generally sparse. Forms end moraines that display broader crests, less microrelief, and more reworking by solifluction and patterned-ground development than those of Mount Osborn age. At east end of Salmon Lake, includes:
Sandy gravel--Ice-contact deposits composed of moderately well sorted, locally stratified sandy gravel

sld **Drift of Salmon Lake age (late or middle Pleistocene)**--Deposits within mountain valleys inferred to have been derived and largely reworked from Salmon Lake glacial deposits. Drift on valley walls is severely modified by development of solifluction lobes and terraces; along valley margins, drift is covered by stabilized alluvial and debris fans. Valley-floor sediments include lacustrine, alluvial, and eolian deposits

srt **Till and ice-contact stratified drift comprising end moraines of Stewart River age (middle Pleistocene)**--Poorly sorted, nonstratified deposits as described for the till of Mount Osborn age (mt). Forms subdued end moraines distinguished only along southern and eastern mountain flanks beyond drainage divides not covered by ice during subsequent glaciations. Near Hog Creek, in the Pilgrim River valley, includes:
Sandy gravel--Kettle-bearing, ice-contact deposits composed of moderately well sorted, locally stratified, sandy gravel

srd **Drift off Stewart River age (middle Pleistocene)**--Thoroughly reworked glacial deposits as described for the drift of Salmon Lake age (sld)

od **Older drift (middle and early Pleistocene)**--Till and associated stratified sediment predominantly of Nome River age; probably includes deposits of both younger (Stewart River) and older (pre-Nome River) glacial ages. Largely reworked by solifluction and other processes, particularly along mountain front. Beyond mountains, deposits are blanketed by as much as 1 m of loess. Commonly recognized by presence of erratic boulders of resistant lithologies locally found on valley-wall benches, in streams, or within colluvial debris

COLLUVIAL DEPOSITS

pr **Protalus-rampart deposits (Holocene)**--Unsorted, nonstratified, angular, bouldery debris forming low, arcuate ridges. Found in well-shaded, largely north-facing sites below steep valley walls. Divided into:
Active deposits--Found at base of persistent snow and ice
Inactive deposits--Support extensive lichen cover and lack associated perennial snow or ice

rg **Rock-glacier debris deposits (Holocene)**--Tongue-shaped aggregates of fresh, angular, bouldery debris that extend from 10 of the deepest north-facing cirques scattered throughout the map area. Fronts are steep and high; some display incorporated ice masses

df **Debris-fan deposits (Holocene and late Pleistocene)**--Active or recently active, cobbly and bouldery rubble derived from colluvial processes. Forms solitary or coalescing fans that support debris levees and steep upper segments; found at base of steep valley slopes. Overlain in places by minor avalanche-boulder deposits (ab). Only major deposits displaying distinct fan morphology on small-scale aerial photographs are mapped

ab **Avalanche boulder deposits (Holocene and late Pleistocene)**--Bouldery debris forming tongues that originate in steep chutes along valley walls and extend far onto valley floors. Presumably produced by debris-rich snow avalanches

rl **Rockfall and talus deposits (Holocene and late Pleistocene)**--Active or recently active aprons of loose, crudely sorted, angular rubble near angle of repose at the base of steep valley heads. Derived from mass-wasting processes involving little transport by water

ls **Landslide deposits (Holocene and late Pleistocene)**--Bouldery, nonstratified, blocky debris associated with steep, scarred slopes. Found in glaciated mountain valleys

lrg **Lobate rock-glacier debris deposits (Holocene and late Pleistocene)**--Lobe-shaped masses of bouldery, angular debris associated with active and inactive talus deposits along foot of steep valley walls. Forms solitary or composite features more than 1 km wide scattered throughout map area

sd **Solifluction debris deposits (Quaternary)**--Thin deposit of weakly stratified, poorly sorted, pebbly silt with platy rock clasts. Forms well-developed lobes and smooth, sweeping terraces. Distinguished only on slopes beyond inferred limit of glacial ice

mrg **Rock-glacier debris deposits of Mount Osborn age (latest Pleistocene)**--Aggregates of coarse rock debris that extend from a few north-facing cirques and valley walls as described for the Holocene rock-glacier debris deposits (rg). However, older unit lacks fresh angular material, steep marginal slopes, and evidence of buried ice masses

