```
/* ------------------------ CODESET ------------------------ */
```
Title: Geologic map of the Eagle A-2 Quadrangle, Fortymile mining district, Alaska
Publication: PIR 2001-3A
URL: http://www.dggs.dnr.state.ak.us/pubs/pubs?reqtype=citation&ID=2669

Title: Bedrock geologic map of the Eagle A-2 Quadrangle, Fortymile mining district, Alaska
Publication: PIR 2001-3B
URL: http://www.dggs.dnr.state.ak.us/pubs/pubs?reqtype=citation&ID=2670

Title: Surficial-geologic map of the Eagle A-2 Quadrangle, Fortymile mining district, Alaska
Publication: PIR 2001-3C
URL: http://www.dggs.dnr.state.ak.us/pubs/pubs?reqtype=citation&ID=2671
```
/* ---------------------------------------------------------- */
```

UNCONSOLIDATED DEPOSITS

The extent of unconsolidated deposits in the Eagle A-2 Quadrangle, Fortymile mining district, was mapped primarily by the interpretation of 1:63,360-scale, false-color, infrared aerial photographs taken from July 1978 through August 1981 and is locally verified by ground observations during field visits.

Terms used to describe the estimated percentages of cobbles and boulders are 'numerous', 'scattered', and 'rare.' 'Numerous' implies that drilling through the layer would encounter two cobbles or boulders in an interval of 0.6 m; 'scattered' implies that drilling would encounter two cobbles or boulders in an interval of 3 to 4.5 m; and 'rare' implies that drilling would encounter two cobbles or boulders in an interval of more than 4.5 m.

Alluvial Deposits

Qa - ALLUVIUM OF MODERN STREAM CHANNELS - Elongate deposits of moderately to well sorted, well stratified, fluvial pebble-cobble gravel, sand, and silt, with scattered to numerous boulders, deposited in active stream channels, flood plains, and associated low terraces. Deposit is medium to thick bedded, locally cross-bedded, shows fining-upward cycles, and is locally auriferous. Cobbles are generally rounded and may reach a maximum diameter of 1 m. Locally overlain by up to 3 m of ice-rich organic silt and muck, particularly along valley margins, containing Pleistocene mammalian remains (including mammoth, horse, caribou, and bison). Surface disturbances, such as from excavation, commonly result in melting and subsequent slumping and flowage. Surface smooth except for local low scarps.

Qac - ABANDONED-CHANNEL DEPOSITS - Elongate deposits of variable grain size, sorting, and bedding style deposited in channels of former streams not related to modern stream regimens. These deposits are closely related to the oldest terrace deposits (Qat1) found throughout the Fortymile mining district. Composition ranges from thin, local surface lags of cobbles and boulders to thick deposits of well sorted, clean pebble-cobble gravel, and gravelly medium to coarse sand with rare to numerous cobbles up to 0.5 m diameter. Thin to thick bedded, locally cross-bedded. Deposits reflect former channels and flow regimes that may be related to early Pleistocene glaciation in the regional stream headwaters. Locally thickly mantled by ice-rich, primary and reworked silt deposits. Surface disturbances of the silt mantle, such as from excavation, commonly result in melting and subsequent slumping and flowage. Placer mining in upper Lost Chicken Creek has exposed more than 8 m of frozen silt and gravel overlying auriferous channel gravels. The channel gravels of upper Lost Chicken Creek consist of well bedded, clast supported, pebble-cobble gravel and sand, with rounded to well-rounded clasts up to 13 cm diameter. The deposit is characterized by numerous limonite-filled fractures, prominent orange stains on bedding planes, and extensive limonite and MnO staining. Twigs and large wood in association with the channel gravels are abundant, but all analyzed material returned infinite dates. The Lost Chicken tephra is preserved in 0-6 cm thick discontinuous lenses and pods of fine white ash approximately 26 cm above the top of the auriferous channel gravels. Naeser and others (1982) used fission-track methods on zircon microphenocrysts and glass shards to date the tephra at 1.7 to 2.6 Ma. Surface smooth with local low scarps and bogs.

Qaf - ALLUVIAL-FAN DEPOSITS - Fan-shaped, heterogeneous mixtures of poorly to moderately sorted, partially stratified gravel with some sand and silt and scattered to numerous, subangular to rounded boulders, especially in proximal areas. Deposits are locally channeled across fan surface. Clasts generally locally derived from the immediate vicinity along the short, steep streams feeding many of the fans. May include torrential fluvial deposits and debris-flow deposits. Thick to thin bedded. Generally form at intersection between tributary and trunk streams. Surface smooth except for numerous shallow, interconnected channels.

