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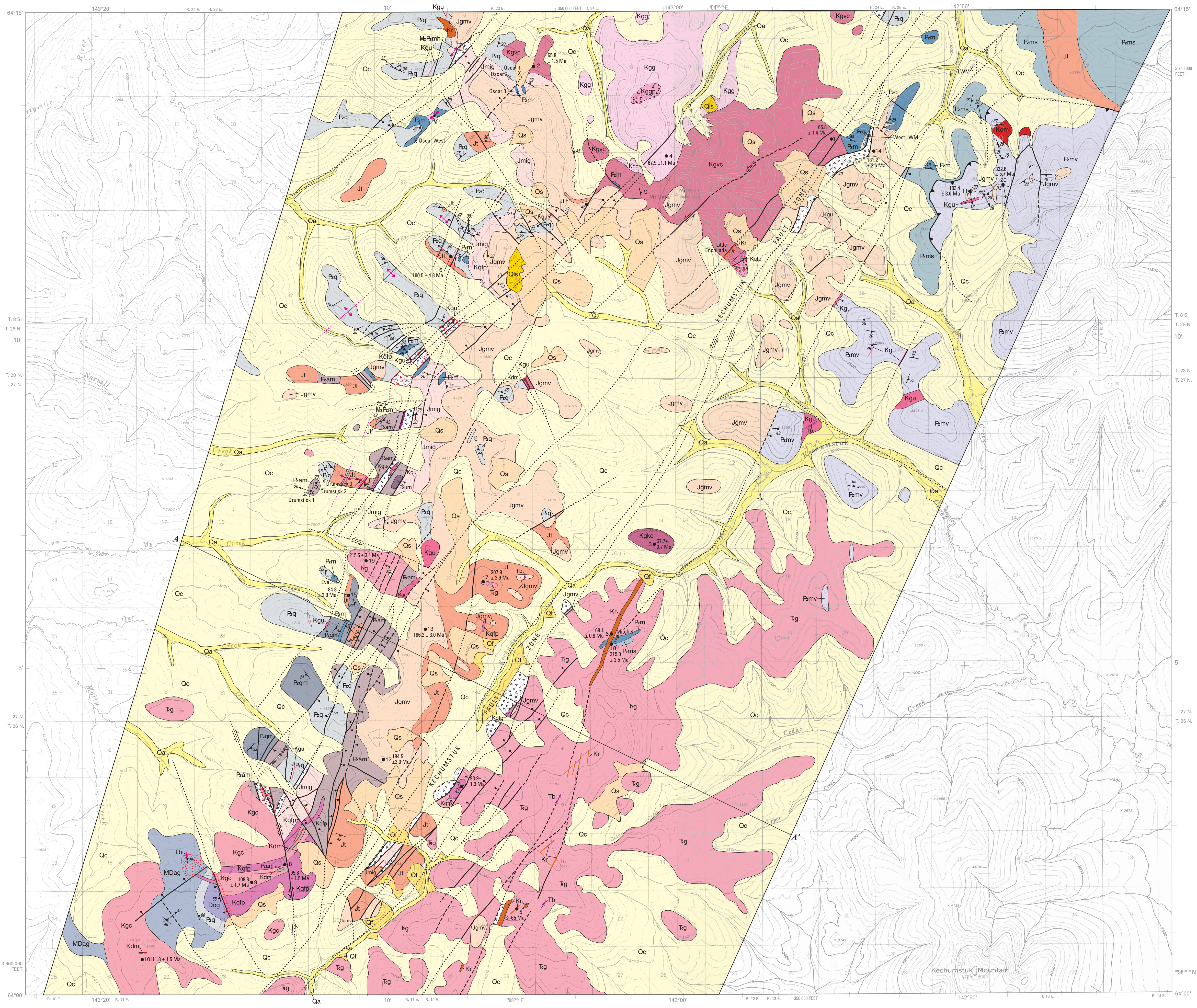