ALLUVIAL DEPOSITS

al **Alluvium (Holocene)**--Stratified deposits of moderately to well-sorted gravel and sand. Primarily channel and over-bank deposits; includes oxbow-lake-fill, fan, bar, mine-tailing, eolian-sand, and glaciofluvial deposits too small to delineate at map scale. Restricted to flood plains and channels of active rivers

af **Alluvial fan deposits (Holocene and late Pleistocene)**--Active or recently active, moderately well sorted, stratified gravel that includes some cobbles and boulders. Forms fans at mouths of tributary streams, particularly those entering low-gradient valleys last occupied by ice during the Salmon Lake glaciation. Includes minor glacial-outwash and debris-flow deposits

of **Old alluvial fan deposits (Quaternary)**--Stratified gravel as described for alluvial fan deposits (af) that forms inactive fans along the northern flank of Kigluaik Mountains. May include outwash deposits in areas where evidence for glacial origin is equivocal

rt **River terrace deposits (Quaternary)**--Principally glaciofluvial deposits; includes other channel and over-bank deposits as described for alluvium (al). Forms terraces above active flood plains of major rivers

LACUSTRINE AND EOLIAN DEPOSITS

lt **Lake terrace deposits (late Quaternary)**--Well-sorted and stratified sand, silt and minor fine gravel. Most extensive deposit includes delraic and lake-bottom sediments adjacent to Salmon Lake. Lake-bottom deposits are also found behind a few moraines of Mount Osborn age and adjacent to rivers in Cobblestone River drainage

sp **Stratified silt and peat (Quaternary)**--Weakly stratified, well-sorted lacustrine and eolian silt and minor sand enclosing layers and lenses of silt rich in organic material and detrital peat. Contains ice wedges and large amount of buried interstitial ice. Found in marshy, topographic depressions containing thaw lakes. Includes the coastal-bluff exposures around Windy Cove

sc **Silty cover deposits (Quaternary)**--Weakly stratified mantles consisting predominantly of loess and secondary periglacially fractured materials. Along mountain flanks, unit overlies and includes aprons of inactive alluvial, glaciofluvial, and possibly other glacial deposits modified by mass-wasting processes including solifluction

BEDROCK

b **Metamorphic bedrock (early Paleozoic and Precambrian)**--Metaigneous and metasedimentary rocks. Forms discontinuous outcrops separated by patches of thin solifluction debris and windblown deposits

Glacier ice--Ice masses found associated with Holocene moraines in three, well-shaded, north-facing cirques. A fourth ice mass of possible glacial origin, but not associated with a Holocene moraine is located at head of major unnamed tributary to Cobblestone River

Geothermal thaw zone--Alluvial and eolian deposits thawed by hot-spring water. Supports a dense ecotonwood forest. Restricted to the Pilgrim Springs area

Contact--Dashed where approximate

Fault--Active or recently active. Dashed where inferred; dotted where concealed

Prominent morainal ridge (pre-Holocene)

Lake shoreline scarp--Probably formed during late Salmon Lake time when ice extended from Crater Creek and dammed Pilgrim River valley (Kaufman and others, 1988)

Radiocarbon sample locality--Number refers to table 1

INTRODUCTION

The Kigluaik Mountains, a rugged, ice-sculpted massif situated approximately 50 km north of Nome, form an east-west-trending belt about 20 km wide and 75 km long that includes the most prominent peaks on Seward Peninsula. The highest of these is Mount Osborn, a horn that reaches 1,437 m and shelters the largest and only active glacier among three small, moraine-producing ice masses remaining on the peninsula. The principal ice-sculptured peaks of the Kigluaik Mountains lie along the axis of an asymmetrically folded uniform composed of Precambrian and early Paleozoic granulite-facies metaigneous and metasedimentary rocks (Sainsbury and others, 1972; Till, 1983; Thurston, 1985; Till and others, 1986).

