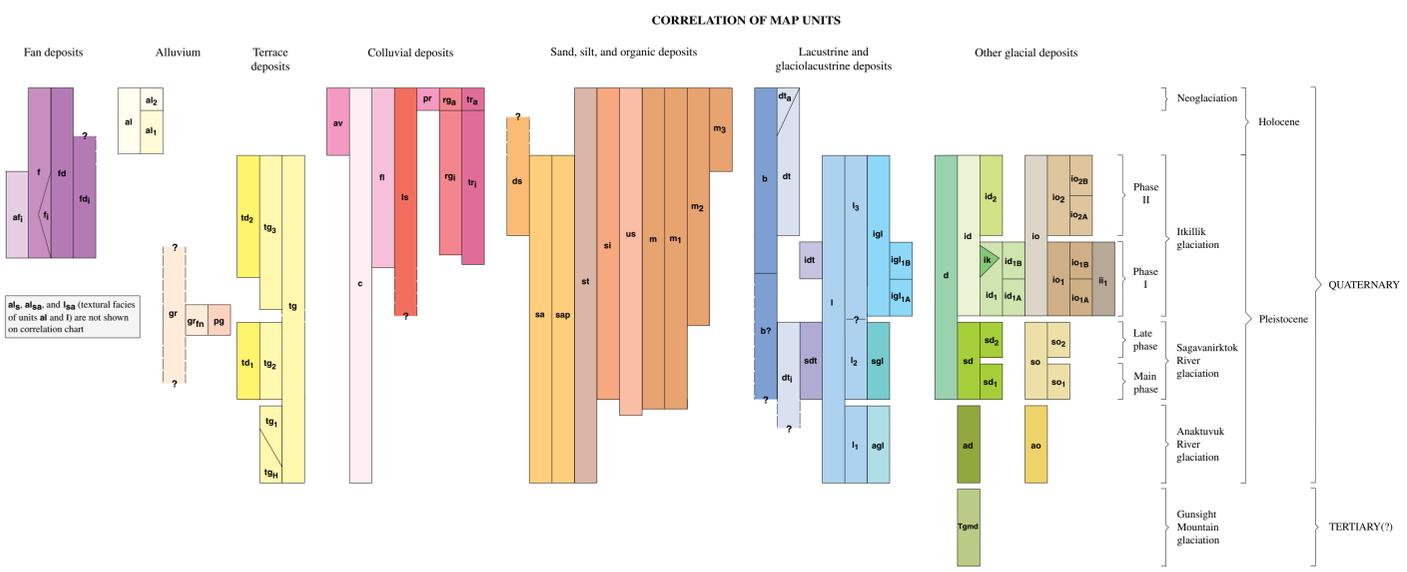


Geology by W.W. Patton, Jr. and T.P. Miller, 1966-70; J.S. Pallister and C. Carlson, 1984; T.D. Hamilton, 1962-66 and 1983-87.
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LIST OF MAP UNITS
(See pamphlet for detailed descriptions. Units queried where uncertain.)