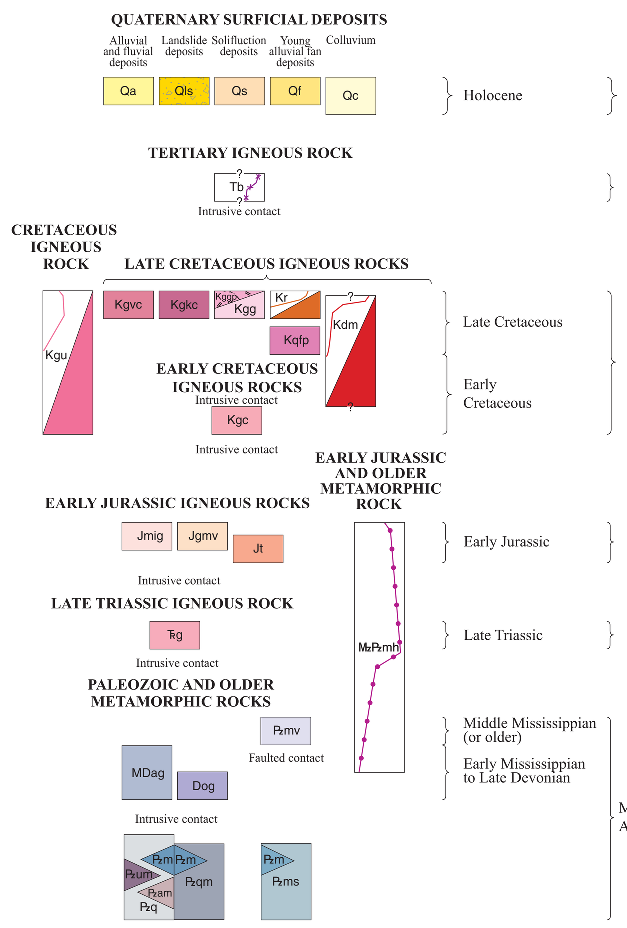

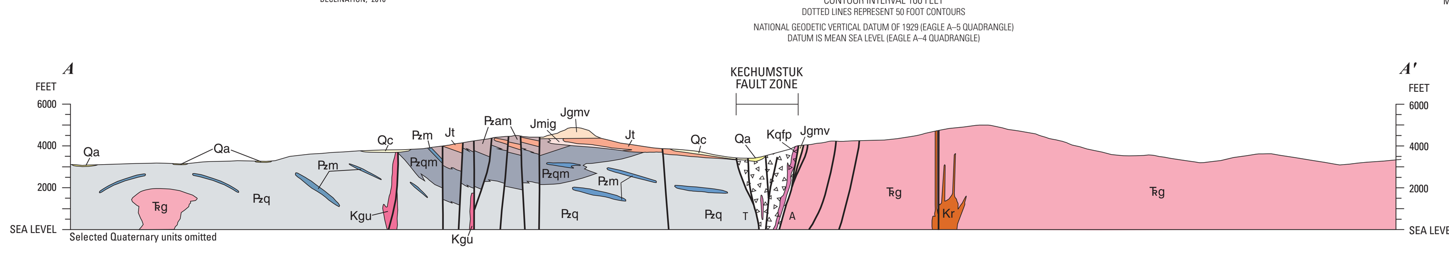

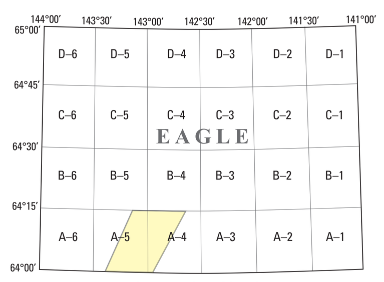

INTRODUCTION

The Kechumstuk fault zone is a northeast-trending zone of faults that transects the crystalline basement rocks of the Yukon-Tanana Upland located in the western part of the Fortymile mining district of east-central Alaska. The Kechumstuk zone, which is mapped in detail for the first time in this report, is one of numerous major northeast-trending zones of deformation that formed between the Denali fault on the south and the Tintina fault on the north (fig. 1). The Denali and Tintina are major right-lateral strike slip faults that form a regional dextral wrench zone that has deformed the intervening terrane. The northeast-trending systems of faults and lineaments (for example, the Shaw Creek fault, Black Mountain tectonic zone, Mount Harper lineament, and Kechumstuk fault zone) bound structural blocks tens of kilometers wide and hundreds of kilometers long that are displaced by left-lateral high-angle faults (Wilson and others, 1985; Saltus and Day, 2006; Day and others, 2007, 2009, 2010). Our new mapping and accompanying age dates demonstrate that the Kechumstuk fault zone was active at least since the earliest Late Cretaceous (Cenomanian), during which a series of about 96–94 Ma quartz-feldspar porphyry intrusions (Kqfp) were emplaced in the zone (Kqf). Subsequent brittle deformation has brecciated the mid-Cretaceous intrusions along the through-going fault. In the Black Mountain tectonic zone, approximately 50 km to the west in the U.S. Geological Survey (USGS) Big Delta (B–1) 1:63,360 quadrangle, Early and Late Cretaceous (about 109–95 Ma) igneous intrusions and associated gold mineralization were also localized along the northeast-trending structures. Locally, the fault scarps are seen in Quaternary deposits as well (Day and others, 2007) indicating Holocene displacment on some northeast-trending faults. As such, these major northeast-trending structural zones have a prolonged history that started in the mid-Cretaceous and lasted, at least locally, into the Holocene.

The map area lies in the Fortymile mining district in the Mount Veta area. The Fortymile mining district was one of the earliest placer-mining districts discovered in Alaska during the 1896–1898 gold rush and has a long history of metals exploration, from placer gold (Yeend, 1996), to precious and base-metal load deposits (Saunders, 1962). Placer gold mining is still active in the region, especially near the town site of Chicken, Alaska. The study area is in the western part of the Fortymile mining district and hosts several epigenetic base- and precious-metal lode prospects (Dusel-Bacon, Aleinikoff, and others, 2009; Dusel-Bacon, Slack, and others, 2009). The prospects are spatially associated with Mesozoic intrusions and are hosted in Paleozoic carbonate horizons (Pzm) and are of both replacement and skarn origin. The Little Whiteman prospect (LWM, northeast part of map area), one of the more important prospects that has received a lot of exploration attention (Siron and others, 2010), lies within the Kechumstuk fault zone. The age of mineralization is either coeval with the Early Jurassic quartz monzonite of Mount Veta or related to the Late Cretaceous igneous activity ubiquitous in the adjacent terrane. A comparison of lead isotope data using feldspars from dated Mesozoic intrusions and sulfides from mineral prospects suggests a Cretaceous age for mineralization (Dusel-Bacon, Aleinikoff, and others, 2009; Dusel-Bacon, Slack, and others, 2009).

Economic geology, geochronological, and petrologic studies associated with this mapping effort are focusing on the characterization of the mineral occurrences, their origin, and the regional evolution of the Mesozoic igneous intrusions and associated volcanism (Dusel-Bacon, Aleinikoff, and others, 2009; Dusel-Bacon, Slack, and others, 2009; Dusel-Bacon and others, 2013).

