Base map from:
Eagle A-2 quadrangle, U.S. Geological Survey digital raster graphic image, 1996.
Geologic map produced in:
Clark 1866 datum, NAD27, UTM zone 7 projection.

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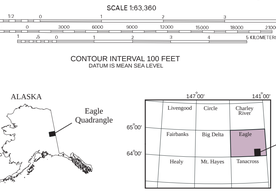


Maps Showing Location of Study Area

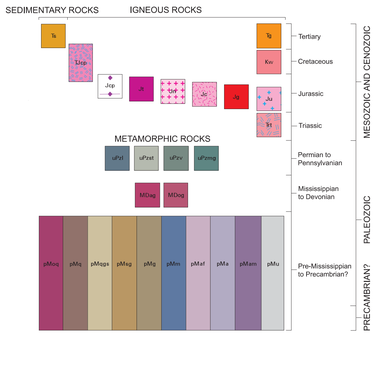
Bedrock geologic field investigations by:
D.J. Szumigala (1999-2000), R.J. Newberry (1999-2000), M.B. Werdon (1999-2000), B. Finseth (1999), M. McCrary (1999), J.C. Grady (2000), W.C. Munley (2000), and R. Flynn (1999).

Technical reviews by:
M.A. Wiltse and L.E. Burns

Electronic digital cartography by:
M.B. Werdon and D.S. Pinney

Acknowledgments
Cartographic advice: A.G. Sturmann
Petrographic and database assistance: J.E. Athey and K.H. Clautice

CORRELATION OF MAP UNITS



MAP SYMBOLS

Contact - Dashed where approximately located or inferred

Fault - Dashed where approximately located or inferred, dotted and queried where interpreted from aeromagnetic data. Arrows indicate apparent direction of relative horizontal movement; U, upthrown block; D downthrown block

Low angle or thrust fault - Dashed where approximately located or inferred; Barbs on upper plate

Fold - Showing trace of axial surface; arrows located on the axial trace indicate direction of plunge

- Antiform
- Overturned antiform, showing direction of dip of limbs
- Synform
- Overturned synform, showing direction of dip of limbs

Strike and dip of bedding

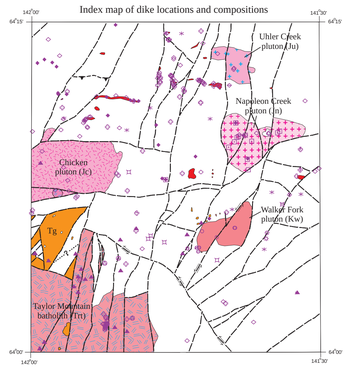
Strike and dip of foliation

Strike of vertical foliation

K Kyanite locality - shown on map

A1 $^{40}Ar/^{39}Ar$ locality - numbers refer to map and table 1

Index map of dike locations and compositions



DIKE SYMBOLS

Dikes shown on map as lines where orientation was recorded

- Microgabbro/diabase; equivalent to Tg (Tertiary)
- Aplitic to pegmatitic; interpreted to be the latest phase of Kw (Cretaceous)
- Granodiorite; equivalent to Kw (Cretaceous)
- Biotite clinopyroxenite; see Jcp in description of map units (Jurassic)
- Hornblende +/- clinopyroxene gabbro; occurs as dikes and inclusions within Jn (Jurassic)
- Aplitic to pegmatitic; interpreted to be the latest phase of Jurassic intrusions (Jurassic)
- Felsic to intermediate granitic; equivalent to Jurassic intrusions (Jurassic)
- Porphyritic hornblende quartz diorite; occurs as dikes cutting the Triassic Taylor Mountain Batholith (Jurassic)
- Altered (probably Jurassic)
- Garnet pyroxene lamprophyre; occurs in placer tailings on Wade Creek (Jurassic or younger)
- Foliated; may either be syn-Jurassic deformation, or part of the pre-Mississippian amphibolite-facies metamorphic rocks

