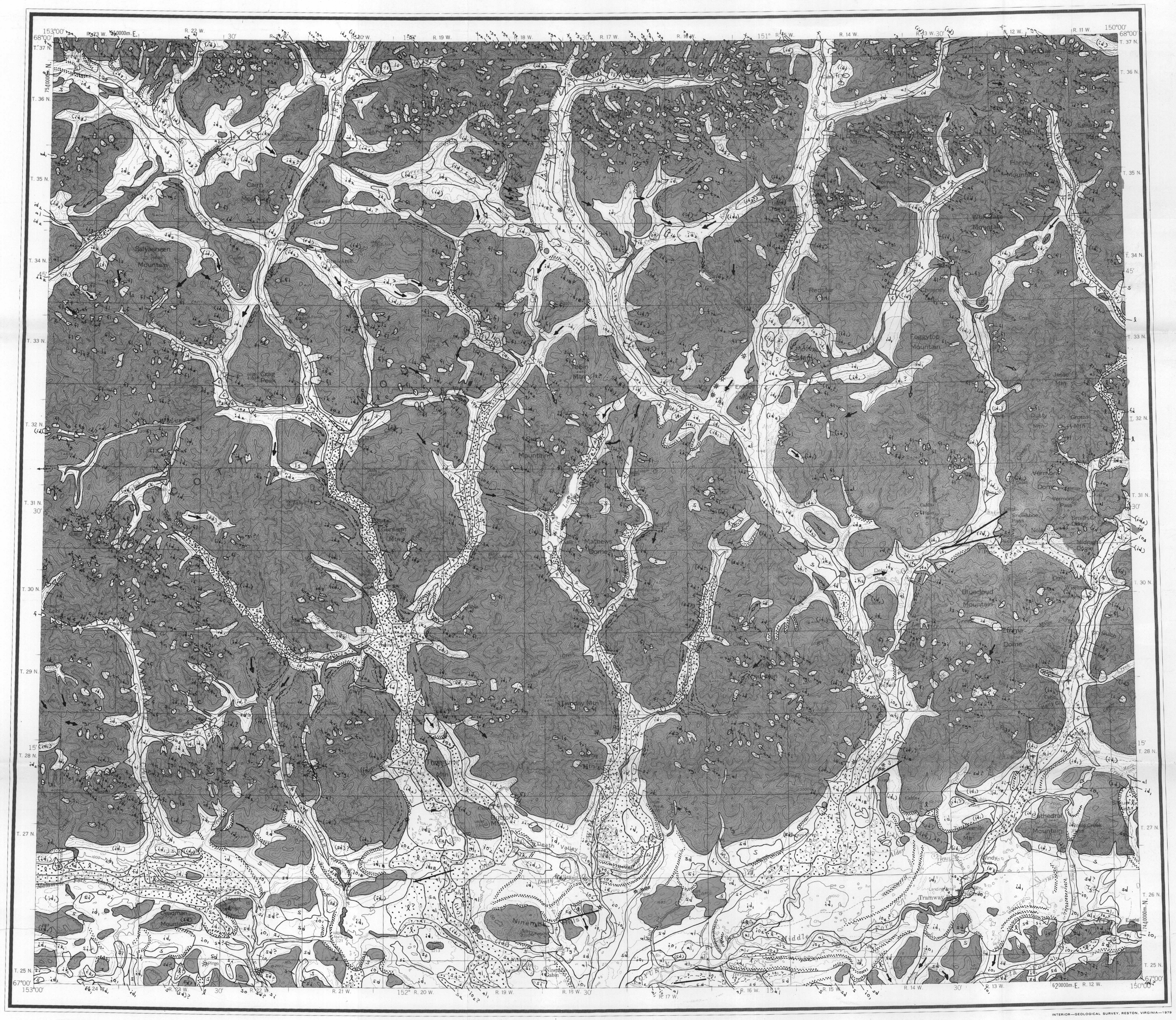
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