ACKNOWLEDGMENTS

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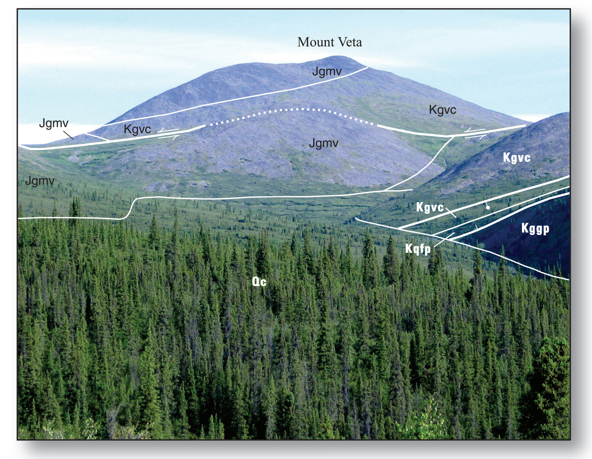


View of Mount Veta looking from the southeast. Main peak of Mount Veta is made up of Late Cretaceous granite of Veta Creek (Kgvc) intruded into Jurassic quartz monzonite of Mount Veta (Jgmv). Thin white lines are contacts, thicker lines are faults. Fault line is dotted where obscured by hill. Photograph taken in 2010 from lat 64.1672°N., long 142.9432°W., looking towards Mount Veta.

Table 1. *New SHRIMP U-Pb zircon ages for samples from the western Fortymile mining district near Mount Veta, east-central Alaska.*

[In the analysis location column, the term ‘inherited cores’ represents a much older part of the analyzed zircon crystal that is xenocrystic, whereas the term ‘rim’ represents younger overgrowths along the margin of the zircon crystal. All samples were analyzed using the USGS/Stanford sensitive high resolution ion microprobe–reverse geometry (SHRIMP-RG) at Stanford University. The primary oxygen beam operated at about 6–8 nanoangstroms (nÅ) and excavated a pit about 25 micrometers (µm) in diameter and 1 µm deep. Elemental fractionation was corrected using zircon standard R33 (419 Ma, Black and others, 2004). The age of each sample was determined by calculating the weighted average of selected $^{206}Pb/^{238}U$ ages. Raw data were reduced and plotted using the Squid 2 and Isoplot/Ex 3 programs of Ludwig (2003, 2009); age errors were calculated at the 95 percent confidence limit. Ma, million years.]

Sample number	Field number	Latitude (N.)	Longitude (W.)	Map unit	Mineral	Analysis location	Age (Ma)*	Rock type
Late Cretaceous igneous rocks								
1	08ADb03	64.2175°	142.9089°	Kgvc	Zircon	Core	65.8 ± 1.4	Nonfoliated medium-grained biotite granite
2	08ADb19	64.2361°	143.0828°	Kgvc	Zircon	Core	65.8 ± 1.5	Nonfoliated medium-grained hornblende-biotite granite
3	129A5	64.1146°	143.0127°	Kgkc	Zircon	Core	67.7 ± 0.7	Nonfoliated fine-grained biotite granite
4	81A5	64.2133°	143.0053°	Kgg	Zircon	Core	67.9 ± 1.1	Nonfoliated biotite-hornblende granite with “smoky” quartz phenocrysts
5	140A5	64.0219°	143.0927°	Kr	Zircon	Core	≤ ~ 65	Rhyolite porphyry dike
6	118A5	64.0918°	143.0378°	Kr	Zircon	Core	68.1 ± 0.8	Rhyolite porphyry dike
Mid-Cretaceous igneous rocks								
7	08AD–032A	64.0530°	143.1248°	Kqfp	Zircon	Core	93.9 ± 1.3	Quartz feldspar porphyry intrusion
8	09AD–343	64.0331°	143.2273°	Kqfp	Zircon	Core	95.8 ± 1.5	Quartz feldspar porphyry dike
9	08AD–052	64.0286°	143.2464°	Kgc	Zircon	Core	108.8 ± 1.7	Nonfoliated biotite granite
10	08ADb20	64.0089°	143.3097°	Kgc	Zircon	Core	111.8 ± 1.5	Nonfoliated leucogranite
Early Jurassic igneous rocks								
11	10AD–368	64.2041°	142.8282°	Jgmv	Zircon	Core	183.4 ± 3.6	Nonfoliated K-feldspar megacrystic hornblende-biotite granite porphyry
12	8A5–4	64.0599°	143.1701°	Jgmv	Zircon	Core	184.5 ± 3.0	Foliated coarse-grained hornblende-biotite megacrystic monzonite
13	08ADb22	64.0930°	143.1458°	Jgmv	Zircon	Core	186.2 ± 3.0	Foliated K-feldspar megacrystic hornblende quartz monzonite
14	08ADb08	64.2144°	142.8842°	Jgmv	Zircon	Core	181.2 ± 2.6	Foliated K-feldspar megacrystic hornblende quartz monzonite
15	08AD–100	64.1016°	143.1905°	Jt	Zircon	Core	184.8 ± 2.9	Foliated clinopyroxene-bearing tonalite dike
16	09AD–240	64.1877°	143.1310°	Jt	Zircon	Core	190.5 ± 4.8	Foliated, medium-grained biotite granite
						Inherited Cores	~ 1–2 Ga	
Late Triassic igneous rocks								
17	09AD–338	64.1051°	143.1121°	Ꞩg	Zircon	Core	207.9 ± 2.9	Foliated medium-grained hornblende leucotonalite
18	08ADb24	64.0892°	143.0378°	Ꞩg	Zircon	Core	215.0 ± 3.5	Hornblende-biotite granodiorite
19	09AD–319	64.1104°	143.1803°	Ꞩg	Zircon	Core	215.5 ± 3.4	Foliated medium-grained hornblende quartz diorite
						Rim	203 ± 4.0	
Mississippian or older metamorphic rocks								
20	09AD–264	64.2058°	142.8089°	Pzmv	Zircon	Core	332.6 ± 5.7	Mylonitic tonalite gneiss interlayered within mafic metavolcanic sequence (unit Pzmv)
						Rim	~ 70	