DESCRIPTION OF MAP UNITS

SEDIMENTARY ROCKS

Ts — SEDIMENTARY ROCKS (Tertiary) — Poorly- to well-indurated, nonmarine sedimentary rocks of early Tertiary age, as established by plant fossils (Foster, 1976). Typically consists of conglomerate, sandstone, shale, amber-bearing coal, siltstone, and graywacke. Includes local felsic tuff, usually rhyolite composition, with distinctive quartz and sanidine phenocrysts in a light colored, fine-grained matrix or fine-grained, layered ash tuff. Total thickness of unit in excess of 140 m. Silicified basal conglomerate with cobbles to 1 m is over 40 m thick in lower Napoleon Creek. Magnetic susceptibility is very low, <0.1 x 10^{-3} SI (Système International). Petrified wood, within massive black chalcedony containing abundant plant fossils, is locally present in the Chicken area. Silicified and altered regional correlatives of this unit contain epithermal gold prospects, as at Ptarmigan Hill, 10 km west of Eagle, Alaska, and Grew Creek, near Ross River, Yukon Territory (Newberry and others, 1998b). Spatial association with placer gold-bearing gravels in the Chicken and Napoleon Creek areas suggests that this unit may be gold-bearing as well. The unit is usually truncated by high-angle faults; unconformable contacts with older units are only rarely observed. The age of this unit may extend into the Cretaceous (based on $^{40}Ar/^{39}Ar$ biotite plateau age of 105.4 Ma and white mica plateau age of 108.8 Ma on tuffaceous? material, east side of Ingle Creek, Eagle A-3 Quadrangle; Layer and others, 2001).

IGNEOUS ROCKS

Tg — MICROGABBRO/DIABASE (Tertiary) — Fine- to medium-grained (1–5 mm) tholeiitic microgabbro or diabase. Typical mineralogy is 50–70 percent felted plagioclase laths, 30–50 percent altered clinopyroxene + olivine, 3–5 percent magnetite + ilmenite, and 0–3 percent biotite. Although previously mapped as fine- to coarse-grained basalt (Foster, 1976), the absence of columnar jointing, layering, vesicles, volcanic breccias, or other evidence of extrusive character suggests that this unit is predominantly of shallow (?) intrusive origin or the interior portion of a thick flow. Contacts with adjacent units, where exposed, are high-angle and sheared, suggesting faulted intrusive contacts. $^{40}Ar/^{39}Ar$ biotite plateau age of 57.5 Ma (sample A1; table 1). Probably correlates with Tertiary basalts of similar major- and trace-element compositions (within-plate) throughout Interior Alaska. Early Tertiary resets in Ar spectra for minerals of the Chicken area and some early Tertiary $^{40}Ar/^{39}Ar$ isochrons (Layer and others, 2001) indicate this magmatism may have been extensive in the study region. Relatively unaltered mafic dikes (too small to be shown at map scale) are sporadically present elsewhere in the map area and probably represent the same early Tertiary magmatic episode. Magnetic susceptibility of the unit is moderate to high, usually 1–11 x 10^{-3} SI. Large bodies spatially correspond to aeromagnetic lows, indicating they are reversely magnetized, similar to Tertiary basalt in the Fairbanks area (Roe and Stone, 1993).

Kw — WALKER FORK PLUTON (Cretaceous) — Sub-equigranular, medium-grained, hornblende biotite granodiorite and lesser tonalite herein called the Walker Fork pluton. Typical primary modal mineralogy is 25–30 percent quartz, 30–55 percent plagioclase, 10–20 percent poikilitic K-feldspar, 8–15 percent biotite, 0–5 percent hornblende, 1 percent myrmekite, 1 percent opaques, and trace apatite and sphene. Distinguished from nearby Jurassic and Triassic plutons by large, prominent biotite crystals and lack of foliation. Locally cut by garnet-bearing, aplite–pegmatite dikes with secondary pyrite and calcite. The pluton is commonly altered, with 0–20 percent sericite–chlorite–epidote–carbonate–rutile–pyrite, mostly after plagioclase and mafic minerals. Magnetic susceptibility is high, typically 3–30 x 10^{-3} SI. Pluton is highly fractured near high-angle faults. As demonstrated by presence and absence of hornfels zones, both intrusive and fault contacts with surrounding gneissic rocks are present. This body is not known to contain or be spatially associated with metallic mineralization or placer gold, although it is cut by chalcedonic quartz veins. $^{40}Ar/^{39}Ar$ biotite plateau age of 100 Ma (sample A2; table 1); biotite from nearby gneiss yielded a K-Ar reset age of 99 Ma (Wilson and others, 1985).

Ugp — CHICKEN PLUTON PORPHYRY (Jurassic to Tertiary?) — One small body of medium- to coarse-grained, pink and gray, K-feldspar–porphyritic biotite hornblende granite. Typical modal mineralogy consists of 20–28 percent quartz, 20–30 percent plagioclase, 30–40 percent K-feldspar, 5–15 percent hornblende, 10–20 percent biotite, and ≤ 1 percent opaques. Intrudes the southern margin of the Chicken pluton (*Jc*). Magnetic susceptibility is 9–9.5 x 10^{-3} SI. Spatially associated with aplite dikes. Southern margin is structurally brecciated adjacent to fault.