The northern flank of the Kigluaik Mountains is steep and fault bounded, contrasting with the more gentle southern slopes. Straight and narrow U-shaped valleys contain small streams that incise massive moraines built up beyond the northern range front, and then debouch onto the lake-dotted plain surrounding Imuruk Basin. This basin occupies a graben buried by moraines and alluvial sediments. Emergent marine deposits, present elsewhere along the shores of Seward Peninsula, are absent within Imuruk Basin, indicating that the basin has subsided more than 7 m in late Quaternary time.

The northern range-front fault, a central feature of the normal fault system of Seward Peninsula, displays surface features clearly indicative of Holocene displacement (Hudson and Plafker, 1978). Its trace is characterized by a well-defined scarp that locally separates bedrock from colluvium and from drift of Wisconsin and older ages. Late Pleistocene lateral moraine crests are vertically offset by 2 to 6 m in a few places along the eastern segment of the fault, but nowhere have offsets been measured on a continuous fault trace cutting moraines of distinctly different ages.

Summit elevations in the southern part of the range are generally lower than in the north. Here, deep, broad glacial troughs form well-integrated drainage networks and contain large fourth-order streams, some of which flow to the southern coast of Seward Peninsula. The southeastern segment of the range appears to be bounded by a young fault (Kaufman, 1985); however, evidence of recent movement is equivocal.

The valleys draining the southern flank of the Kigluaik Mountains contain an especially complete glacial record that spans some 2 m.y. and includes at least six episodes of glacial advance (Kaufman and Hopkins, 1986). The effects of former extensive and repeated glacial activity are conspicuously manifested in deep U-shaped valleys, well-developed moraines, and abundant erratic boulders that characterize this area. The oldest glacial episodes predate an 800,000-year-old lava flow that overran drift of the Nome River glaciation in central Seward Peninsula (Kaufman and Hopkins, 1986). During these ancient glaciations, ice originating in the Kigluaik Mountains filled major valley systems, advanced southward more than 60 km, and terminated beyond the present-day coastline at Nome. Deposits of these ancient glaciations have been studied extensively on the southern coastal plain of Seward Peninsula, where Hopkins (1967, 1972, 1973) and Hopkins and others (1960) documented the stratigraphic relations between these ancient drift sheets and several interglacial transgressive marine units. Within the map area, we do not distinguish among deposits of these very ancient glaciations. However, the majority of these deposits can be assigned to the Nome River glaciation, the last of the very extensive glacial advances.

Although they affected a much smaller area than the Nome River glaciation, subsequent glacial intervals are most clearly represented in the map area. The earliest of these, the Sawyer River glacial interval of Kaufman and Hopkins (1986), is thought to be older than the last major interglaciation; it is recorded by moraine complexes situated 5 to 10 km beyond the limits of drift of the younger Salmon Lake glaciation on the south margin of the Kigluaik Mountains. The Salmon Lake glaciation is older than 40,000 yr B.P. (table 1); although this glaciation has long been considered of early Wisconsin age, we cannot exclude the possibility that it predates the last major interglaciation.

The most recent major ice advance, the Mount Osborn glaciation, is older than 11,500 yr B.P. (table 1) and was restricted to the highest alpine valleys. A glacial still-stand or readvance during late Mount Osborn time is recorded by a set of distinctive loop moraines situated well up-valley from Mount Osborn terminal moraines in the highest north-facing cirques within the map area.

Holocene glacial advances apparently were restricted to as few as three sheltered cirques. However, several inactive protalus ramparts, evidence of former ice-wedge activity (map number 12, table 1), and at least 10 tongue-shaped rock glaciers that preserve small ice masses, are indicative of colder or moister conditions during the late Holocene.

Retreat of Pleistocene glaciers left over-steepened valley walls vulnerable to regrading by mass-wasting and periglacial processes. Debris-flow, avalanche, talus, and landslide deposits evidence large areas of glacial valley walls. Debris fans are particularly common; many coalesce to form broad aprons at the base of steep valley walls. Similar slope forms are typically not seen in areas mantled by pre-Salmon Lake drift where steep valley-wall segments are absent.