DESCRIPTION OF MAP UNITS

[Geological Society of America geologic time scale used to determine age boundaries (Geological Society of America, 2012)]

QUATERNARY SURFICIAL DEPOSITS

Qa **Alluvial and fluvial deposits (Holocene)**—Clay, silt, sand, and pebble to cobble gravel deposited in narrow stream channels; locally includes minor colluvium (Qc). Maximum thickness unknown

Qls **Landslide deposits (Holocene)**—Angular fragments of bedrock mixed with soil, or heterogeneous mixtures of boulders and finer grained material derived from adjacent steep hill slopes; characterized by irregularly shaped, hummocky topography. Estimated thickness less than 30 m

Qs **Solifluction deposits (Holocene)**—Unsorted, water-saturated colluvial material restricted to higher mountain peaks; characterized by numerous elongate terraced or flattish areas that step down into adjacent active drainages. Estimated thickness less than 10 m

Qf **Young alluvial fan deposits (Holocene)**—Poorly sorted silty sand and gravel deposits that form small alluvial fans along margins of major stream drainages. Maximum thickness unknown

Qc **Colluvium (Holocene)**—Residual deposits of clay, silt, sand, pebbles, and cobbles that mantle gently to moderately dipping slopes. Estimated thickness ranges up to 15 m at the base of hill slopes

TERTIARY IGNEOUS ROCK

Tb **Basaltic to andesitic dikes (Eocene?)**—Dark-gray to black, non-foliated basalt dike containing small, randomly oriented plagioclase phenocrysts set in devitrified aphanitic groundmass. Age uncertain, but may be correlative with a 50–54 Ma suite of bimodal volcanic rocks; basaltic dike swarms are commonly associated with these rocks throughout this part of the Yukon-Tanana Upland (Newberry and others, 1995, 1998). Non-foliated fabric indicates intrusions were emplaced after regional ductile deformation occurred (post-Early Jurassic, Dusel-Bacon and others, 2006)

CRETACEOUS IGNEOUS ROCK

Kgu **Granite, undivided**—Non-foliated granodiorite to granite forming isolated dikes and small intrusions. Age uncertain

LATE CRETACEOUS IGNEOUS ROCKS

Kgvc **Granite of Veta Creek**—Light-gray, homogeneous, medium-grained, non-foliated biotite-hornblende granite with minor alkali feldspar phenocrysts up to 1.5 cm diameter. Unit intrudes base of quartz monzonite of Mount Veta (Jgmv). SHRIMP U-Pb zircon crystallization ages ~ 65.8 Ma (table 1, samples 1 and 2).

Kgkc **Granite of Kechumstuk Creek**—Light-gray, homogeneous, fine-grained, non-foliated biotite granite. Occurs as isolated intrusion east of the Kechumstuk fault zone. SHRIMP U-Pb zircon crystallization age of 67.7 ± 0.7 Ma (table 1, sample 3). Temporally and compositionally similar to granitic and rhyolitic units Kgvc, Kgg, and Kr, indicating unit was part of a broad Late Cretaceous intrusive event

Kggp **Porphyritic granite of Gold Bottom Creek**—Greenish-gray, non-foliated, porphyritic late-phase of granite of Gold Bottom Creek intrusion. Unit is porphyritic with distinctive dark gray “smoky” quartz phenocrysts in fine-grained gray silicified matrix. Unit is hydrothermally altered with distinctive network of quartz veins with minor disseminated pyrite and molybdenite

Kgg **Granite of Gold Bottom Creek**—Light-gray, non-foliated biotite-hornblende granitic hypabyssal intrusion with characteristic coarse-grained dark gray “smoky” quartz phenocrysts, which exhibit both rounded and euhedral morphology, set in a fine-grained granitic groundmass. Crystallization U-Pb SHRIMP age of 67.9 ± 1.1 Ma (table 1, sample 4) is within analytical error of that of the granite of Veta Creek (Kgvc) and the granite of Kechumstuk Creek (Kgkc); thus all these late Cretaceous granitic units are thought to be coeval

Kr **Rhyolite dikes**—Light-tan to light-gray felsic dikes of fine-grained quartz porphyry to quartz-feldspar porphyry rhyolite with biotite phenocrysts in an aphanitic groundmass. Locally pyrite bearing, causing rock to weather light brown. SHRIMP U-Pb zircon ages between ~ 65 Ma and 68.1 ± 0.8 Ma (table 1, samples 5 and 6, respectively), making these dikes coeval, within analytical uncertainty, with the granite of Gold Bottom Creek (Kgg), the granite of Veta Creek (Kgvc), the granite of Kechumstuk Creek (Kgkc), and rhyolite tuff and granite porphyry of the Middle Fork caldera, which is approximately 10 km northwest of the map area (Bacon and Lanphere, 1996; Bacon and others, 2012)

Kdm **Mafic dikes (Early? and Late? Cretaceous)**—Dark gray, non-foliated dioritic to basaltic dikes and small plugs with 2–4 mm diameter biotite ± hornblende phenocrysts in altered dark gray fine-grained matrix. Distinguished from unit Tb due to high degree of alteration. Unit cuts Early Cretaceous granite of Corner (Kgc); absolute age uncertain