Jcp — BIOTITE CLINOPYROXENITE DIKES (Jurassic) — Fine- to coarse-grained, dark green, generally unfoliated and equigranular (rarely porphyritic) dikes. Typical modal mineralogy consists of 15–90 percent clinopyroxene, 0–50 percent amphibole (secondary?), 0–30 percent plagioclase, 0–7 percent biotite, 0–4 percent quartz, and 3–5 percent opaques. Locally highly altered. Secondary minerals include actinolite, chlorite, talc, carbonate, epidote, clinozoisite, opaques, carbonate, and sericite. Magnetic susceptibilities vary from 0.01–0.7 x 10^{-3} SI to 3.6–5.1 x 10^{-3} SI. Spatially co-extensive with the Napoleon pluton and Jg intrusions in northwestern map area and generally not foliated. Compositionally and texturally similar biotite clinopyroxenite dikes in the northeastern Eagle Quadrangle yield K-Ar ages of 184–185 Ma (Newberry and others, 1998). Such biotite clinopyroxenite bodies are also known to bear platinum group metals (PGM) (Foley and others, 1989) and placers in Napoleon Creek are reported to contain anomalous PGM values (Cathrall and others, 1989). A clinopyroxenite dike/inclusion within the Napoleon pluton contains up to 25 ppb platinum and 6 ppb palladium (Werdon and others, 2000).

Jt — TOURMALINE–MUSCOVITE GRANITE (Jurassic) — Medium-grained, pegmatitic to aplitic granite. Typical primary modal mineralogy is 2 percent tourmaline, 20–25 percent muscovite, 20–25 percent quartz, 25–30 percent K-feldspar, 20–25 percent plagioclase, and trace zircon. Surrounding gneiss contains float of muscovite + tourmaline quartz veins and tourmaline–muscovite granite dikes. Magnetic susceptibility is 0.01–0.02 x 10^{-3} SI. $^{40}Ar/^{39}Ar$ muscovite plateau age of 185.9 Ma (sample A6; table 1). Trace-element data suggests this is a highly fractionated granite with arc-type tectonic affinities.

Jn — NAPOLEON CREEK PLUTON (Jurassic) — Sub-equigranular, medium- to coarse-grained, weakly- to non-foliated hornblende quartz monzonite and lesser monzonite and quartz monzodiorite, herein called the Napoleon Creek pluton. Typical primary modal mineralogy is 3–8 percent quartz, 40–50 percent plagioclase, 20–40 percent K-feldspar, 15–20 percent hornblende, 1 percent sphene, 1 percent opaques, 0–1 percent myrmekite, and trace apatite and allanite. Generally characterized by large K-feldspar and obvious hornblende phenocrysts, which define the foliation, if present. Quartz is invariably strained, and crystal margins are commonly granulated. Most contacts with country rocks are linear zones lacking outcrops and displaying no obvious hornfels aureole, suggesting post-intrusive faulting. Magnetic susceptibility is typically high (1–27 x 10^{-3} SI), but the core of the body is significantly less magnetic (0.31–0.61 x 10^{-3} SI). Includes small bodies of biotite clinopyroxenite and coarse-grained hornblende gabbro, which may be inclusions, dikes, and (or) marginal phases. Both the Napoleon Creek pluton and the mafic phases are cut by minor late granite aplite–pegmatite dikes. Extensive, sheared zones of gold-bearing quartz–carbonate–sericite–chlorite–pyrite alteration are present within the pluton, yield an early Cretaceous $^{40}Ar/^{39}Ar$ isochron age (sample A4; table 1), and are under current industry investigation. Plutonic hornblende yielded a $^{40}Ar/^{39}Ar$ plateau age of 186 Ma (sample A7; table 1).

Jc — CHICKEN PLUTON (Jurassic) — Medium- to coarse-grained, tan to white, porphyritic to equigranular, weakly- to non-foliated, biotite granite and lesser hornblende biotite granodiorite, herein called the Chicken pluton. Previously mapped as part of the Taylor Mountain batholith (Foster, 1976), but displays significant contrasts in mineralogy, texture, major oxide composition, and age. Typical primary modal mineralogy is 20–25 percent quartz, 30–40 percent plagioclase, 20–30 percent K-feldspar, 0–5 percent hornblende, 5–10 percent biotite, 1–2 percent myrmekite, <1 percent sphene, magmatic? epidote and opaques, and trace apatite and allanite. K-feldspar megacrysts are common; aplite dikes are locally abundant, especially in upper Stonehouse Creek. Quartz is commonly strained and mortar texture is prevalent. Usually exhibits little alteration, but where alteration is present, it consists mostly of hornblende replaced by epidote + chlorite. Magnetic susceptibility is usually high, typically 4–12 x 10^{-3} SI. Contacts with surrounding rocks are mostly obscure. Lack of obvious hornfels or skarn in surrounding calcareous metamorphic rocks suggests contacts are largely faulted. No significant mineralization is known to occur in this pluton, although quartz–pyrite and K-feldspar–quartz veins occur at the head of Chicken Creek and gold prospects are present near the Chicken pluton at Purdy and Lilliwig Creek. Hornblende from the Chicken pluton yields a $^{40}Ar/^{39}Ar$ plateau age of 187.8 Ma (sample A8; table 1), and a $^{40}Ar/^{39}Ar$ isochron age of 54 Ma for the biotite indicates significant heating in early Tertiary time, presumably associated with nearby gabbro. The presence of apparently magmatic epidote in this pluton suggests it crystallized at elevated pressure, probably >5 kbar.