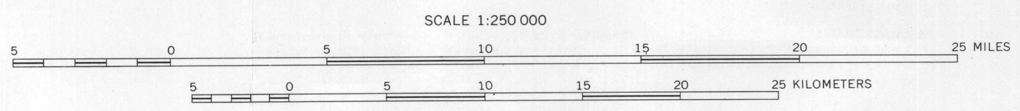
MISCELLANEOUS FIELD STUDIES
MAP MF-1122



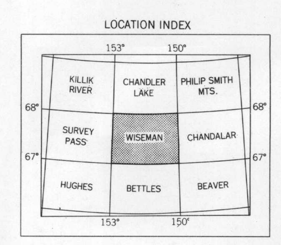
Base from U. S. Geological Survey, 1956

Geology by Reuben Kachadoorian, 1969-1970; R.D. Reger and Roy Kreig, 1971-1974; and T.D. Hamilton, 1969-1977

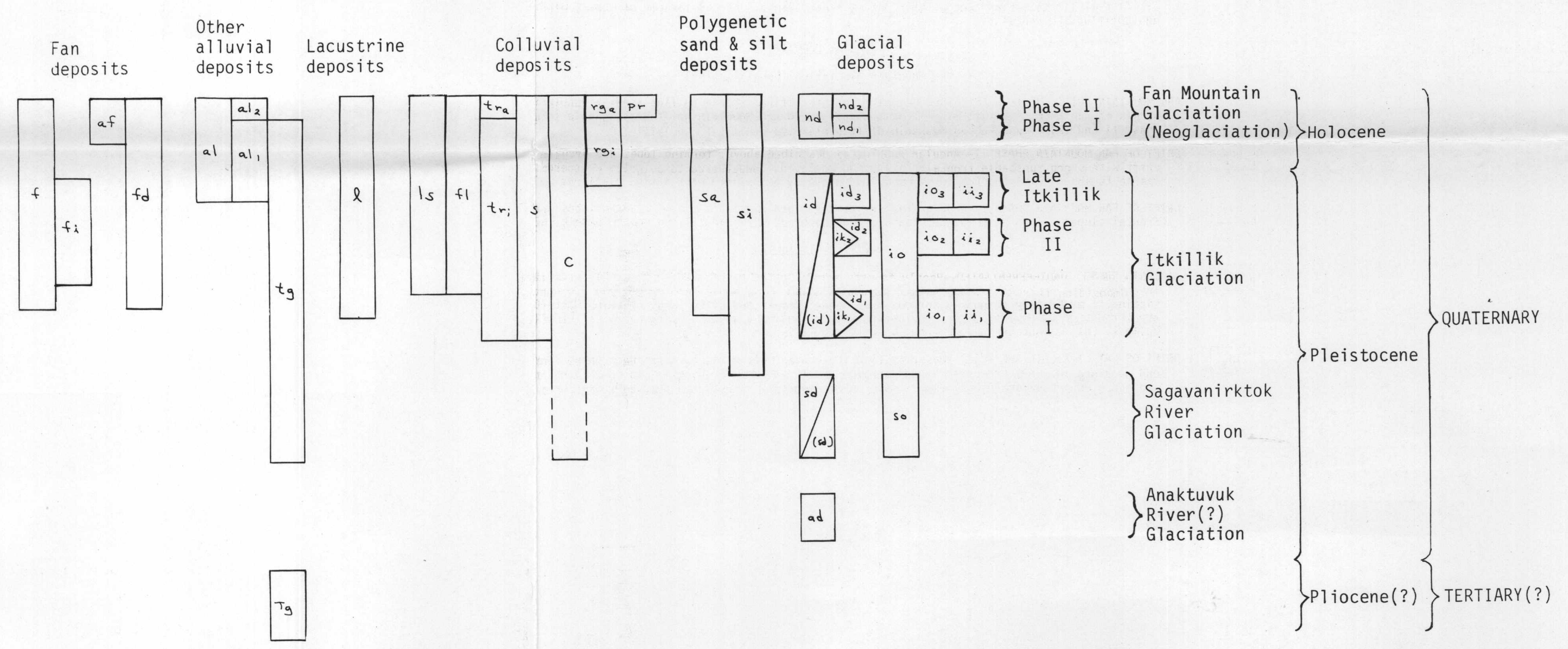
QUADRANGLE LOCATION



CONTOUR INTERVAL 200 FEET
DATUM IS MEAN SEA LEVEL



CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

INTRODUCTION

Surficial geologic mapping of the Wiseman quadrangle was based on (1) surface observations of morphology, composition, and distribution of unconsolidated deposits, (2) examination of test pits, roadcuts, placer workings, and other shallow excavations, (3) stratigraphic study of exposures along river bluffs, and (4) analysis of geologic data prepared for the corridor occupied by the Alyeska Pipeline (for example, Kachadoorian, 1971; Hamilton, 1979a). Map units are defined on the basis of their character, age, and genesis; most are identical to units mapped previously within the neighboring Chandalar and Philip Smith Mountains quadrangles (Hamilton, 1978a, b).