Kqfp **Quartz-feldspar porphyry**—Non-foliated quartz-feldspar rhyolite porphyry characterized by distinctive medium-grained quartz “eyes” and sericitized plagioclase and biotite phenocrysts set in a fine-grained gray rhyolitic groundmass. These rock types yield SHRIMP U-Pb zircon ages of 93.9 ± 1.3 Ma and 95.8 ± 1.5 Ma, respectively (table 1, samples 7 and 8). Interpreted to be hypabyssal bodies intruded into and adjacent to Kechumstuk fault zone

EARLY CRETACEOUS IGNEOUS ROCKS

Kgc **Granite of Corner**—Coarse-grained, medium-gray, non-foliated, porphyritic biotite granite with diagnostic 1.5-cm-diameter quartz and feldspar phenocrysts, and medium-grained leucogranite. U-Pb SHRIMP age of 108.8 ± 1.7 Ma on biotite granite (table 1, sample 9) and 111.8 ± 1.5 Ma on leucogranite (table 1, sample 10); unit emplaced after regional Mesozoic ductile deformation. Type locality crops out in the SW¼ SW¼ sec. 20, T. 26 N., R. 11 E. at vertical angle benchmark (VABM) demarked as Corner on the Eagle (A–5) quadrangle

EARLY JURASSIC IGNEOUS ROCKS

Jmig **Migmatite**—Foliated migmatite with the paleosome a mixture of Paleozoic metasedimentary country rocks (Pzms), hornfels, amphibolite (Pzam), laminated marble (Pzm) invaded by neosome of foliated, medium-grained, biotite-hornblende quartz monzonite of Mount Veta (Jgmv). Neosome is foliated and forms sills within Paleozoic units parallel to strong penetrative ductile metamorphic fabric and compositional layering and is locally enfolded with the paleosome. Unit structurally underlies Jurassic quartz monzonite, forming migmatitic footwall zone of the Jurassic intrusion (Jgmv)

Jgmv **Quartz monzonite of Mount Veta**—Coarse-grained porphyritic monzonite to quartz monzodiorite characterized by potassium feldspar megacrysts set in a coarse-grained hornblende-bearing groundmass. Grades locally into zones devoid of characteristic potassium feldspar megacrysts. Compositional variants also include granodiorite and granite. Locally cut by hornblendite dikes. Unit originally designated syenite of Mount Veta by Foster (1976). Ductile tectonic foliation forms near footwall and roof pendant zone of intrusion (approximately 4 km west of Mount Veta in northern part of map area) that is parallel to that of the dominant regional penetrative fabric in the country rock. Intrusion is interpreted to be a synkinematic tabular-shaped body intruded during waning stages of regional ductile deformation event, constraining the dominant metamorphic event to the Jurassic. SHRIMP U-Pb zircon data indicate the primary crystallization ages range from 183.4 ± 3.6 Ma for a small intrusion on the east side of the Kechumstuk fault zone (table 1, sample 11) to a range from 181.2 ± 2.6 to 186.2 ± 3.0 Ma recorded in samples taken from the main intrusion west of the Kechumstuk fault zone (table 1, samples 12–14)

Jt **Tonalite**—Foliated, fine- to medium-grained, leucocratic, biotite granite, hornblende tonalite, and clinopyroxene tonalite dikes and small intrusions. Locally, unit is intensely deformed, as evidenced by the mineral foliation as well as polygonal, strained quartz grains (table 1, samples 15 and 16). Unit occurs structurally beneath the main quartz monzonite of Mount Veta intrusion (Jgmv). Although U-Pb SHRIMP ages for unit Jt (184.8 ± 2.9 Ma and 190.5 ± 4.8 Ma; table 1, samples 15 and 16, respectively) are within error of those of unit Jgmv, relative age is inferred to be slightly older

EARLY JURASSIC AND OLDER METAMORPHIC ROCK

MzPzmh **Metahornblendite dike (pre-Early? Cretaceous)**—Black, coarse-grained, foliated metahornblendite dike. Age uncertain, but presence of tectonic foliation indicates unit present during regional pre-Early Cretaceous deformation

LATE TRIASSIC IGNEOUS ROCK

Ꞩg **Hornblende granodiorite**—Dark-gray, weakly foliated, medium-grained hornblende-biotite granodiorite, hornblende quartz monzodiorite, and hornblende leucotonalite. Unit forms batholithic intrusion in southeastern part of map and smaller intrusions to the west of the Kechumstuk fault. U-Pb zircon ages range from 207.9 ± 2.9 Ma to 215.5 ± 3.4 Ma (table 1, samples 17–19)

PALEOZOIC AND OLDER METAMORPHIC ROCKS

Pzmv **Metavolcanic and lesser metasedimentary rocks (Middle Mississippian or older)**—Dark green to black, fine-grained, weakly to moderately foliated metabasalt and meta-andesite volcanics interlayered with metasedimentary rocks of the Chicken metamorphic complex of Werdon and others (2001). Thin interlayers of mylonite made up of recrystallized quartz and feldspar locally lie between foliation surfaces, presumably developed during regional tectonism, which thrust unit over supracrustal Paleozoic metamorphic rocks (Pzms). Unit metamorphosed to upper greenschist facies, with chlorite-epidote-calcite alteration assemblage. Primary age of unit uncertain, but an interlayered mylonitic felsic horizon (approximately 2 m thick), whose protolith was a dacitic volcanic rock or tonalite sill within the mafic metavolcanic rocks was dated at Middle Mississippian (table 1, sample 20). Mafic metavolcanic rocks have island-arc tholeiite trace-element signatures (Dusel-Bacon and others, 2013). U-Pb SHRIMP analyses of zoned zircons from the mylonite have cores dated at 332.6 ± 5.7 Ma (table 1, sample 20), which represent the age of volcanism (or intrusion?) of the protolith, and rims dated at ~70 Ma, interpreted to be the youngest possible age of tectonism undergone by the mylonite. At a locality within the Chicken metamorphic complex in the southeastern Eagle quadrangle, marble interlayered with metabasalt yielded poorly preserved conodonts of late Paleozoic, possibly Mississippian, age (Dusel-Bacon and Harris, 2003)

