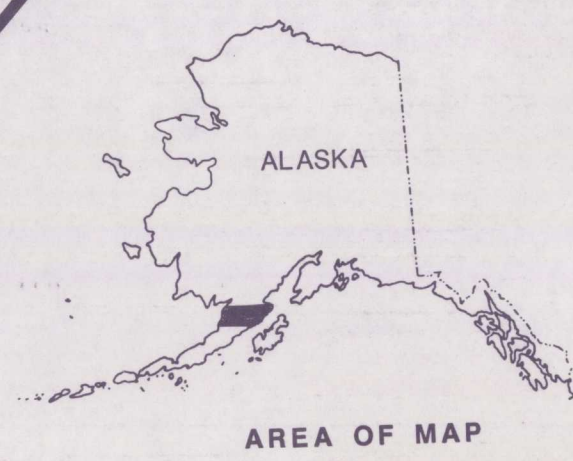




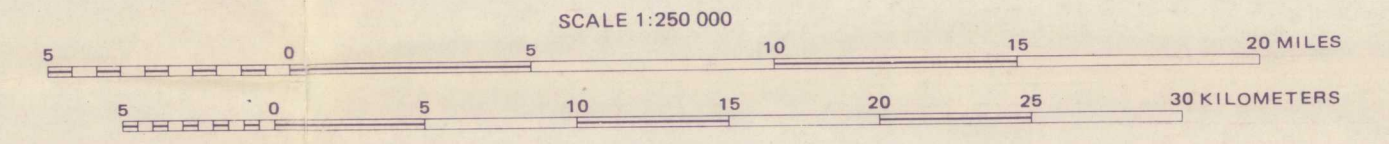
7 ▲ Locality of bedrock sample
7 ● Locality of stream cobble sample



LOCALITIES OF STREAM COBBLE SAMPLES AND BEDROCK SAMPLES COLLECTED DURING STREAM-SEDIMENT SAMPLING

J.R. Riehle, E.A. Bailey, S.E. Church, and M.E. Yount--1989

Geologic base from Riehle and others (1987)
U.S. Geological Survey Open-File Report 87-593



GEOLOGIC MAP SYMBOLS

- Contact—Dashed where inferred or approximately located
- - - Fault—Dashed where inferred or approximately located, dotted where concealed; queried where uncertain. Upthrown side, D-downthrown side
- Thrust or reverse fault—Sawtooth on upper plate; bar with number indicates dip of fault plane
- Anticlinal axis—Showing direction of plunge; dashed where approximately located; dotted where concealed; queried where existence uncertain
- Area of horst
- Synclinal axis—Showing direction of plunge; dashed where approximately located; dotted where concealed; queried where existence uncertain
- Measured strike and dip of beds
- Approximate strike and dip of beds
- Strike and dip of foliation
- Horizontal bedding
- Dike
- Quaternary volcanic vent
- Area of alteration