The basic stratigraphic framework for the surficial map units is provided by the central Brooks Range glacial sequence of Detterman, Bowsher, and Dutro (1958), with modifications by Porter (1964), Hamilton and Porter (1975), and Hamilton (1978a and in press). Glaciers were generated at relatively high altitudes along the Continental Divide near the north margin of the Wiseman quadrangle and also in lower lying cirques along the south flank of the Brooks Range and in localized granitic highlands west of the John Valley. During the more extensive glaciations, ice flowed from these source areas southward through the major valley systems to terminate at and beyond the south flank of the Brooks Range. Outwash trains were deposited along south- and west-flowing streams that issued from the ice fronts, and loess derived from outwash and other glacial deposits formed blankets beyond the flood-plain margins.

Drifts of four major glaciations are recognized within the Wiseman quadrangle. The Anaktuvuk and Sagavanirktok Glaciations of Detterman, Bowsher, and Dutro (1958) are currently termed Anaktuvuk River and Sagavanirktok River Glaciations to avoid confusion with previously named rock units (Keroher and others, 1966, p. 91 and 3379). Although Sagavanirktok River drift forms two units in its type locality (Hamilton, 1978b), only a single drift can be distinguished in the Wiseman quadrangle. Phases I and II of the Itkillik Glaciation are as described by Hamilton and Porter (1975), but the Itkillik "III" moraines of those authors are here designated as drift of late Itkillik age. Fan Mountain I and II advances (Porter, 1964) are equated with the late Holocene Neoglacial interval as described by Porter and Denton (1967) for the North American Cordillera. An additional glaciation, the Alapah Mountain Glaciation of Detterman, Bowsher, and Dutro (1958), Porter (1964), and Hamilton (1978a, b), is not used here. Drift formerly assigned to Alapah Mountain is reinterpreted as alpine moraines of late Itkillik age.

Radiocarbon dates from the neighboring Chandalar and Philip Smith Mountains quadrangles indicate that Itkillik I glaciation occurred more than 53,000 ^{14}C years B.P., that late Itkillik readvances took place about 12,500 to 11,500 yr B.P., and that post-Itkillik basin filling had commenced by at least 10,500 yr B.P. in some valleys (Hamilton, 1979b, c). The age of Itkillik II glaciation is uncertain but probably lies largely within the 23,000 to 16,000 yr B.P. time range of late Wisconsin maximum glaciation in the standard North American glacial succession (for example, Dreimanis and Goldthwait, 1973). About 30 radiocarbon dates from the Wiseman quadrangle will be available by 1980.

Lineaments are evident in unconsolidated deposits within the John, Wild, and Middle Fork Valleys near the south flank of the range; they also occur south of the Koyukuk River near the confluence of its North and Middle Forks and are present within the moutain valleys of Glacier Creek and the North Fork. These features are expressed as alined and unusually straight swales, gullies, and vegetation lines, associated in some places with pingos or pingo clusters, stream deflections, or abrupt linear boundaries of surficial map units. No vertical or horizontal offsets of unconsolidated deposits could be detected in the field, however, and a fault origin for these linear elements is unproven. They may represent true faults, perhaps caused by isostatic readjustments at the time of deglaciation (Mörner, 1978); alternatively, they may merely be surface expressions of underlying bedrock structures.

Permafrost probably is present beneath all but the larger lakes and rivers of the Wiseman quadrangle. Its upper surface ranges in depth from more than 1 m in permeable coarse-grained sediments to only a few centimeters in poorly drained deposits beneath thick moss and sod cover. Although its general thickness is unknown, mining records (for example, Reed, 1938, p. 62 and 129) suggest that the base of permafrost may lie at a depth of slightly more than 100 m in some valleys.