Ju — UHLER CREEK PLUTON (Jurassic) — Sub-equigranular, medium-grained, modestly- to non-foliated biotite–hornblende granite and lesser quartz monzodiorite, herein called the Uhler Creek pluton. Typical modal mineralogy is 15–20 percent quartz, 35–45 percent plagioclase, 10–15 percent K-feldspar, 10 percent each biotite and hornblende, 1–2 percent sphene, myrmekite, opaques, and magmatic? epidote, and trace apatite and allanite. K-feldspars are up to 8 mm in length, other major minerals typically are 2–5 mm. Alteration is usually minor, with some chloritization of mafic minerals and sericitic dusting of plagioclase. The presence of magmatic epidote (for example, overgrowths on allanite) suggests mesozonal crystallization conditions. Most contacts with country rocks are linear zones lacking outcrops and displaying no obvious hornfels aureole, suggesting post-intrusive faulting. Magnetic susceptibility is generally low (0.1–0.7 x 10^{-3} SI). $^{40}Ar/^{39}Ar$ hornblende plateau age of 188 Ma (sample A9; table 1).

Jg — FELSIC-COMPOSITION PHANERITIC DIKE-LIKE BODIES (Jurassic?) — Numerous small and elongate Jurassic (?) plutons scattered throughout the northern half of the map area compositionally and texturally resemble the Chicken and Uhler plutons. May or may not be foliated, commonly porphyritic, medium-grained, tend to be elongated in east–west direction parallel to fold axial traces in surrounding metamorphic rocks, and mostly range between granite and quartz monzodiorite in composition. Typically contain 15–30 percent quartz, 15–35 percent K-feldspar, 35–45 percent plagioclase, 0–25 percent hornblende, 2–10 percent biotite, and minor sphene, opaques, and magmatic? epidote as overgrowths on trace allanite. Magnetic susceptibilities vary greatly, from 0.1–0.3 to 1–2.5 x 10^{-3} SI. Presence of magmatic epidote indicates the bodies were emplaced at mesozonal depths. Locally spatially associated with small base-metal skarns (Werdon and others, 2000) south of Buckskin Creek, and east of the South Fork of the Fortymile River just north of the mouth of Napoleon Creek. One of these dikes from just east of the map area yielded a $^{40}Ar/^{39}Ar$ age of 188 Ma (Layer and others, 2001).

TTr — TAYLOR MOUNTAIN BATHOLITH (Triassic) — Slightly foliated (interior) to strongly foliated (margins), medium- to coarse-grained, sub-equigranular, biotite–hornblende quartz monzodiorite, tonalite, granodiorite, and quartz diorite of the Taylor Mountain Batholith. Typical primary modal mineralogy is 15–25 percent quartz, 40–70 percent plagioclase, 5–20 percent K-feldspar, 5–10 percent hornblende, 0–5 percent biotite, <1 percent sphene and opaques, and trace apatite. Strained quartz and mortar texture are ubiquitous in thin section, as is partial alteration of biotite and hornblende to chlorite + epidote + carbonate. Magnetic susceptibility of most samples is high (2–10 x 10^{-3} SI), but marginal facies and sheared samples are typically lower. Contacts with surrounding rocks are complex; zones of intimately foliated quartz dioritic dikes and sills are locally present in units uPzst, uPzv, and uPzmg near the batholith, but sheared contacts apparently predominate. Most likely the Taylor Mountain batholith intruded units uPzst, uPzv, and uPzmg, but subsequent Jurassic deformation, and later high-angle faulting, has disrupted most of the original contacts. The batholith is not in direct contact with amphibolite-facies gneissic rocks within the map area and the relationship between these two units is not known.

