

EXPLANATION

This map shows the distribution of unconsolidated deposits and undifferentiated bedrock exposed at the surface in portions of the Tyonek A-4, A-5, B-4, B-5, and B-6 quadrangles. Units were mapped by interpretation of ~165,000-scale false-color infrared aerial photographs taken in August 1978. Composite Landsat imagery collected between 1989 and 2003 was used to update glacial extents. Fieldwork was conducted in 2009 and 2010.

Map units shown with a question mark (?), such as "Qd?", indicate a questionable identification.

DESCRIPTIONS OF MAP UNITS

Unconsolidated Deposits

ALLUVIAL DEPOSITS

ABANDONED-FLOODPLAIN ALLUVIUM—Alluvium of abandoned floodplain of Chakachata River

ABANDONED-CHANNEL ALLUVIUM—Undifferentiated late Pleistocene to Holocene abandoned-channel deposits; includes sand and gravel deposited in channels formed by diversion of the Beluga River along margins of Thremle Creek moraine deposited by massive glacial lobes from lower Saetia River valley and ice-marginal and proglacial outwash related to 730 lake and Nikolai lateral and terminal moraines during the Sklik stage, and sand and gravel deltas deposited in slackwaters of Beluga River jökulhlaups in lower valleys of Scarp and Bishop creeks; overlies varved clays near confluences of Bishop and Scarp creeks with Beluga River

UNDIFFERENTIATED ALLUVIUM—Alluvium of active, inactive, and abandoned floodplains; well-sorted and well-stratified polygenic pebble gravel, sand, and silt comprising channel and overbank deposits of major drainages; includes lahar deposits in upper Chakachata River drainage

STREAM-TERRACE ALLUVIUM—Alluvium of stream terraces; massive to well-sorted, polygenic pebble gravel with some sand and scattered to numerous subrounded to subangular cobbles and boulders; no longer subject to flooding; includes lahar deposits and alluvium of jökulhlaups in upper Chakachata River drainage and jökulhlaup deposits in Beluga River drainage

FAN CLAYEYES—Granular fans of Killey and Sklik stages near Tyonek and lower Beluga River that are pitted by numerous kettle lakes resulting from fan deposition over stagnant ice related to Thremle Creek moraine; Tyonek outwash fan composed chiefly of sandy pebble gravel with scattered thin beds overlying diamictic mudstone with scattered cobble and boulder dropstones; kettle fillings up to 4.7 m thick of thin to massive peat intercalated with thin beds of silt, sand, and tephra; river bluff through proximal zone of Beluga expansion fan exposes boulders overlying glacial diamict

LAHAR DEPOSITS—Lahar deposits of middle to late Holocene age, including poorly sorted, nonstratified, bouldery gravel with sand and silt matrix and volcanic blocks up to 10 m in diameter proximal to Mt. Spurr volcanic complex; transformed into fine-grained fluvial channel deposits along Chakachata River and Straight Creek (Meyer and Traubert, 1995; Waythomas, 2001, 2007; Waythomas and Nye, 2002)

COLLUVIAL DEPOSITS

UNDIFFERENTIATED COLLUVIUM—Blankets, aprons, cones, and fans of heterogeneously mixed angular to subangular rock fragments, gravel, sand, and silt deposited by complex, gravity-driven mass movements involving sliding, flowing, and frost creep of weathered bedrock and modified glacial drift; cobbles and boulders are scattered to numerous; on lower benchwalls of cirque and colateral diamictic, surface features include talus cones, incipient rock glaciers, and steep fans built by rockfalls and snow avalanches

MIXED COLLUVIUM AND ALLUVIUM—Primarily fan-shaped or elongate, massive to poorly stratified, generally inorganic silt mixed with sands, angular to subangular pebble gravels derived from weathering of Tertiary bedrock and laid down by debris-flow deposits and torrential water flows during brief, intense storms; colluviation-alluviation

LANDSLIDE DEPOSITS—Massive, extensive slides and flows produced by widespread, retrogressive failures of Tertiary sedimentary bedrock; composed of large blocks of Tyonek Formation mixed with glacial and colluvial diamictics; surface features include sag ponds, prominent marginal scarps, wrinkle ridges, rotated slump blocks and sharp, multilobe toes associated with terminal boulders