FAN DEPOSITS

f — FAN DEPOSITS, UNDIFFERENTIATED--Range from poorly sorted, weakly stratified, subangular silty sandy coarse gravel at mouths of steep canyons to moderately sorted and stratified subrounded sandy gravel at mouths of large tributary streams with relatively gentle gradients. Locally subject to icings during winter (Sloan and others, 1976).

f_i — INACTIVE FAN DEPOSITS--Sandy gravel to muddy sandy gravel, as described above, usually with thick (more than 0.5 m) cover of organic silt to stony silt beneath unbroken sod and vegetation. Best developed in valleys that remained unglaciated during Itkillik II time (for example, valleys of Mettenpherg and Florence Creeks, Malamute Fork of John River, and South Fork of Koyukuk River).

af — DEPOSITS OF STEEP ALPINE FANS--Coarse, very poorly sorted, nonstratified to weakly stratified, subangular to subrounded muddy sandy gravel at mouths of avalanche chutes and steep canyons near heads of mountain valleys. Upper segments generally channeled, with levees of angular to subangular coarse debris. Subject to snow avalanches during winter and spring (Luckman, 1978), slushflows during spring snowmelt season (Washburn, 1973, p. 164-169), and debris flows during summer (Rapp, 1975). Surface gradients (generally 12°-25°) intermediate between those of alluvial fans and talus cones.

fd — FAN-DELTA DEPOSITS--Alluvial-fan facies (poorly sorted, weakly stratified, subangular sandy gravel) near valley walls, grading into deltaic and lacustrine facies (well sorted and stratified silt, sand, and fine gravel) near valley centers. Occur in moraine-dammed basins within valleys of John, Wild, and Hammond Rivers, Malamute Fork of Alatna River, and North Fork of the Koyukuk. Locally subject to icings.

OTHER ALLUVIAL DEPOSITS

al — ALLUVIUM, UNDIFFERENTIATED--Ranges from poorly sorted, moderately well stratified, subangular to subrounded sandy coarse gravel near heads of mountain valleys to moderately well sorted, well stratified, subrounded to rounded sandy gravel and gravelly sand along slow-flowing stretches of major streams. May contain local beds and lenses of sand and sandy silt. Includes fan, flood-plain, and low terrace deposits too small to be designated separately.

al_2 — MODERN ALLUVIUM--Sand and gravel, as described above; generally unvegetated and commonly subject to icings (see Sloan and others, 1976). Differentiated only along Koyukuk River and its North, Middle, and South Forks, and along John River.

al_1 — LOW ALLUVIAL TERRACE DEPOSITS--Sand and gravel, as described above; generally mantled with up to 0.5 m of organic silt, very fine sand, peat, and sod; and generally vegetated. Form terraces generally 0.5 to 3.0 m above upper limit of modern alluvium.

tg — TERRACE GRAVEL, UNDIFFERENTIATED--Gravel and sandy gravel, as described above, in terrace remnants of uncertain origin along parts of Wolverine, Shukokluk, Chicken, and Florence Creeks and near heads of Clear and John Rivers.

Tg — TERTIARY(?) GRAVEL DEPOSITS--Rounded to well rounded, well to moderately sorted pebbles and small cobbles in matrix of strongly oxidized coarse sand. Stones are better rounded, better sorted, smaller, and more quartzose (50 percent of total) than in any local outwash, interglacial, or postglacial deposits. Forms residual knobs near Ninemile Hills that stand 50 to 100 m high. Probably present beneath glacial deposits of Sagavanirktok River(?) age near southeast corner of map area.

LACUSTRINE DEPOSITS

ℓ — LACUSTRINE DEPOSITS, UNDIFFERENTIATED--Well stratified silt and clay, containing sparse dropstones, grading into generally well stratified sand near former shorelines and sandy fine gravel near former stream mouths. Extensive thick deposits behind Itkillik-age moraines in valleys of John, Wild, Allen, and Hammond Rivers, Wiseman and Sixtymile Creeks, Malamute Fork of Alatna River, and Koyukuk River's North Fork. Shown only by stippled map pattern where buried beneath late Itkillik outwash or beneath Holocene alluvium, solifluction deposits, and fan deposits. Include beach and deltaic deposits too small to designate individually.