The four major glacial intervals, in addition to the unnamed Holocene advance, constitute the Quaternary stratigraphic framework for the Kigluaik Mountains first put forth by Hopkins (1953). Refinements to this framework include (1) the establishment of a relative-age chronology of glaciations based on subsurface and surface-boulder weathering and moraine-morphological evidence (Kaufman, 1987a,b; Calkin and others, 1987; Kaufman and Calkin, 1988); (2) the differentiation of Holocene from latest Pleistocene (Mount Osborn) glacial deposits (Calkin and others, 1986, 1987; Przybyl, 1988; Whitford and others, 1988); (3) the recognition of the Sawyer River glacial interval that occurred between the Salmon Lake and Nome River glaciations (Kaufman and Hopkins, 1986; Kaufman, 1986); and (4) the dating of (a) the Nome River glaciation as older than 800,000 yr B.P. (Kaufman and Hopkins, 1985, 1986), (b) the Salmon Lake as older than 40,000 yr B.P. (table 1) and (c) the Mount Osborn glaciation as older than 11,500 yr B.P. (Kaufman and others, 1988; table 1).

This report integrates these new findings with results of field and photo-interpretative studies conducted by the authors largely since 1983. Also included is a comprehensive listing of radiocarbon ages for the map area (table 1). Additional funding for these investigations was provided by the National Science Foundation Division of Polar Programs (grant DPP-8412897).

REFERENCES CITED

Calkin, P.E., Moeller, S.M., and Nelson, R.E., 1986, Extent of latest Wisconsin through Holocene glaciation, Seward Peninsula, Alaska [abs.]: 9th Biennial Meeting, American Quaternary Association, Program and Abstracts, p. 120.

Calkin, P.E., Przybyl, B.J., and Kaufman, D.S., 1987, Latest Quaternary glaciation, Kigluaik Mountains, northwestern Alaska: Geological Society of America Abstracts with Programs, v. 19, p. 8.

Hopkins, D.M., 1953, Seward Peninsula, in Péwé, T.L., ed., Multiple glaciation in Alaska--a progress report: U.S. Geological Survey Circular 289, p. 10-11.

_____1967, Quaternary marine transgressions in Alaska, in Hopkins, D.M., ed., The Bering Land Bridge: Stanford, Stanford University Press, p. 47-90.

_____1972, The paleogeography and climatic history of Beringia during late Cenozoic time: International Journal of Arctic and Nordic Studies, no. 12, p. 121-150.

_____1973, Sea level history in Beringia during the past 250,000 years: Quaternary Research, v. 3, p. 520-540.

Hopkins, D.M., MacNeil, F.S., and Leopold, E.B., 1960, The coastal plain at Nome, Alaska--a late Cenozoic type section for the Bering Strait region, in Chronology and climatology of the Quaternary: Report of the 21st International Geological Congress, Copenhagen, 1960, part 4, p. 46-57.

Hopkins, D.M., Pratt, Richard, Nelson, R.E., and Powell, C.L., 1983, Glacial sequence, southwestern Seward Peninsula, in Thorson, R.M., and Hamilton, T.D., eds., Glaciation in Alaska--extended abstracts from a workshop: Alaskan Quaternary Center, University of Alaska Museum Occasional Paper 2, p. 45-49.

Hudson, Travis and Plafker, George, 1978, Kigluaik and Bendeleben faults, Seward Peninsula, in Johnson, K.M. ed., The United States Geological Survey in Alaska--accomplishments during 1977: U.S. Geological Survey Circular 722-B, p.B47-B50.

Kaufman, D.S., 1985, Windy Creek and Crater Creek faults, Seward Peninsula, in Bartsch-Winkler, Susan, and Reed, K.M., eds., The United States Geological Survey in Alaska--accomplishments during 1983: U.S. Geological Survey Circular 945, p. 22-25.

_____1986, Surficial geologic map of the Solomon, Bendeleben, and southern Kotzebue quadrangles, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF 1838-A, scale 1:250,000.

_____1987a, Morphometric analysis of Pleistocene glacial deposits in the Kigluaik Mountains, northwestern Alaska: Seattle, University of Washington, M.S. thesis, 50 p.