MDag **Augen gneiss (Early Mississippian to Late Devonian)**—Inhomogeneous orthogneiss dominated by light-gray, medium- to coarse-grained, strongly foliated biotite-muscovite augen gneiss with zones of relatively augen-free biotite gneiss of granodioritic to granitic bulk composition. Unit is characterized by lenticular augen made up of alkali feldspar porphyroclasts (as much as 5 cm in diameter) and quartz, feldspar, mica, and garnet mineral aggregates (amphibolite-grade) set in a medium-grained, foliated to granoblastic matrix of granodioritic composition. Anastomosing mica-rich shear bands separate zones of both equigranular matrix and augen into sigmoid-shaped zones (mesolithons). Dusel-Bacon and Aleinikoff (1985) described the regional geologic context for the unit and documented a porphyritic granitoid protolith. Dusel-Bacon and others (2006, and references therein; see their table 1) and Dusel-Bacon and Williams (2009) reported U-Pb zircon ages that range from 347 ± 5 Ma to 371 ± 3 Ma for compositionally and texturally similar bodies of augen gneiss in the USGS Big Delta and Tanacross 1:250,000 quadrangles. Day and others (2003) reported a U-Pb zircon SHRIMP age of 365 ± 4 Ma (Late Devonian) for unit in the Big Delta (B–2) quadrangle, which lies approximately 80 km to the west of this study area. Aleinikoff and others (1981; their sample AG–5) reported K-Ar dates on muscovite of 113 ± 4 Ma and on biotite of 110 ±4 Ma from Devonian augen gneiss in the Big Delta quadrangle, reflecting postmetamorphic cooling during the Early Cretaceous

Dog **Biotite orthogneiss (Late Devonian)**—Predominantly light to medium gray, medium-grained, layered trondhjemitic to granodioritic orthogneiss with lesser amounts of biotite schist, quartzite, and paragneiss. Undated in the map area, but similar rocks in the Big Delta quadrangle yielded Late Devonian (367 ± 7 Ma) U-Pb SHRIMP dates on zircon cores (Day and others, 2007). That study also showed that U-Pb SHRIMP ages on zircon rims showed two populations: (1) an older group at 114 ± 2 Ma and (2), a younger group at 109 ± 2 Ma. The U-Pb SHRIMP data on zircons from the sample indicate that the protolith intrusion (or intrusive complex?) inherited zircons from a crustal source that was in part Precambrian, was emplaced during the Devonian, and was recrystallized twice during pulses of regional Cretaceous tectonism at ~114 Ma and at ~109 Ma. The younger age is coeval with the Early Cretaceous intrusions in the western Fortymile district mapped in this study (Kgc)

Pzq **Quartzite-rich metasediments, undivided (middle Paleozoic or older)**—Predominantly light gray, fine-grained, laminated micaceous quartzite with lesser amounts of dark green micaceous layers of metamorphosed shale, amphibolite, micaceous schist, metagraywacke, and minor metapelite. Interlayered with white to light-gray marble (Pzm). Section exposed on western part of map area progresses up structural section (west to east) and seemingly forms an upward coarsening sequence from micaceous schist and metagraywacke up through dark green phyllite, argillite, light gray to white, medium-grained platy, and laminated quartzite; to light gray cherty marble, laminated, white to light gray fine-grained quartzite; to light gray thinly bedded marble; to tan to light brown fine-grained, platy micaceous quartzite interlayered with massive marble. Metamorphic grade is uppermost greenschist facies to lower amphibolite facies. Protolith was sequence of sandstone with variable clay content, mudstone, graywacke, locally mafic (tuff?) interlayers, and limestone horizons in a relatively shallow, near-shore environment

Pzm **Marble (Paleozoic)**—Light gray marble with thin (cm-thick) metachert lenses. Unit forms discontinuous beds in a predominantly siliciclastic sequence (Pzq) and undivided metasedimentary rocks (Pzms). Unit is more massive in the northern part of the map area, whereas marble layers become more interlayered with micaceous units farther south. Age is unknown. Fossils in the region are extremely rare and include only the possible Mississippian conodont occurrence described above for unit Pzmv and Late Mississippian to Early Permian conodonts from marble in the Fortymile River assemblage in the southeastern Eagle quadrangle (Dusel-Bacon and Harris, 2003). Alternatively, the unit may predate Early Mississippian orthogneiss that intrudes a similar marble-bearing sequence (Fortymile River assemblage) in the eastern Eagle quadrangle (Day and others, 2002; Dusel-Bacon and others, 2006), and (or) the Late Devonian to Early Mississippian age of the augen gneiss and orthogneiss in the southwestern edge of the map area

Pzqm **Quartzite and mafic volcaniclastic metasediment, undivided (pre-Late Devonian)**—Light gray fine-grained micaceous quartzite intermixed with dark green layers of mafic metavolcanic to volcaniclastic metasedimentary rocks and biotite schist. Protolith thought to be mixture of siliciclastic sedimentary units interspersed with volcaniclastic sediments predominantly of mafic composition. Age uncertain but a pre-Late Devonian age is based on the interpretation that this unit is intruded by unit Dog of assumed Late Devonian age