Qat4 - YOUNGEST TERRACE ALLUVIUM - Elongate deposits of well sorted, well rounded to subrounded, stratified pebble-cobble gravel and coarse sand with trace to some silt and rare to numerous boulders forming low terrace bordering Mosquito Fork floodplain. Clearly related to modern drainage. May be overlain by up to 3 m of locally ice-rich organic silt, muck, and over bank deposits. Surface smooth to hummocky with local low scarps and bogs.

Qat3 - YOUNG TERRACE ALLUVIUM - Elongate deposits of well sorted, well rounded to subrounded, stratified pebble-cobble gravel and sand with trace to some silt and rare to numerous boulders forming elevated benches bordering Mosquito Fork, Dennison Fork, North Fork, and Buckskin Creek flood plains. Clearly related to Recent drainage. Maximum tread elevation approximately 30 m above the present streams. Deposits may be capped by variable thickness of locally ice-rich primary and reworked eolian silt. Surface smooth to hummocky with local low scarps and bogs.

Qat2 - OLD TERRACE ALLUVIUM - Elongate deposits of well sorted, well rounded to subrounded, pebble-cobble gravel and sand with trace to some silt and rare to numerous boulders forming elevated benches bordering Mosquito Fork, Dennison Fork, North Fork, and Buckskin Creek. Probably related to Pleistocene drainage. Maximum tread elevation approximately 100 - 130 m above the present streams. Thickness highly variable. Deposits locally capped by variable thickness of ice-rich primary and reworked eolian silt. Surface smooth to hummocky with local low scarps and bogs.

Qat1 - OLDEST TERRACE ALLUVIUM - Elongate deposits of well sorted, well rounded to subangular, generally poorly stratified gravel, sand, and silt, possibly of glaciofluvial origin, forming elevated benches bordering Mosquito Fork, Dennison Fork, North Fork, Buckskin Creek, Uhler Creek, Napoleon Creek, and Chicken Creek basin. Maximum tread elevation approximately 165 - 230Êm above the present streams. Thickness highly variable, ranging from thin gravel veneers on bedrock near Wall Street Creek and Dennison Fork to 15 m thick observed in the Napoleon Creek area. Yeend (1996) reported maximum gravel thickness of 40 m at Napoleon Creek. Maximum cobble size observed was 0.5 m diameter, but most clasts are in the range of 0.1 to 0.2 m diameter. Mostly clast-supported, with a medium to coarse, subangular sand matrix. Locally stained orange by limonite. While generally massive and structureless, a vague bedding fabric at Napoleon Creek suggests a slight (~9 degree) dip to the west. Locally thickly mantled by ice-rich, primary and redeposited eolian silt. Surface generally smooth and heavily vegetated. Bench gravels are auriferous and have been very successfully mined at Napoleon Creek.

Qfp - FLOODPLAIN ALLUVIUM - Elongate deposits of moderately to well sorted, well-stratified, fluvial gravel, sand, and silt with scattered to numerous boulders in flood plains and associated low terraces. Deposits may reflect former channels and flow regimes. Typically mantled by thin layer of silty over bank deposits. Generally finer grained than similar deposits in Qa unit because of deposition during flood-stage events. May locally include Wisconsin to Holocene terrace alluvium. Lower surfaces may be flooded during periods of maximum stream discharge. Locally overlain by up to 3 m of ice-rich organic silt and muck, particularly along valley margins, containing Pleistocene mammalian remains (including mammoth, horse, caribou, and bison). Surface disturbances of the frozen silt cover, such as from excavation, commonly result in melting and subsequent slumping and flowage. Ground ice content highly variable. Surface smooth to hummocky with local low scarps and bogs.

Colluvial Deposits

Qc - UNDIFFERENTIATED COLLUVIUM - Irregular, heterogeneous blankets, aprons, and fans of angular to subangular rock fragments, gravel, sand, and silt that are left on slopes, slope bases, or high-level surfaces by residual weathering and complex mass-movement processes including rolling, sliding, flowing, gelifluction, and frost action. Locally washed by meltwater and slope runoff. Deposit is generally unsorted to very poorly sorted, and medium to thick bedded. Thickness is highly variable, with thickest deposits at the bases of slopes. Organic material is commonly incorporated in the deposit, and it is locally overlain by up to 3 m of ice-rich organic silt and muck that may contain Pleistocene mammalian remains (including mammoth, horse, caribou, and bison, especially at the bases of slopes bordering streams. Surface disturbances, such as from excavation, commonly result in melting and subsequent slumping and flowage. Surface smooth, lobed, or terraced and, if deposit is thin, generally reflects configuration of underlying bedrock surface.