_____1987b, Morphometric analysis of moraines and its application to the glacial sequence of the Kigluaik Mountains, Alaska: Geologic Society of America Abstracts with Programs, v. 19, no. 6, p. 393.

Kaufman, D.S., and Calkin, P.E., 1988, Morphometric analysis of Pleistocene glacial deposits in the Kigluaik Mountains, northwestern Alaska: Arctic and Alpine Research, v. 20, p. 273-284.

Kaufman, D.S., and Hopkins, D.M., 1985, Late Cenozoic radiometric dates, Seward and Baldwin Peninsulas and adjacent continental shelf, Alaska: U.S. Geological Survey Open-File Report 85-374, 27 p.

_____1986, Glacial history of the Seward Peninsula, in Hamilton, T.D., Reed, K.M., and Thorson, R.M., eds., Glaciation in Alaska--the geologic record: Anchorage, Alaska Geological Society, p. 51-78.

Kaufman, D.S., Hopkins, D.M., and Calkin, P.E., 1988, Glacial geologic history of the Salmon Lake area, Seward Peninsula, in Galloway, J.P. and Hamilton T.D., eds., Geologic studies in Alaska by the U.S. Geological Survey during 1987: U.S. Geological Survey Circular 1016, p. 91-94.

Przybyl, B.J., 1988, The regimen of Grand Union glacier and the glacial geology of the northeastern Kigluaik Mountains, Seward Peninsula, Alaska: Buffalo, State University of New York, M.A. thesis, 106 p.

Sainsbury, C.L., Hummel, C.L., and Hudson, Travis, 1972, Reconnaissance geologic map of the Nome quadrangle, Seward Peninsula, Alaska: U.S. Geological Survey Open-File Report 72-326, 28 p.

Thurston, S.P., 1985, Structure, petrology, and metamorphic history of the Nome Group blueschist terrane, Salmon Lake area, Seward Peninsula: Geological Society of America Bulletin, v. 96, no. 5, p. 600-617.

Till, A.B., 1983, Granulite, peridotite, and blueschist--Precambrian to Mesozoic history of Seward Peninsula: Journal of the Alaska Geological Society, v. 3, p. 59-66.

Till, A.B., Dumoulin, J.A., Gamble, B.M., Kaufman, D.S., and Carroll, P.I., 1986, Preliminary geologic map and fossil data from Solomon, Bendeleben, and southern Kotzebue quadrangles, Alaska: U.S. Geological Survey Open-File Report 86-276, 36 p.

Whitford, W.B., Przybyl, B.J., and Calkin, P.E., 1988, Distribution and activity of glaciers, rock glaciers and protalus ramparts, Kigluaik Mountains, Alaska: Geological Society of America Abstracts with Programs, v. 20, no. 1, p. 79.