COLLUVIAL DEPOSITS

ls — LANDSLIDE DEPOSITS--Unsorted, nonstratified, coarse to fine angular rubble, commonly with matrix of finer debris, forming lobes below detachment scars and slide tracks on high, steep rock walls. Subject to episodes of rapid downslope motion and long periods of relative stability. Most common in schist, phyllite, the Hunt Fork Shale, and other shale and siltstone units as mapped by Brosgé and Reiser (1971); also present in very steep slopes underlain by Kanayut Conglomerate and by limestone. Only 18 of the 54 landslides recognized in the Wiseman quadrangle lie on or close to faults mapped by Brosgé and Reiser (1971).

fl — FLOW-SLIDE DEPOSITS--Very poorly sorted, angular, tabular rubble in abundant matrix of generally micaceous sand and silt containing little clay. Forms lobes subject to slow and probably continuous downslope motion. Most numerous in phyllite, siltstone, and the Hunt Fork Shale as mapped by Brosgé and Reiser (1971); also present in quartz mica schist and in limestone with siltstone or phyllite interbeds.

tr_a — ACTIVE TALUS RUBBLE--Angular, unsorted, nonstratified rock debris forming cones and aprons along lower walls of mountain valleys and in cirques at valley heads. Also forms thin (less than 1-2 m) and generally discontinuous sheets over many uplands mapped as "bedrock". Generally unvegetated, unweathered to slightly weathered, and with lichen cover sparse to absent. Subject to rockfalls, especially during spring snowmelt season.

tr_i — INACTIVE TALUS RUBBLE--Angular rock debris, as described above, generally weathered and lichen-covered, and commonly with partial sod cover. Thin (less than 1-2 m) blankets of stabilized talus occur on uplands mapped as bedrock beyond limits of Itkillik II glaciation in southwestern and south-central parts of map area.

s — SOLIFLUCTION DEPOSITS--Very poorly sorted, nonstratified to weakly stratified stony sandy silt and organic silt in sheets and aprons more than 1 m thick on lower slopes of valleys. Most common on drift and bedrock beyond outer limits of Itkillik I glaciation but also form generally smaller, more widely scattered deposits on shale, schist, and phyllite farther north (see Brosgé and Reiser, 1971). Several extensive solifluction slopes within mountain valleys (for example, North Fork Koyukuk near Ipnek Creek and Moving Mountain; Wild Valley near Matthews Dome) appear to be associated with fault zones mapped by Brosgé and Reiser. Form thin (less than 1-2 m) sheets and aprons over many areas mapped as Itkillik I and older drift.

c — COLLUVIUM, UNDIFFERENTIATED--Mixed talus rubble and solifluction deposits, as described above, forming aprons more than 1-2 m thick on slopes beyond limits of Itkillik II glaciation in valleys of Clear River, Mashooshalluk Creek and Kevuk Creek and near heads of Wolverine Creek, Khukokluk Creek, and Malamute Fork of the John River. Most common on phyllite, shale, and slate as mapped by Brosgé and Reiser (1971).

rg_a — ROCK-GLACIER DEPOSITS, ACTIVE--Very poorly sorted, nonstratified, coarse angular rock debris, commonly with matrix of silt and fine rubble. Contains abundant interstitial ice. Upper surfaces generally unvegetated, unweathered to moderately weathered, and with sparse to moderate lichen cover. Frontal slopes barren, steep, and unstable, meeting upper surfaces at abrupt angle. Form (1) lobate deposits at bases of talus cones along valley walls and (2) tongue-shaped deposits within cirques (see White, 1976). The tongue-shaped variety commonly overlies stagnant glacier ice (Ellis and Calkin, in press). Subject to slow downslope motion.

rg_i — ROCK-GLACIER DEPOSITS, INACTIVE--Coarse angular rock debris, as described above, but generally lacking abundant interstitial ice and underlying stagnant glacier ice. Upper surfaces and frontal slopes weathered, lichen covered, and commonly bear partial sod or vegetation cover. Frontal slopes grade into upper surfaces without abrupt angles.

pr — PROTALUS RAMPART DEPOSITS--Unsorted, nonstratified, coarse, angular rock debris forming arcuate low ridges at bases of cirque headwalls. Associated with persisting snowbanks in shaded sites. Subject to rockfalls during spring snowmelt season.