EOLIAN DEPOSITS

DUNE SAND—Dune sand on low terrace of McArthur River

GLACIAL DEPOSITS

Undifferentiated

UNDIFFERENTIATED GLACIAL DRIFT—Heterogeneous, nonstratified, polygenic pebble-cobble gravel with some sand and silt and few to numerous subangular to subrounded boulders deposited by glacial ice and locally reworked by meltwater washing and associated mass-movement processes; forms thick deposits on lower bedrock walls of glaciated valleys; kettle fillings of interlayered peat, sand, and silt may be several meters thick

Alaskan Glaciation

MODERN DRIFT—Drift of very recent age; mapped in areas where satellite imagery shows that glacial ice has retreated since 1978 aerial photography

HOLOCENE DRIFT—Drift of Alaskan glaciation, including 430 lake, Chichatna River, 353 lake, and Straight Creek moraines; shows evidence of presence or former presence of glacier ice, such as ice-stagnation terrain with kettle lakes and ice-covered moraines; typically buried by or incorporates debris-avalanche deposits and lahars near Mt. Spurr; includes rockfall and snow-avalanche deposits in steep terrain

Naptoevic Glaciation

DRIFT OF NAPTOEVIC GLACIATION—Undifferentiated moraine deposits of Naptovian glaciation of late Wisconsin (MIS 2) age

DRIFT OF ELIMBORO STAGE—Moraine deposits of Elimodoro stage of Naptovian glaciation, including Carlson Lake moraine (table 1)

DRIFT OF SKLIK STAGE—Moraine deposits of Sklik stage of Naptovian glaciation, including Congbuhna Lake and Denalov Lake moraines of Schmol and Yehle (1987) (table 1)

DRIFT OF KILLEY STAGE—Moraine deposits of Killey stage of Naptovian glaciation, including Nikolai, 730 lake, and Thremle Creek moraines of Schmol and Yehle (1987) (table 1)

DRIFT OF MOOSEHORN STAGE—Moraine deposits of Moosehorn stage of Naptovian glaciation, including 1405 and 810 lakes moraines of Schmol and Yehle (1987) (table 1)

Pre-Naptoevic Glaciations

PRE-NAPTOEVIC DRIFT—Deposits of pre-Naptoevic glaciations; moraine remnants and drumlin-like drift ridges modified by slope processes and stream erosion; details of moraine topography obliterated and moraine ridges have round cross profiles; on penultimate Upper Chaitna (MIS 4) moraine (Q4p) deposited by ice from the Cape Glacier corridor, granitic erratics are generally smooth and little weathered; on pre-penultimate moraine deposited by ice from Chakachata-McArthur Embayment, granitic erratics are rough surfaced with feldspar crystals and apatite dikes standing 2–5 mm in relief, have rounded joint patterns, and numerous granitic erratics are broken; no moraine topography remains on pre-penultimate (MIS 6?) Blueberry Hill drift sheet (Q4b) in Lone Ridge area; on Lone Ridge, Blueberry Hill deposits form very thin and discontinuous cover over bedrock (Q4b?) (table 1)

GLACIOFLUVIAL DEPOSITS

EXPANSION-FAN DEPOSITS—Alluvium, debris flows, and lahar deposits of large expansion fan built in the Chakachata-McArthur Embayment by breaching floods caused by breaching of massive debris avalanche that blocked Chakachata River during mid-Holocene (Waythomas, 2001), breaching of smaller late Holocene lahars (Meyer and Traubert, 1995), and episodic outbursts of Chakachata Lake, which was dammed by advances of Barrier Glacier; includes the large Beluga expansion fan deposited by Beluga River jökulhlaups late in the Killey stage

DELTA DEPOSITS—Fine-grained prograding delta apron of Chakachata-McArthur River drainage; inorganic silt and clay

OUTWASH DEPOSITS—Outwash of Alaskan glaciation of Holocene age; massive to well-sorted, polygenic pebble gravel with some sand; scattered to numerous subrounded to subangular cobbles and boulders proximal to former ice limits; in Chakachata River valley includes clay-rich lahar deposits related to massive debris avalanche resulting from mid-Holocene sector collapse of Mt. Spurr (Waythomas, 2007)

LACUSTRINE DEPOSITS

LAKE DEPOSITS—Lake sediments; impounded by massive Chakachata River debris avalanche and Holocene advance of Straight Creek glacier