- FAN DEPOSITS**
- af1 Inactive deposits of steep alpine fans—Very poorly sorted sandy gravel at mouths of avalanche chutes and steep canyons, currently inactive
 - f Fan deposits—Range from coarse gravel (mountain valleys) to gravelly sand and silt (lowlands)
 - fi Inactive fan deposits
 - fd Fan-delta deposits—Alluvial-fan deposits that grade distally into deltaic and lacustrine beds
 - fdi Inactive fan-delta deposits
- ALLUVIUM**
- al Alluvium, undivided—Coarse gravel in northern part of map area; sandy fine gravel and gravelly sand farther south. Locally includes fan and low terrace deposits too small to map separately
 - al1 Fine-grained silty alluvium—Along slow-moving streams in glacial-lake basins
 - al2 Fine-grained sandy alluvium—Along slow-moving streams
 - al3 Modern alluvium—Gravel and sandy gravel, generally unvegetated
 - al4 Low alluvial-terrace deposits—Gravel and sandy gravel mantled with thin silt, sand, turf, and peat generally within 3.4 m of modern stream levels
 - gr Gravel deposits, other—Isolated erosion remnants of uncertain composition and origin
 - gr1 Fine gravel—Rounded pebbles and small cobbles in slightly oxidized quartzose sand. Forms erosion remnants
 - gr2 Piedmont gravel—Schist and quartz pebbles in abundant matrix of oxidized sand with schist chips
- TERRACE DEPOSITS**
- td2 Terrace deposit, low-level (late Pleistocene)—Laminated clay and silt (lacustrine) and sandy fine gravel (deltaic); capped by outwash gravel and silty floodplain deposits
 - td1 Terrace deposit, high-level (middle Pleistocene)—Strongly oxidized gravel, with some sand, silt, clay and fill deposits; capped by thick silt
 - td3 Terrace gravel, low-level (late Pleistocene)—Alluvial gravel with thin silt cover, forming surfaces 8-10 m high
 - td2 Terrace gravel, intermediate-level (middle Pleistocene)—Alluvial gravel with silt cover of intermediate thickness forming isolated surfaces 20-25 m high
 - td1 Terrace gravel, high-level (early Pleistocene)—Alluvial gravel and sandy gravel, generally with thick silt and muskeg cap, forming widespread surfaces 30-35 m high
 - td3 Terrace gravel, highest-level (early Pleistocene?)—River-formed surface 75 m high, with thick loess cap
 - td2 Terrace gravel, other—Gravel terrace inset within drift of Itkillik Phase I
- COLLUVIAL DEPOSITS**
- av Avalanche tracks and deposits—Unsorted rock debris in tongues and fans below unvegetated tracks or chutes
 - c Colluvium, undivided—Mixed solifluction deposits and talus rubble
 - fi Flow deposits—Lobes of angular rock rubble in abundant silty matrix
 - la Landslide deposits—Angular rubble below detachment scars and slide tracks
 - pr Protalus rampart deposits—Arcuate low ridges of coarse angular rock debris at bases of persistent snowbanks
 - rga Rock-glacier deposits, active—Lobes of coarse angular rock debris with matrix of ice-rich silt and fine rubble
 - rgi Rock-glacier deposits, inactive—Coarse angular rock debris lacking interstitial ice. Surfaces weathered and partly vegetated
 - tr1 Talus rubble, active—Angular rock debris forming along lower walls of mountain valleys; generally unvegetated and unweathered
 - tr2 Talus rubble, inactive—Angular rock debris; generally weathered and partially sod covered
- SAND, SILT AND ORGANIC (MUSKEG) DEPOSITS**
- ds Dune sand—Fine to medium sand forming subdued parabolic ridges; generally vegetated
 - sa Sand-sheet deposits—Stratified sand; may contain fine alluvium along valley centers
 - sap Sand aprons—Fine sand forming smoothly sloping, vegetated, wedge-like deposits against flanks of uplands
 - st Silt deposits—Thick silt and organic silt, with lenses of stony to sandy silt. Generally stable and vegetated
 - sl Ice-rich silt deposits—Thick silt deposits, commonly with ice-wedge polygons in swales and other depressions and along valley centers
 - us Upland silt deposits—Silt and organic silt; commonly grades downslope into organic-rich silt or solifluction deposits
 - m Muskeg—Organic deposits more than 1-2 m thick where drainage restricted
 - m3 Muskeg that forms floor of Pah River Flats
 - m2 Isolated muskeg remnants—At levels intermediate between m1 and m3
 - m1 High-level muskeg deposits—Around Pah River Flats. Separated from lower-level muskeg by heavily vegetated bluffs
- LACUSTRINE AND GLACIOLACUSTRINE DEPOSITS**
- b Beach deposits—Sand and platy fine gravel, locally shored into ridges
 - dt Deltaic deposits—Sandy alluvial deposits at lake margins
 - df1 Active deltaic deposits
 - df2 Inactive deltaic deposits