POLYGENETIC SAND AND SILT DEPOSITS

sa — SAND--Moderately sorted fine to medium sand, horizontally bedded to crossbedded, commonly with thin interbeds of sandy peat or organic silty fine sand. Deposited by slow-moving streams within basins partly dammed by end moraines in valleys of John and Allen Rivers, Sixtymile and Michigan Creeks, and Malamute Fork of Alatna River. Upper 0.5 to 5 m locally reworked by wind into sand sheets and dunes. Commonly grade downward into lacustrine deposits (see stippled map pattern).

si — ORGANIC SILT--Poorly stratified organic silt and silty peat, containing abundant ice as lenses, wedges and interstitial grains. Occurs beneath *Sphagnum* and black spruce in poorly drained depressions (muskeg) beyond Itkillik II limits at and near south flank of Brooks Range. Formed largely of loess, with admixed organic and solifluction deposits.

GLACIAL DEPOSITS

Fan Mountain Glaciation (Neoglaciation)

nd — FAN MOUNTAIN DRIFT, UNDIFFERENTIATED--Unsorted, nonstratified, coarse to fine angular rubble in cirques near north margin of map area. Designates (1) remnants of eroded Fan Mountain drift unassignable to either Phase I or Phase II and (2) composite Fan Mountain drift bodies too small for subdivision.

nd_2 — DRIFT OF FAN MOUNTAIN PHASE II--Angular rubble, as described above, forming lobes and arcuate ridges of ice-cored drift with steep, unstable frontal slopes. Unvegetated, unweathered to slightly weathered, and with lichens sparse to absent. Restricted to cirques and generally associated with active glaciers.

nd_1 — DRIFT OF FAN MOUNTAIN PHASE I--Angular rubble, as described above, forming dissected lobes and ridges with stable frontal slopes. Generally weathered and lichen covered, with partial sod cover in some localities.

Itkillik Glaciation

id — ITKILLIK DRIFT, UNDIFFERENTIATED--Poorly to very poorly sorted nonstratified to weakly stratified till, ranging in composition from muddy sandy gravel to clayey stony silt, with local stratified ice-contact deposits consisting of moderately to poorly sorted sand, sandy gravel, and silty sandy gravel. Contains faceted and striated stones up to boulder size. Designates thick (greater than 3 m) drift deposits, usually within mountain valleys, that cannot be assigned to a specific Itkillik moraine system.

id_3 — DRIFT OF LATE ITKILLIK AGE--Till and stratified ice-contact deposits, as described above. Forms sharp-crested end moraines and very irregular ground moraine and ice-stagnation deposits in upper John and Tinayguk Valleys and along Hunt Fork and Fish Creek. Loess cover generally absent, and exposed stones very slightly weathered.

id_2 — DRIFT OF ITKILLIK PHASE II--Till and stratified ice-contact deposits, as described above, forming sharply defined drift lobes with conspicuous knob and kettle morphology associated with undissected channeled outwash trains. Lacustrine plains occupy many nonglaciated tributaries dammed by ice in main valleys. Loess and solifluction cover thin to absent over crests and slopes; exposed stones exhibit slight to moderate weathering. Present in upper valleys of Clear and Hammond Rivers, along North and Middle Forks of Koyukuk River, and along John Valley and its northern tributaries.

Subunit ik_2 (KAME AND KAME-TERRACE DEPOSITS) designates unusually extensive and thick (greater than 30 m) deposits of moderately sorted sand, gravelly sand, and sandy gravel, usually with less than 0.2 m cover of silt, organic silt, and sod. Forms extensive deposits along North Fork of Koyukuk River and near mouth of Allen River; less extensive deposits occur elsewhere in Koyukuk and John River drainages.

id_1 — DRIFT OF ITKILLIK PHASE I--Till and stratified ice-contact deposits, as described above. Form broad, heavily forested piedmont lobes with large kettle lakes and extensive outwash terraces at south flank of Brooks Range. Eroded arcuate end moraines and lateral moraine embankments extend from glaciated main valleys of Wild and John Rivers and North and Middle Forks of Koyukuk River into lower courses of unglaciated tributaries.

Subunit id_{1B} designates conspicuous inner moraines near Wild Lake, west of John River at south flank of Brooks Range, and along Middle Fork Koyukuk River that probably represent local readvances of Itkillik I glaciers during interval of general ice wastage.