MARINE DEPOSITS

GLACIOESTUARINE DEPOSITS—Glacioestuarine sediments in Granite Point area sediments (Kolas sections of Schmol and others, 1983) correlated with the Bootlegger Cove Formation (Reger, 2009)

BEACH DEPOSITS—Cobble-pebble gravels and sand

BEACH-RIDGE DEPOSITS—Complex of gravel ridges separated by fine-grained trough fills by Bootlegger Cove Formation beneath coastal plain between Beluga River and Tyonek

TIDAL DEPOSITS—Tidal-flat sediments; mostly flocculated clays

PALUDAL DEPOSITS

SWAMP DEPOSITS—Organic swamp deposits; fibrous and locally woody peat interlayered with thin beds of organic silt, sand, and tephra deposited in lowlands underlain by Bootlegger Cove Formation beneath coastal plain between Beluga River and Tyonek

VOLCANIC DEPOSITS

VOLCANIC FLOW DEPOSIT—Fragmental volcanic deposit produced by rock avalanches from Crater Peak (C. Waythomas, 5/22/2015 written comment)

VOLCANIC AVAILANCHE DEPOSIT—Debris-avalanche deposit catastrophically emplaced during major mid-Holocene sector collapse on southern flank of Mount Spurr volcanic complex; four recognized units include (1) blocks, rubble-achiers, and coarse, angular volcanic debris; (2) altered blocks with little interstitial matrix and outcrop-scale agnate-block texture; (3) a mixed facies of block-covered hummocks surrounded by granular matrix sediments; and (4) poorly sorted, granular, matrix-supported volcanic debris, sand, silt, and clay that grade downvalley into a clay-rich lahar deposit (Waythomas, 2001, 2007)

UNDIFFERENTIATED VOLCANIC DEPOSITS—Undifferentiated volcanic deposits and rock of Quaternary age

UNDIFFERENTIATED EOLIAN DEPOSITS—Mixed primary and reworked eolian sand and silt of volcanic compositions with thin tephra; surface thought to be channelled by glacial meltwater or snow melt (C. Waythomas, 5/22/2015 written comment)

VOLCANIC PLATEAU DEPOSITS—Volcaniclastic complex of volcanic plateau consisting of crudely bedded conglomerate to sandy to muddy volcanogenic debris and hyper-concentrated flows (Harris and others, 2011); upper 1–6 m composed of very coarse sand derived from volcanic cinders reworked by wind; local meltwater, and debris flows and overburden by up to 2 m of loess composed primarily of Holocene tephra

VOLCANIC PLATEAU DEPOSITS OVERLAIN BY ICE—Volcaniclastic complex of Quaternary volcanic plateau that has been overridden by glacial ice

Bedrock Deposits

UNDIFFERENTIATED BEDROCK—Exposed undifferentiated bedrock

THINLY COVERED BEDROCK—Undifferentiated bedrock overlain by thin, probably discontinuous cover of colluvium and glacial drift

EXPLANATION OF MAP SYMBOLS

--- CONTACT—Identify and existence certain; location approximate

--- FAULT—Identify and existence certain; location approximate

● RADIOCARBON AGE DATE SAMPLE LOCALITY—Showing sample identification (table 1)

○ BOREHOLE LOCALITY—Showing station identification

▲ GLACIAL ERRATIC

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SURFICIAL-GEOLOGIC MAP OF THE TYONEK AREA, COOK INLET, ALASKA

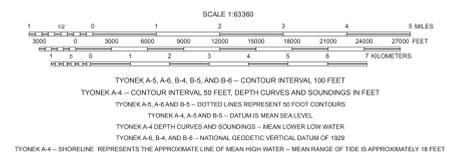
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Topographic base map from:
U.S. Geological Survey topographic maps
Tyonek A-4 (1958 - minor revisions 1968)
Tyonek A-5 (1958 - minor revisions 1967)
Tyonek A-6 (1958 - minor revisions 1967)
Tyonek B-4 (1954 - minor revisions 1970)
Tyonek B-5 (1958 - minor revisions 1970)
Tyonek B-6 (1958 - minor revisions 1974)

Projection:
Universal Transverse Mercator Zone 5 North

Datum:
North American Datum of 1927

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