The majority of the Taylor Mountain batholith is devoid of known metallic mineralization; however, small copper–bismuth–gold-bearing veins are present in and near the far northern edge of the batholith at Lilliwig Creek and the Highway Copper prospect. $^{40}Ar/^{39}Ar$ dating of these prospects (Newberry and others, 1998b; sample 10; table 1) yields mineralization ages of ~183–194 Ma, that is, ~20–30 Ma younger than the batholith. Rocks of the Taylor Mountain batholith have yielded a U–Pb (sphene) age of 214 Ma (Aleinikoff and others, 1981); K-Ar ages of 177–183 Ma (Wilson and others, 1985); and $^{40}Ar/^{39}Ar$ plateau ages of 209 Ma (hornblende), 204 Ma (biotite) (Cushing, 1984), and 210–211 Ma (biotite and hornblende; Layer and others, 2001). Most likely the magmatic age is ~214 Ma with younger apparent ages caused by an early Jurassic heating and deformation event. Cut by porphyritic hornblende quartz diorite dikes with $^{40}Ar/^{39}Ar$ hornblende plateau age of 197.5 Ma (sample A11; table 1).

CHICKEN METAMORPHIC COMPLEX

The greenschist facies uPzmg, uPzv, uPzl, and uPzst units have been variously grouped and correlated. Foster (1969) mapped these units together as 'metamorphic rocks of the Chicken area' and distinguished them from greenschist facies graphitic quartzite present 20 km north and 25 km east of the map area. Foster (1976) grouped all the greenschist facies rocks in the map area as a single unit. Cushing (1984) identified the metagabbro–metadiorite (uPzmg) as 'amphibolite' and correlated it with the locally amphibolite-bearing rocks of the amphibolite-facies gneiss and schist units. Foster and others (1994) correlated the greenschist facies units originally identified as 'metamorphic rocks of the Chicken area' with mafic-ultramafic rocks of the Seventymile Terrane (ophiolite). However, the absence of ultramafic rocks in the Chicken area and the presence of intermediate- and felsic-composition metavolcanic rocks is atypical of the Seventymile Terrane.

uPzst — METASEDIMENTARY AND METATUFFACEOUS ROCKS (upper Paleozoic) — Greenschist facies metasedimentary and lesser metavolcanic rocks. Metasedimentary rocks of this unit are fine- to medium-grained marble, slate, quartz mica phyllite, and minor quartzite. Paleozoic age assignment based on reported crinoid columns in marble near Napoleon Creek (Prindle, 1909). Metavolcanic rocks are mostly andesitic to rhyolitic composition with mm-scale mineral and color banding suggesting a tuffaceous origin. Minor massive greenstone interbeds included in this unit. Unit thickness is unknown, but most likely in excess of 200 m. Magnetic susceptibility of this unit varies tremendously; greenstone is typically 0.5–5 x 10^{-3} SI; intermediate to felsic composition metavolcanic rocks are 0.5–0.1 x 10^{-3} SI, and metasedimentary rocks are <0.1 x 10^{-3} SI. This unit contains gold–calcite veins at the Purdy mine, but no evidence for base-metal syngenetic mineralization. Absence of hornfels in this unit or skarn in carbonate-bearing portions near or adjacent to contacts with Jurassic and Triassic plutons suggest that these contacts are faults.

uPzl — LIMESTONE (upper Paleozoic) — Limestone, subunit of uPzst. White, gray, and yellowish-brown colored, fine- to medium-grained limestone. Limestone varies from thin-bedded units interbedded with phyllite to massive beds up to 46 m thick. Commonly forms cliffs where exposed. Limestone varies from fairly pure calcium carbonate to impure varieties with quartz, muscovite, epidote, and opaque (carbonaceous) material. Fragments of crinoid stems present in limestone cropping out on the South Fork of the Fortymile River just below the mouth of Napoleon Creek (Prindle, 1909). Unit is dolomitized and/or brecciated near high-angle faults. Magnetic susceptibility is <0.1 x 10^{-3} SI.

uPzv — METAVOLCANIC AND LESSER METASEDIMENTARY ROCKS (upper Paleozoic) — Greenschist facies metavolcanic and lesser metasedimentary rocks. Metavolcanic rocks are mostly fine-grained, chlorite–albite–quartz–carbonate phyllite of basaltic major- and trace-element composition. May include minor phyllitic rocks of andesitic to rhyolitic composition with mm-scale mineral and color banding suggesting a tuffaceous origin. Sills or dikes 1–2 m thick of metagabbro and metadiorite are common within 0.5 km of the contact with the metagabbro unit (uPzmg). Metasedimentary rocks of this unit are fine- to medium-grained marble, slate, quartz mica phyllite, and minor quartzite. Paleozoic age assignment based on spatial association with uPzst and uPzl units. Unit thickness is unknown, but most likely in excess of 200 m. Magnetic susceptibility of this unit varies tremendously; greenstone is typically 0.5–5 x 10^{-3} SI; intermediate to felsic composition metavolcanic rocks are 0.5–0.1 x 10^{-3} SI; and metasedimentary rocks are <0.1 x 10^{-3} SI. This unit contains epithermal-style veining at the Wall Street mine, but no evidence for base-metal syngenetic mineralization. Absence of either hornfels in this unit or skarn in carbonate-bearing portions near or adjacent to contacts with Jurassic and Triassic plutons suggests that these contacts are faults. Cut by metadiorite dike with $^{40}Ar/^{39}Ar$ hornblende plateau ages ranging from 287.7 Ma to 304.6 Ma (sample A13; table 1; Layer and others, 2001).