Subunit ik_1 (KAME AND KAME-TERRACE DEPOSITS) designates unusually extensive and thick ice-contact stratified sand and gravel associated with drift of Phase I and Phase IB at and near south flank of Brooks Range.

io — OUTWASH, UNDIFFERENTIATED--Moderately well sorted and stratified sandy gravel, generally decreasing in maximum size from subrounded cobbles and small boulders near moraine fronts to subrounded to rounded pebbles and cobbles farther downvalley. Forms aprons and valley trains in front of Itkillik moraines; forms isolated terrace remnants farther downvalley.

io_3 — OUTWASH OF LATE ITKILLIK AGE--Sandy gravel, as described above, usually with thin (less than 0.3 m) silt and sod cover. Forms aprons and valley trains in front of late Itkillik moraines. Terraces are as high as 15 m and generally continuous.

io_2 — OUTWASH OF ITKILLIK PHASE II--Sandy gravel, as described above, usually with thin (less than 0.3 m) silt and sod cover. Forms extensive aprons and valley trains in front of Itkillik II moraines. Terraces generally continuous and 15 to 25 m high.

io_1 — OUTWASH OF ITKILLIK PHASE I--Sandy gravel, as described above, usually with thick (0.5 to 4 m) and widespread cover of silt and organic silt (loess and solifluction deposits). Forms aprons and valley trains in front of Itkillik I moraines. Terraces generally 20 to 30 m high.

Subunit io_{1B} designates outwash associated with inner moraines (Phase IB) near John Valley at south flank of Brooks Range.

ii_3 — INWASH OF LATE ITKILLIK AGE--Well to moderately sorted and stratified gravelley sand and sandy fine gravel, commonly grading upvalley into fan deposits and downvalley into lacustrine sediments. Deposited near mouths of nonglaciated tributaries blocked by late Itkillik glaciers in main valleys. Forms benches and terraces that abut against outer flanks of lateral moraines or outer faces of drift lobes. Loess, sod, and silt cover generally thin to absent (less than 0.2 m). Occurs only within valley of Kevuk Creek.

ii_2 — INWASH OF ITKILLIK PHASE II--Gravelly sand, sandy fine gravel, and local fan deposits, as described above. Forms benches and terraces that abut against drift of Itkillik II age within valleys of Canyon Creek, Glacier River and northern tributary to Shukokluk Creek.

ii_1 — INWASH OF ITKILLIK PHASE I--Gravelly sand, sandy fine gravel, and local fan deposits, as described above. Forms benches and terraces that abut against drift of Itkillik I age within valleys tributary to Allen and Tinayguk Rivers.

Sagavanirktok River Glaciation

sd — DRIFT--Poorly sorted nonstratified till, probably ranging in composition from silty sandy bouldery gravel to clayey stony silt, with local deposits of moderately well sorted and stratified gravel. Forms broad morainal ridges and hummocky till plains at and beyond south margin of Brooks Range; forms extensive drift bodies along Michigan Creek and isolated drift remnants beyond Itkillik ice limits elsewhere within mountain valleys. Generally covered by thick (more than 3 m), nonstratified to weakly stratified blanket of silt, stony silt, and organic silt (loess, solifluction, and muskeg deposits). Crests of some ridges and knolls yield limited exposures of weathered gravel consisting of subrounded pebbles, cobbles, and small boulders of resistant lithologies.

Subunit (*sd*) designates thin (less than 3 to 5 m) and generally discontinuous drift deposits on bedrock beyond Itkillik ice limits.

so — OUTWASH--Moderately well sorted, stratified sandy gravel, generally decreasing in maximum size from subangular cobbles and small boulders near moraine fronts to subrounded pebbles and cobbles farther downvalley. Associated with maximum limit of Sagavanirktok River drift in a single locality 9 km south of Heart Mountain.

Anaktuvuk River(?) Glaciation

ad — DRIFT--Glacial deposits of unknown composition forming very subdued ground moraine south of South Fork Koyukuk River in extreme southeast corner of map area. Covered by thick and extensive solifluction deposits.

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GEOLOGIC SYMBOLS

- Bedrock
- Ice-scoured bedrock - Showing direction of ice movement or meltwater drainage
- Glacier - Curved lines concave downvalley
- Surface and subsurface lacustrine deposits
- Morainal ridge
- Pingo
- Direction of glacier flow across topographic divide
- Direction of glacial meltwater flow across topographic divide or ridge spur
- Lineament expressed in unconsolidated deposits
- Contact - Dashed where divides ice-scoured bedrock from other bedrock
- ( ) Thin and generally discontinuous deposit above bedrock

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SURFICIAL GEOLOGIC MAP OF THE WISEMAN QUADRANGLE, ALASKA

By

Thomas D. Hamilton

1979