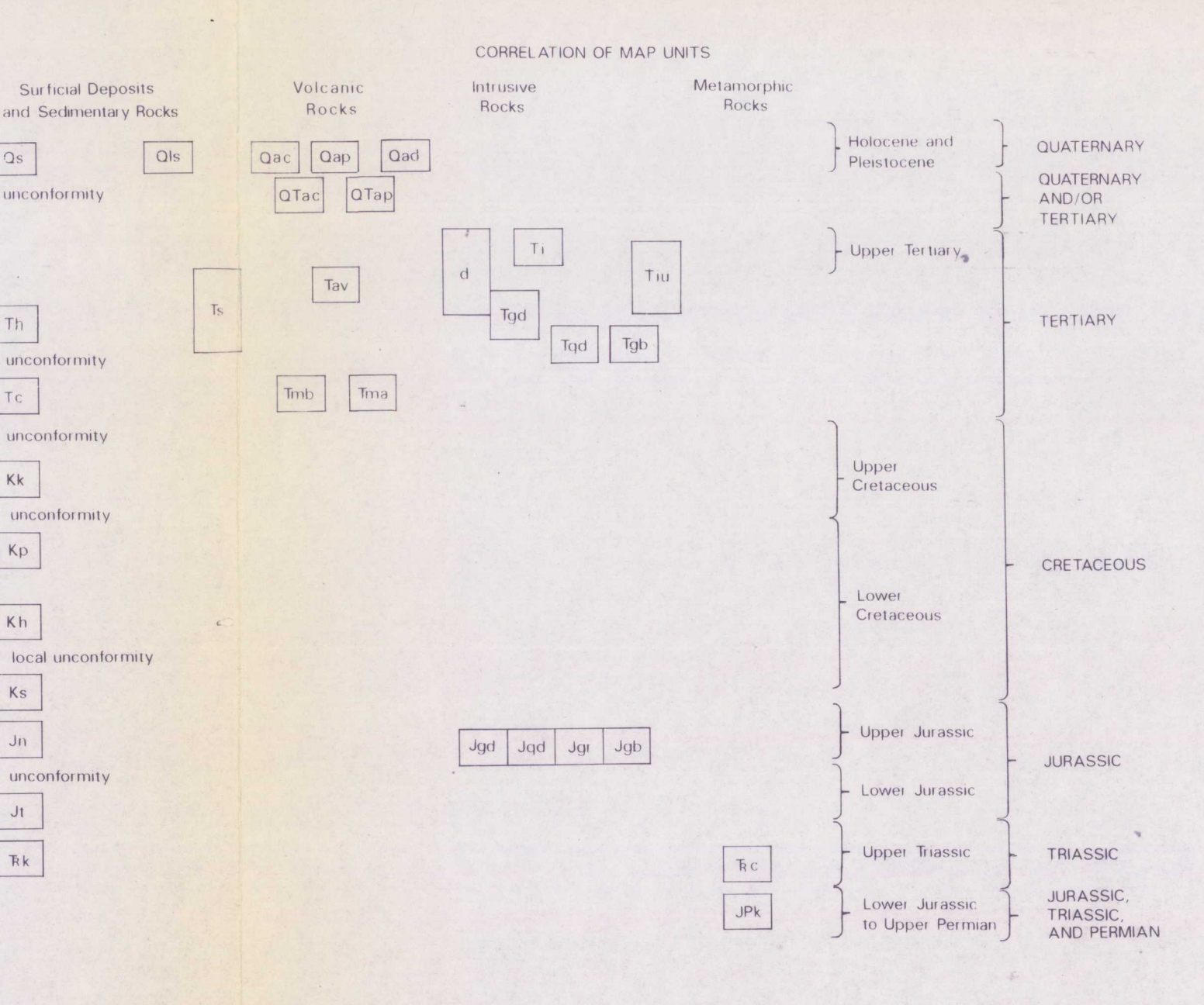
DESCRIPTION OF MAP UNITS

- SURFICIAL DEPOSITS AND SEDIMENTARY ROCKS**
- Qs Surficial deposits (Holocene and Pleistocene)—Unconsolidated to poorly consolidated alluvial, colluvial, glacial, marine, lacustrine, andolian deposits. Locally includes extensive redeposited pumice and ash initially deposited during the 1912 Katmai eruption
 - Qls Landslide deposits (Holocene and Pleistocene)—Non-sorted, nonstratified coarse angular rubble forming lobate masses
 - Ts Sedimentary rocks (Tertiary)—Poorly to moderately well indurated. Fluvial sandstone, siltstone, and conglomerate. Upper clasts consist of both plutonic and volcanic rocks of local derivation
 - Th Hemlock Conglomerate (Oligocene)—Poorly indurated fluvial conglomerate, pale brown tuffaceous sandstone, siltstone, shale, coal, and tuff. Age is late Oligocene
 - Tc Copper Lake Formation (Tertiary)—Massive, well indurated, polymictic conglomerate, sandstone, and siltstone. Age is early Tertiary
 - ks Kaguyak Formation (Late Cretaceous)—Upper part consists of interbedded siltstone and graded greywacke sandstone that represent the upper and middle members of a submarine fan. Lower part consists of thinly bedded siltstone and some thin limestone beds and includes abundant ammonites, pelecypods, and limestone concretions
 - kp Pkwanak Formation (Early Cretaceous)—Thin-bedded grey sandstone and minor amounts of siltstone and shale that contain ammonites of Albian age
 - kh Hereford Formation (Early Cretaceous)—Calcareous sandstone and siltstone, thinly bedded, light to dark olive grey
 - ks Stankovich Formation (Early Cretaceous)—Siltstone, shale, and thinly bedded, fine-grained, feldspathic and laumontitic brown sandstone
 - Jn Naknek Formation (late Jurassic)—Main sedimentary rock-unit of the map area, consisting of sandstone, conglomerate, siltstone, and dark shale. Divided into five members (not mapped here), from oldest to youngest: massive conglomerate and thinly bedded sandstone member; thick-bedded massive sandstone member; thinly bedded, dark grey siltstone member with limestone concretions; thinly bedded sandstone and siltstone member; massive conglomerate member. Clasts in both the oldest and youngest conglomerate members are dominantly metamorphic, volcanic, and sedimentary rocks with subordinate plutonic rocks
 - Jt Talkeetna Formation (Early Jurassic)—Lava flows, breccias, and lahars locally interbedded with volcanoclastic sandstone, conglomerate, and shale. Includes sills of uncertain ages. Metamorphosed to non-schistose epidote-albite-calcite assemblages suggestive of lower greenschist facies