Map No.	Quadrangle[1] lat.	long	Material and stratigraphic context	Chronological significance	Age (yr B.P.) [2] laboratory[3]	Reference
1	Teller (A-2) 65° 03'	165° 45'	Fine-grained organic detritus interbedded with pebbly sand below 3 m of gravel exposed in banks of Lake 4 ft. self near head of Windy Cove.	Provides a minimum age for lower gravel; possibly Salmon Lake outwash; overlying gravel may be Mount Osborn age.	>40,000 (I-13,040)	P.E. Calkin and D.M. Kaufman, unpub. data, 1987
2	Nome (D-2) 64° 59'	165° 59'	Fine-grained organic detritus from two layers in lake clay near drift of Salmon Lake age in Canyon Cr. valley.	Provides a minimum age for Salmon Lake glaciation.	>49,000 (I-7,718) >33,000 (I-7,708)	Hopkins and others, 1983
3	Nome (D-1) 64° 57'	165° 27'	Fine-grained organic detritus from 1.3-m depth in lacustrine deposits at mouth of cirque at head of Windy Cr.	Provides a minimum age for retreat of a Mount Osborn age glacier from main valley.	11,530 ± 450 (I-15,041)	Kaufman and others, 1988; collected by W.B. Whitford
4	Solo (D-6) 64° 57'	164° 44'	Peat and organic silt from pond deposits over drift in a terrace of Pilgrim River.	Indicates that Salmon Lake glaciation took place more than 10,900 years ago.	10,880 ± 160 (I-7,782) 10,210 ± 160 (I-7,782)	D.M. Hopkins, unpub. data, 1973
5	Teller (A-2) 65° 01'	165° 05'	Peat capping paleosol developed in diamicton and overlain by 1.7 m of boulder colluvium at mouth of Glacier Creek valley.	Dates close of a period of stabilization and onset of local colluviation.	6,950 ± 110 (I-15,045)	P.E. Calkin and W.B. Whitford, unpub. data, 1987
6	Nome (D-2) 64° 59'	165° 59'	Peat and wood from thaw-lake deposits overlying alluvium that, in turn, overlies drift in Crater Creek valley.	Provides a distant minimum age for Salmon Lake glaciation.	6,150 ± 110 (I-7,708) 5,910 ± 100 (I-7,707) 4,430 ± 90 (I-7,706)	D.M. Hopkins, unpub. data, 1973
7	Solo (D-6) 64° 58'	164° 43'	Fine-grained organic detritus below 55 cm of loess overlying sand and gravel on crest of same moraine 2.3 km east of Big Creek at Pilgrim River.	Dates Holocene filling of a depression on moraine of Stewart River age.	6,930 ± 80 (B-17,974)	P.E. Calkin and D.S. Kaufman, unpub. data, 1986
8	Nome (D-2) 64° 58'	165° 37'	Plant material at 1.4-m depth in flood deposit exposed in central Snake Creek valley.	Dates an interval separating periods of alluviation.	4,100 ± 90 (B-17,969)	P.E. Calkin and W.B. Whitford, unpub. data, 1987
9	Teller (A-2) 65° 00'	165° 47'	Organic detritus under 1-m of coarse gravel and sand in dissected hummock at lake 1217 ft. east near Pond Creek.	Dates alluvial sediments apparently exhumed as a pingo.	2,470 ± 90 (I-15,042)	P.E. Calkin, W.B. Whitford, and B.J. Peck, unpub. data, 1987
10	Nome (D-1) 64° 58'	165° 15'	Organic silt overlying gray silt capping till at confluence of North and West Forks Grand Central River.	Provides a distant minimum age for Mount Osborn glaciation.	2,180 ± 80 (I-11,131)	R.E. Nelson and D.M. Hopkins, unpub. data, 1978
11	Nome (D-1) 65° 00'	165° 20'	Fine-grained organic detritus from base of 1-m section of interbedded organic silt and sand in terrace 10 m above North Fork Grand Central R.	Provides a supporting minimum age for Mount Osborn glaciation and onset of postglacial slope-wash accumulation.	2,070 ± 70 (B-13,378)	P.E. Calkin, unpub. data, 1985
12	Solo (D-6) 64° 58'	164° 43'	Delta from ice-wedge-fill material in lower section of terrace of Pilgrim River.	Dates thaw of ice wedge.	2,025 ± 80 (I-7,703) 1,985 ± 80 (I-7,704)	D.M. Hopkins, unpub. data, 1973
13	Nome (D-2) 64° 57'	165° 13'	Organic detritus below 1.5 m of gravelly sand near head of Cobblestone River.	Provides a minimum age for Salmon Lake glaciation.	1,400 ± 80 (I-11,045)	P.E. Calkin and W.B. Whitford, unpub. data, 1987
14	Nome (D-1) 64° 57'	165° 12'	Organic silt overlying gray silt capping till at mouth of Thompson Creek.	Provides a distant minimum age for Mount Osborn glaciation.	1,390 ± 85 (I-11,143)	R.E. Nelson and D.M. Hopkins, unpub. data, 1978

[1] Nome, Nome quadrangle; Solo, Solomon quadrangle; Teller, Teller quadrangle.
[2] ±1σ, above sea level.
[3] Radiocarbon laboratories: B, Beta Analytic, Inc; I, Isotopes, Inc.

Table 1. *Radiocarbon ages from the Kigluaik Mountains area, Alaska*

SURFICIAL GEOLOGIC MAP OF THE KIGLUAIK MOUNTAINS AREA, SEWARD PENINSULA, ALASKA

By

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1989

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