 - ld1 Deltaic deposits of Itkillik age (late Pleistocene)—Sandy fine gravel above till, ice-contact, and lacustrine deposits of Itkillik Phase I age in Alutka Valley
 - sdt Deltaic deposits of Sagavanirktok River age (middle Pleistocene)—Sandy fine gravel associated with outwash of Sagavanirktok River age
 - l Lacustrine deposits—Fine sediments, grading into sand and gravel near former shorelines and river mouths
 - laa Sandy lacustrine deposits
 - lg Lacustrine deposits, eroded—Muskeg-covered lacustrine flats, heavily eroded by streams
 - l2 Lacustrine deposits, low-level—Stratified silt and related deposits overlain by muskeg with abundant lakes
 - l1 Lacustrine deposits, high-level—Stratified silt and related deposits separated from unit l2 by bluffs
 - lgl1 Glacial-lake deposits of Itkillik age (late Pleistocene)—Stratified fine sediments, grading into sand and gravel near former stream mouths
 - lgl1B Glacial-lake deposits—Behind moraine dams of Itkillik Phase IB
 - lgl1A Glacial-lake deposits—Behind moraine dams of Itkillik Phase IA
 - lgl2 Glacial-lake deposits of Sagavanirktok River age (middle Pleistocene)—Poorly exposed probable lacustrine sediments
 - agl1 Glacial-lake deposits of Anaktuvuk River age (early Pleistocene)—Lacustrine sediments that form extensive muskeg-covered plains near end moraines of inferred Anaktuvuk River age
- OTHER GLACIAL DEPOSITS**
- d Drift, undivided—Glacial deposits of uncertain age
 - id Drift of Itkillik age, undivided—Compact bouldery till, with ice-contact deposits
 - id1 Drift of Itkillik Phase II—Till and ice-contact deposits
 - id2 Drift of Itkillik Phase I—Till and ice-contact deposits
 - id1B Drift of Itkillik Phase IB—End moraines and associated drift upvalley from outermost moraines
 - id1A Drift of Itkillik Phase IA—Outermost moraine of Itkillik complex and associated drift
 - ik Kame and kame-terrace deposits of Itkillik Phase IB—Thick and extensive water-washed sand and gravel deposits
 - io Outwash of Itkillik age, undivided—Bouldery till, with local deposits of coarse gravel and valley trains capped by thick deposits of colluvial silt
 - io2 Outwash of Itkillik Phase II—Sandy gravel associated with end moraines of Itkillik Phase II age
 - io2A Outwash of Itkillik Phases IIB and IIA—Forms terraces at two distinct levels
 - sd Sagavanirktok River glaciation (middle Pleistocene)
 - sd1 Drift of Sagavanirktok River age—Till and local ice-contact gravel; generally capped by thick silt
 - sd2 Drift of Sagavanirktok River late phase—Till and ice-contact deposits
 - sd1 Drift of Sagavanirktok River main phase—Till and ice-contact deposits
 - so Outwash of Sagavanirktok River age—Gravel to sandy gravel, forming aprons and valley trains, and terrace remnants farther downvalley
 - so2 Outwash of Sagavanirktok River late and main phases—Gravel and sandy gravel
 - sd Anaktuvuk River glaciation (early Pleistocene)
 - ad Drift of Anaktuvuk River age—Bouldery till, with local deposits of coarse gravel
 - ao Outwash of Anaktuvuk River age—Gravel to sandy gravel, forming aprons and valley trains capped by thick deposits of colluvial silt
 - Tgmd Drift of possibly Gunsight Mountain age—Poorly exposed bouldery diamict. Heavily dissected; with thick silt cover
- MAP SYMBOLS**
- Contact—Dashed where approximately located or inferred
 - Fault—Expressed in Quaternary sediments. Sense of motion (D, down; U, up) shows where determinable
 - Drainage channel—Abandoned or underfit
 - Crest of moraine ridge
 - Headwall scarp of landslide
 - Direction of glacier flow across topographic divide
 - Direction of ice movement or meltwater drainage—Associated with ice-scoured bedrock
 - Former glacial-lake outlet or drainage diversion
 - Slope direction on gravel surface
 - U-shaped pass—Where glacier crossed topographic divide
 - Pingo
 - Bedrock, undifferentiated
 - Bedrock—Exposed along canyon walls or margin of river terrace
 - Near-surface bedrock—Generally covered by 1-2 m of sod, peat, loess, solifluction deposits, and rock debris; usually completely vegetated
 - High-level erosion surfaces—River-cut surfaces along northwest and southeast walls of Koyukuk River valley
 - Pediment at east flank of Indian Mountain—Bears thin silt cover
 - Altiplano terrace
 - Tailings from mining activities
 - Surface and subsurface surficial deposits
 - Heavily eroded surficial unit
 - Lake—M, Minnikoska; K, Kliallaimuket; T, Tokhakkllanten

SURFICIAL GEOLOGIC MAP OF THE HUGHES QUADRANGLE, ALASKA

By
Thomas D. Hamilton
2002

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