- INTRUSIVE ROCKS**
- dk Kamishak Formation (late Triassic)—Slightly to moderately recrystallized, non-fossiliferous limestone
 - Younger deposits and rocks of Aleutian volcanic arc
 - Qap Pyroclastic-flow deposits (Holocene)—Poorly sorted, variably indurated deposits of ash, vitrophyric blocks, and (or) pumiceous lapilli. Comprises the 1912 ash flow of Katmai (Novarupta) and the Holocene block-and-ash flows of Kaguyak caldera
 - Qad Domes (Holocene)—Domes of dacitic or rhyolitic composition
 - Qac Younger central-vent deposits and rocks (Holocene and Pleistocene)—Lava flows, tuffs, and breccias dominantly of andesitic composition but locally including lava flows of low-silica dacitic composition, airfall deposits of andesite to rhyolitic composition on Baked Mountain and Broken Mountain, and scoria cones of basaltic composition
 - QTap Pyroclastic-flow deposits (Pleistocene and late Tertiary)—Poorly sorted, variably indurated deposits of ash, vitrophyric blocks, and/or pumiceous lapilli. Primary compositions are uncertain owing to alteration but probably range from andesitic to dacitic
 - QTac Older central-vent deposits and rocks (Pleistocene and late Tertiary)—Lava flows, breccias, and domes of andesitic and dacitic composition. Locally moderate to extensive alteration associated with fossil fumaroles (e.g., bleaching to light red or yellow shades)
 - Tav Older volcanic rocks of Aleutian volcanic arc (late Tertiary)—Breccias, lava flows, sills, and local pyroclastic and epiclastic tuffs of late Tertiary volcanic field located southeast of the Aleutian Range crest and extending from the Katmai River to Kooka Bay. Dominantly of andesitic and dacitic composition. Propylitic alteration is extensive and argillic or potassic alteration is locally intensive, such as near contacts with hypabyssal intrusive rocks of unit Tl
 - Volcanic rocks of Meshik volcanic arc (early Tertiary)—Divided into:
 - Tmb Basaltic lava—Plugs, dikes, and flows of basaltic composition that intrude or overlie rocks of unit Tm
 - Tma Andesitic and dacitic lava flows and breccias—Unit also includes local domes or tuffs of rhyolitic(?) composition, now altered to quartz and sericite or kaolinite

- INTRUSIVE ROCKS**
- d Dikes (Tertiary)—Dikes from 1 m to 20 m wide that occur southeast of the Bruin Bay fault, that is, in rocks no older than the Naknek Formation. Many are in rocks as young as the Hemlock Conglomerate (Th), however, suggesting that most are middle to late Tertiary in age
 - Tl Hypabyssal intrusive rocks of Aleutian volcanic arc (late Tertiary)—Sill-like or cross-cutting hypabyssal, intrusive bodies generally less than 10 km in outcrop area, as well as larger plutonic bodies such as those beneath four peaks of the Aleutian Range crest east of Serpent Tongue Glacier. Fine-grained, porphyritic to equigranular rocks that consist dominantly of granodiorite or tonalite and minor quartz diorite
 - Tlu Hypabyssal intrusive rocks, undivided (Tertiary)—Intrusive bodies ranging from small plugs and sills to plutons exposed over as much as 30 sq km. Rocks are fine- to medium-grained, commonly porphyritic, and consist chiefly of quartz diorite or tonalite
 - Tgd Granodiorite (Tertiary)—Medium-grained equigranular to marginally porphyritic rocks that are low in modal quartz; unit includes samples that are classified as quartz monzonites
 - Tqd Quartz diorite (Tertiary)—Medium-grained equigranular rocks in which abundance of modal quartz ranges widely, rocks of the unit include tonalite and monzonite
 - Tgb Gabbro and diorite (Tertiary)—Medium-grained rocks having gabbroic or diabasic textures
 - Jgr Granite (Jurassic)—Medium-grained equigranular or fine-grained porphyritic rocks
 - Jgd Granodiorite (Jurassic)—Medium-grained equigranular or fine-grained porphyritic rocks. Also includes isolated outcrops of tonalite and quartz diorite
 - Jqd Quartz diorite and tonalite (Jurassic)—Medium-grained equigranular rocks
 - Jgb Diorite and gabbro (Jurassic)—Dark, diabasic- and gabbroic-textured rocks

- METAMORPHIC ROCKS**
- Jpk Kakhonak Complex (Jurassic, Triassic, and Permian)—Locally foliated or banded quartzite, schist, amphibolite, and garnet-bearing gneiss. Indicative of amphibolite-facies metamorphism. Protoliths presumably consisted of Talkeetna Formation (Jt), Kamishak Formation (dk), Cottonwood Bay Greenstone (jc), and unnamed Permian(?) sandstone and argillite
 - Jc Cottonwood Bay Greenstone (late Triassic)—Basalt flows now metamorphosed to epidote-albite-actinolite assemblages suggestive of greenschist facies; also locally includes chert and fine- to medium-grained diabase



This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or with the North American Stratigraphic Code. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.