uPzmg — HORNBLENDE METAGABBRO AND METADIABASE (upper Paleozoic) — Moderately- to non-foliated, fine- to medium-grained, hornblende metagabbro and metadiabase. The bulk of this unit is interpreted to represent a volcanic arc upon which more extrusive volcanic-dominated (uPzv) and sediment-dominated (uPzst, uPzl) units were deposited. Possibly a sill- or dike-swarm, as suggested by fine-grained intra-unit contacts and common occurrence of this unit as sills or dikes in unit uPzst. These rocks are nearly indistinguishable in major- and trace-element composition from the metabasalt of unit uPzst. In thin section, these rocks display a variably strong greenschist facies overprint, with primary igneous (?) hornblende and clinopyroxene replaced by fine-grained actinolite + chlorite + calcite and plagioclase replaced by albite + carbonate + sericite. Magnetic susceptibility is usually high, 5–20 x 10^{-3} SI, but considerably lower where sheared. Abundant dikes of Taylor Mountain batholith-type quartz diorite are locally present in this unit on both sides of the South Fork of the Fortymile River east of Chicken; however, abrupt, sheared contacts suggest that original intrusive contacts have been displaced by high-angle faults. Similarly, although dikes and sills of metagabbro/metadiabase are present in unit uPzst, the contact between uPzmg and uPzst is mostly faulted. Amphibole from uPzmg and from a dike of this unit in greenstone yielded disturbed $^{40}Ar/^{39}Ar$ spectra, with highest-temperature fraction ages of 227 and 225 Ma and pseudo-plateau ages of 213 and 201 Ma (Cushing, 1984). The spectra indicate a pre-mid Triassic magmatic age with a thermal reset caused by intrusion of the Taylor Mountain Batholith and younger plutons.

FORTYMILE RIVER ASSEMBLAGE

Foster (1969) grouped all the amphibolite-facies rocks in the map area as a single gneiss and schist unit. Although individual lithologic unit boundaries were not delineated, marble-rich, garnet-rich, and quartzite-rich areas and augen gneiss localities encountered on ridgeline traverses are indicated by various symbols on her map. Foster (1976) grouped all the amphibolite-facies rocks in the map area as a single biotite gneiss and amphibolite unit, with marble-rich areas indicated by a carbonate pattern on the map. Based on mineral assemblages in mafic rocks and mineral assemblages and compositions in pelitic rocks, rocks of the Eagle A-2 Quadrangle have experienced epidote–amphibolite facies metamorphism (Dusel-Bacon and others, 1995). Local presence of staurolite and kyanite in gneiss and schist is apparently related to local aluminum-rich protoliths and not to significant variations in metamorphic conditions. Pre-, syn-, and post-tectonic mineral fabrics are observed in the rocks, indicating a complex thermal and structural history, probably involving multiple deformational episodes. Hornblendes from these amphibolite-facies metamorphic rocks have yielded highest-temperature $^{40}Ar/^{39}Ar$ fraction ages of 190–214 Ma and stepped pseudo-plateaus, plateau, and saddle ages of 188–204 Ma (Cushing, 1984; Hansen and others, 1991). Biotites far from known Jurassic or younger plutons have yielded $^{40}Ar/^{39}Ar$ plateau ages of 187 Ma (Cushing, 1984) and 182 Ma (Layer and others, 2001) and pseudo-plateau ages of 185–186 Ma (Hansen and others, 1991). Metaplutonic rocks in the Eagle A-2 Quadrangle are texturally and compositionally indistinguishable from metaplutonic rocks of the Eagle A-1 Quadrangle that have Mississippian U–Pb (magmatic) ages (Cynthia Dusel-Bacon, written commun., 2001) indicating the amphibolite-facies metamorphic rocks are as a whole of Mississippian or older age. Similarities in protolith age, major- and trace-element composition, and metamorphic facies to metamorphic rocks of the Tanacross Quadrangle (Dusel-Bacon and Cooper, 1999) and to the Fairbanks area (Newberry and others, 1996) suggest that this unit is widespread in eastern Interior Alaska. We infer that this unit was structurally juxtaposed with the lower-grade Pennsylvanian metamorphic rocks by early Jurassic time, as both are intruded by early Jurassic plutons, but all contacts between this unit and pre-Jurassic rocks are obscured by the extensive high-angle faulting and generally poor exposures characteristic of the region. Although these amphibolite-facies rocks were previously referred to as the Taylor Mountain Assemblage (Hansen and Dusel-Bacon, 1998), our mapping shows these units are not in contact with the Taylor Mountain Batholith. The amphibolite-facies units are currently referred to as the Fortymile River Assemblage (Cynthia Dusel-Bacon, written commun., 2000).