Pzum **Ultramafic (late to middle Paleozoic)**—Light brown to dark green, coarse-grained, massive, non-foliated, weakly serpentinized metaharzburgite that forms approximately 200-m-wide body located within the metamorphosed mafic sequence (Pzam). Uncertain if protolith of ultramafic unit was coeval with protoliths of adjacent metamorphosed mafic rocks (Pzam) or, as proposed in Dusel-Bacon and others (2013), is a tectonic sliver emplaced during late Paleozoic or Mesozoic tectonism. Metaharzburgite is identical in composition and texture to partially serpentinized harzburgite in other parts of the Eagle quadrangle that are interpreted as alpine-type peridotites derived from the mantle and part of the Seventymile terrane (Group II of Foster and Keith, 1974; Foster and others, 1994)

Pzam **Amphibolite and metagabbro, undivided (middle Paleozoic or older)**—Dark green, fine- to medium-grained strongly foliated to gneissic amphibolite and metagabbro commonly interlayered with biotite schist, dark gray siliciclastic metasedimentary rocks and foliated, medium-grained leucogranite, granite and tonalite (Jt). Textures indicating primary depositional environment have been obliterated during regional Mesozoic ductile deformation; pillow structures not observed. Protolith was basalt and gabbro interlayered with argillaceous siliciclastic sediments. Unit occurs west of the main Mount Veta ridge and becomes more common in southwestern part of map area. Northeastward along structural trend, the unit is interlayered with the metasedimentary sequence suggesting paleoenvironment was dominated by an emergent mafic volcanic sequence in the south that graded into a near-shore sedimentary sequence (Pzq) to the north of exposed area

Pzms **Metasediments, undivided—(middle Paleozoic or older)**—Predominantly metapelite and argillite with lesser amounts of quartzite, graywacke, greenstone and sand-rich marble horizons intermixed with volcaniclastic metasedimentary rocks. Interlayered with white to light-gray marble (Pzm). Differs from map unit Pzq exposed to the west of the Kechumstuk fault in that unit contains less quartzite. Metamorphic grade is uppermost greenschist. Protolith was sequence of mudstone, shale, and graywacke with interlayers of sandstone and volcaniclastic sediments. Regional relations suggest unit was deposited on the continental margin of North America during the early Paleozoic (Dusel-Bacon and others, 2006)

EXPLANATION

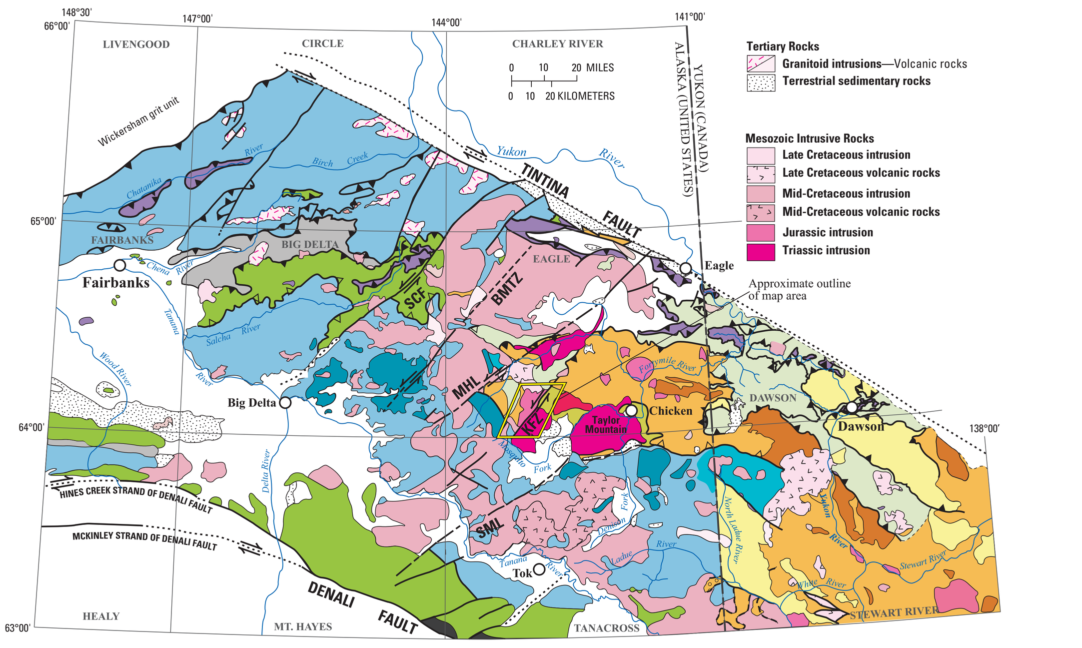
Alteration zone—Silicification and iron oxide staining due to alteration of mafic, iron oxide, and sulfide minerals producing red to ochre staining