MDag — AUGEN GNEISS (Mississippian to Devonian) — Medium- to coarse-grained, biotite–quartz–feldspar gneiss with relict igneous K-feldspar megacrysts that now form porphyroclasts (augen) to 3.5 cm in a matrix of quartz, feldspar, biotite (commonly chloritized), and lesser white mica. Generally has a granodioritic to granitic bulk composition. Present as ellipsoidal bodies generally <2 km^2 in surface area generally displaying sheared contacts with surrounding amphibolite-facies metamorphic rocks. Magnetic susceptibility variable, but commonly 1–10 x 10^{-3} SI. There are no published dates for this unit in the Eagle Quadrangle, but similar-appearing bodies elsewhere in the Yukon–Tanana region yield Mississippian (Aleinikoff and others, 1986; Newberry and others, 1998a) and uppermost Devonian (Mortensen, 1986) U–Pb ages.

MDog — ORTHOGNEISS (Mississippian to Devonian) — Medium- to coarse-grained, dark green, generally unfoliated and equigranular (rarely porphyritic) dikes. Typical modal mineralogy consists of 15–90 percent clinopyroxene, 0–50 percent amphibole (secondary?), 0–30 percent plagioclase, 0–7 percent biotite, 0–4 percent quartz, and 3–5 percent opaques. Locally highly altered. Secondary minerals include actinolite, chlorite, talc, carbonate, epidote, clinozoisite, opaques, carbonate, and sericite. Magnetic susceptibilities vary from 0.01–0.7 x 10^{-3} SI to 3.6–5.1 x 10^{-3} SI. Spatially co-extensive with the Napoleon pluton and Jg intrusions in northwestern map area and generally not foliated. Compositionally and texturally similar biotite clinopyroxenite dikes in the northeastern Eagle Quadrangle yield K-Ar ages of 184–185 Ma (Newberry and others, 1998). Such biotite clinopyroxenite bodies are also known to bear platinum group metals (PGM) (Foley and others, 1989) and placers in Napoleon Creek are reported to contain anomalous PGM values (Cathrall and others, 1989). A clinopyroxenite dike/inclusion within the Napoleon pluton contains up to 25 ppb platinum and 6 ppb palladium (Werdon and others, 2000).

pMog — ORTHOGNEISS AND QUARTZITE (Pre-Mississippian) — Float of trondhjemitic orthogneiss (MDog) and quartzite (pMq). Well-mixed float could suggest abundant sills and (or) dikes of MDog within pMq. Orthogneiss is fine- to medium-grained, locally finely foliated, equigranular to porphyritic, and has an estimated modal mineralogy of 1–2 percent chlorite (after biotite?), 5–10 percent white mica, 5–10 percent quartz, and 85 percent feldspar. Quartzite is fine-grained and consists of quartz and minor white mica. Contains minor highly magnetic, biotite–quartz–feldspar gneiss.

pMq — QUARTZITE (Pre-Mississippian) — Fine-grained quartzite. Dark gray and greenish-gray, locally color banded, foliated, relatively pure quartzite with minor white mica, biotite (up to 3 percent; ± chloritized), feldspar, and carbonate, and occasional pyrite and limonite disseminations and fracture fillings. Contains occasional slightly carbonaceous-rich and (or) magnetite-rich layers, and locally interlayered with lesser quartz–feldspar gneiss (± garnet, ± biotite, ± amphibole), marble, and schist. Magnetic susceptibility for quartzite is generally very low (0.01–0.11 x 10^{-3} SI) except in magnetite-rich areas (up to 9 x 10^{-3} SI).