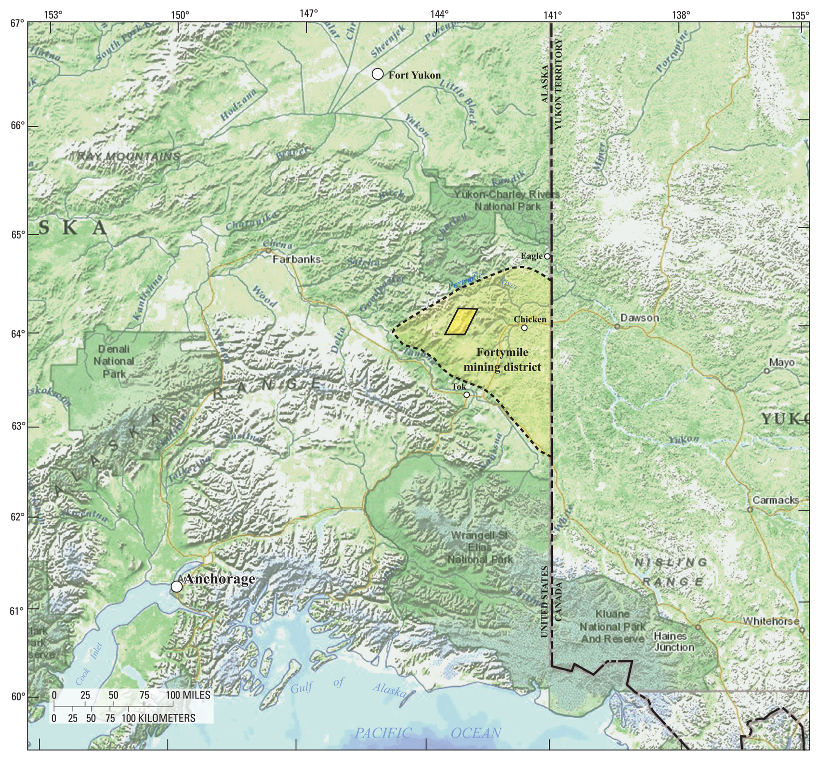
Shear zone—Broad zone of interleaved faulting, fracturing, and brittle cataclastic deformation of adjacent geologic units

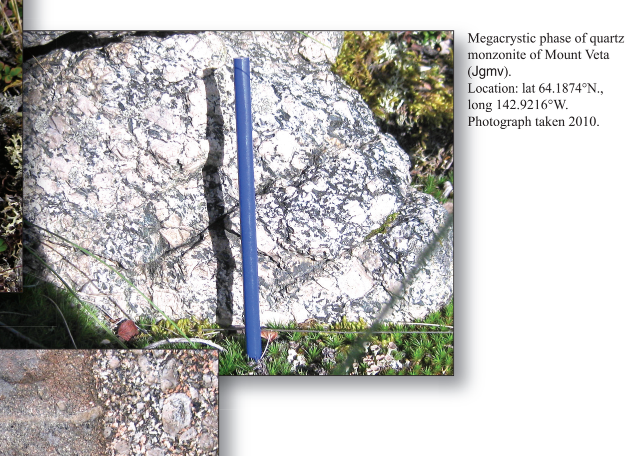
Contact—Dashed where inferred, dotted where concealed

Fault—Dashed where inferred, dotted where concealed

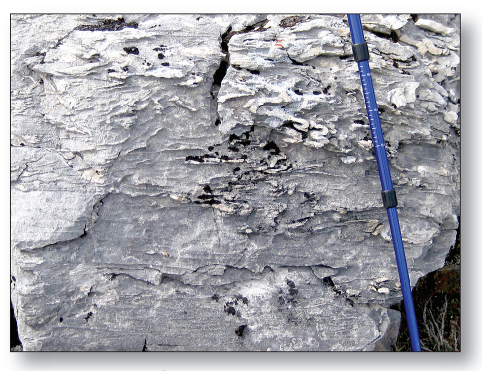
Normal fault—Dashed where inferred, dotted where concealed; bar and ball on downthrown block

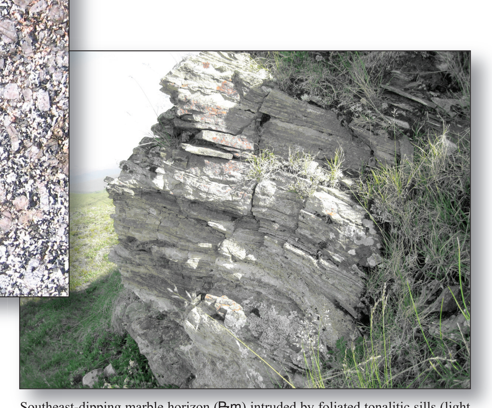


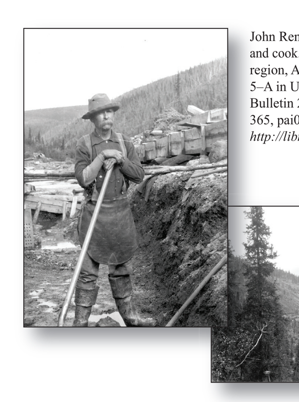




Float rock showing ductile deformation within adjacent basal part of Jurassic Mount Veta intrusion (Jgmv). Location: lat 64.1520°N., long 143.1349°W. Photograph taken 2009.







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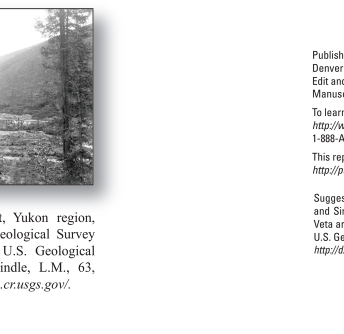

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Geologic Map of the Kechumstuk Fault Zone in the Mount Veta Area, Fortymile Mining District, East-Central Alaska

By
Warren C. Day,[1] J. Michael O'Neill,[1] Cynthia Dusel-Bacon,[1] John N. Aleinikoff,[1] and Christopher R. Siron[2]
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[1] U.S. Geological Survey
[2] Full Metal Minerals, Ltd., Vancouver, B.C., Canada