pMags — QUARTZITE, GNEISS, AND SCHIST (Pre-Mississippian) — Mixed unit consisting of, in decreasing order of abundance, interlayered quartzite, gneiss, and schist. Quartzite is fine grained, contains ± garnet, ± feldspar, muscovite (1–20 percent), biotite (± chloritized), and is locally calcareous and (or) marble bearing. Magnetic susceptibility for quartzite is bimodal, 0.01–0.5 x 10^{-3} SI and 5–30 x 10^{-3} SI. Gneiss varies from a fine- to medium-grained, locally banded, equigranular biotite–quartz–feldspar tonalite(?) gneiss (± white mica, ± chlorite) to a locally schistose, garnet–biotite ± muscovite quartz feldspar gneiss. Magnetic susceptibility for gneiss is generally 0–0.6 x 10^{-3} SI, but occasionally as high as 16 x 10^{-3} SI. Schist is fine- to coarse-grained, and varies from a ± kyanite ± staurolite ± garnet–biotite–muscovite schist to a ± muscovite, biotite (± chloritized)–quartz–feldspar schist. Locally asymmetrically folded. Magnetic susceptibility for schist is generally 0.1–0.4 x 10^{-3} SI, but rarely can be as high as 45 x 10^{-3} SI.

pMag — SCHIST AND GNEISS (Pre-Mississippian) — Mixed unit defined by the abundance of schist. Contains interlayered, medium- to coarse-grained schist and gneiss, with minor local biotite quartzite and marble. Although mineralogically similar, the schist is distinguished from gneiss by its lepidoblastic (schistose) texture and a greater proportion of biotite and white mica. Typical mineralogy includes local garnet and occasional staurolite porphyroblasts in a matrix that includes biotite (10–15 percent in schist; 0–5 percent in gneiss), white mica (15–20 percent in schist; 0–5 percent in gneiss), feldspar, and quartz. Schist in this unit is commonly crenulated and folded.

pMg — GNEISS (Pre-Mississippian) — Fine- to medium-grained gneiss. Primary mineralogy consists of ± kyanite, ± garnet, ± muscovite, biotite, feldspar, and quartz. Small-scale isoclinal folds are locally visible, suggesting that the entire unit is isoclinally folded. Metasedimentary protoliths appear to predominate. Locally abundant banded quartzo-feldspathic gneiss interlayered on a cm-to-meter scale with biotite- and amphibole-rich gneiss suggests volcanic protoliths. Magnetic susceptibilities are generally moderate to low (0.1–1 x 10^{-3} SI).

pMm — MARBLE, MARBLE-RICH GNEISS, AND SCHIST (Pre-Mississippian) — Coarse-grained, light gray, massive outcrops of non-fossiliferous calcite marble. Mapped as a separate unit where near-continuous, massive marble outcrops or float are abundant within other amphibolite-facies units. Magnetic susceptibility <0.01 x 10^{-3} SI. Mostly light gray with lesser green, reddish brown, and pink color variations, folded and discontinuous, with granoblastic polygonal texture. Locally contains veins, bands, and (or) disseminated crystals of clinopyroxene, epidote, tremolite, garnet, apatite, quartz, plagioclase, white mica, and (or) iron sulfides/oxides. Most calc-silicates were produced by local metasomatism at the interface between marble and either schist or gneiss, although hydrothermal skarns are locally developed in pMm adjacent to Jurassic intrusions.

pMaf — AMPHIBOLE–FELDSPAR GNEISS (Pre-Mississippian) — Mixed unit defined by amphibole–feldspar gneiss. Typical modal mineralogy consists of 30–70 percent hornblende, 30–50 percent plagioclase, 0–6 percent biotite. Commonly altered to epidote, locally cut by quartz veins with 1–3 percent pyrite, and occasionally pyrrhotite, limonite, and carbonate. Magnetic susceptibility is 0.29–2 x 10^{-3} SI. In north-central map area, a less deformed portion exhibits relict volcaniclastic texture (clasts to 7.5 cm), which supports an interpreted andesitic-arc protolith. Interlayered on varying scales with amphibolite (pMa), fine- to coarse-grained biotite–quartz–feldspar gneiss (± hornblende, ± garnet) and lesser schist, quartzite, and marble.

pMa — AMPHIBOLITE AND GNEISS (Pre-Mississippian) — Mixed unit defined by amphibolite, with arc chemistry (Dusel-Bacon and Cooper, 1999), and gneiss. Amphibolite is dark green, foliated, fine- to coarse-grained, and typical mineralogy consists of ± epidote, ± garnet, ± quartz, ± biotite, and plagioclase (± sericite altered). Locally quartz-veined and bearing disseminated iron sulfides. Equigranular metagabbro bodies present locally. Magnetic susceptibilities are generally 0.1–2.5 x 10^{-3} SI, with locally high values (5–50 x 10^{-3} SI). Gneiss is banded on various scales, and mineralogically consists of biotite–quartz–feldspar gneiss with varying proportions of white mica, hornblende, and garnet, with occasional epidote, rare carbonate, and local quartz veining. Locally interlayered with minor quartz