Qcf - FINE-GRAINED COLLUVIUM AND SILT - Irregular, heterogeneous blankets, fans, and aprons of fine-grained colluvium and silt. Silt is largely retransported from original hillside sites of eolian deposition to lower slopes by mud flows, slope wash, gelifluction, and frost action. May contain abundant angular clasts of local origin. Massive to thinly bedded, with some wavy bedding and cross-bedding. Thickness is highly variable, with thickest deposits at the bases of slopes. Commonly perennially frozen and ice rich. Surface disturbances, such as from excavation, may result in melting and subsequent slumping and flowage. Surface steep to gently sloping. Deposits blanket pediments primarily in southwest map area.

Qcl - LANDSLIDE DEPOSITS - Oval- to tongue-shaped heterogeneous mixture of fractured bedrock and pebble-cobble gravel with trace to some sand and silt deposited by near-surface to deep creep, flowing, and sliding due to instability of failed bedrock and unconsolidated surficial deposits on north fork of Napoleon Creek. Potential failure block is delineated on aerial photographs by apparent ground fractures and remains coherent, but may be subject to spontaneous slope failure at some future time. Surface ranges from smoothly sloping to slightly irregular and broken by arcuate ground cracks.

Complex Deposits

Qs - SWAMP DEPOSITS - Elongate to blanket deposits of complexly bedded peat, organic silt, and organic sand accumulated as surface deposits in local basins and in former stream channels. Saturated and locally frozen, locally ice rich. Thickness highly variable. Surface smooth, hummocky, or pitted. May have standing water.

Qca - COLLUVIAL AND ALLUVIAL VALLEY-FILL DEPOSITS - Elongate, apron- and fan-shaped, heterogeneous mixtures of poorly to moderately sorted angular rock fragments with trace to some gravel, sand, and silt deposited in upper stream courses and on lower slopes along the margins of stream valleys by complex mass-movement processes (including rolling, sliding, flowing, gelifluction, and frost action) and strongly influenced by meltwater and slope runoff. Other important depositional processes may include debris flows, brief, intense (torrential) summer stream flows, and minor snow-avalanching. Commonly forms alternating stratified and unstratified zones and lenses in gullies and steep tributary valleys with intermittent or ephemeral streams. Locally overlain by variable thickness of ice-rich organic silt and muck, especially in areas of little or no slope. Surface disturbances, such as from excavation, commonly result in melting and subsequent slumping and flowage. Surface steep to gently sloping, with local low scarps and shallow channels from ephemeral runoff streams.

Man-made Deposits

Qh - PLACER-MINE TAILINGS AND ARTIFICIAL FILLS - Pebble-cobble gravel with trace to some sand and silt forming bases for roads and airports and piled in active or former gravel pits, open-pit mines, and dredged areas. Well to poorly sorted. Surface smooth to irregular. Extent based primarily on distribution between July 1978 and August 1981 when the aerial photographs were taken.

BEDROCK 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 40Ar/39Ar 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. 40Ar/39Ar biotite plateau age of 57.5 Ma (sample 1; 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 40Ar/39Ar 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 magmatism. 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) 3/4 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. 40Ar/39Ar biotite plateau age of 100 Ma (sample 2; table 1); biotite from nearby gneiss yielded a K-Ar reset age of 99 Ma (Wilson and others, 1985).

Tjcp - CHICKEN PLUTON PORPHYRY (Jurassic to Tertiary?) 3/4 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) 3/4 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) 3/4 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. 40Ar/39Ar muscovite plateau age of 185.9 Ma (sample 6; table 1). Trace-element data suggests this is a highly fractionated granite with arc-type tectonic affinities.

Jn - NAPOLEON CREEK PLUTON (Jurassic) 3/4 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 40Ar/39Ar isochron age (sample 4; table 1), and are under current industry investigation. Plutonic hornblende yielded a 40Ar/39Ar plateau age of 186 Ma (sample 7; table 1).

Jc - CHICKEN PLUTON (Jurassic) 3/4 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 40Ar/39Ar plateau age of 187.8 Ma (sample 8; table 1), and a 40Ar/39Ar 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) 3/4 Sub-equigranular, medium-grained, modestly- to non-foliated biotite-hornblende granodiorite and minor 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). 40Ar/39Ar hornblende plateau age of 188 Ma (sample 9; table 1).

Jg - FELSIC-COMPOSITION PHANERITIC DIKE-LIKE BODIES (Jurassic?) 3/4 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 40Ar/39Ar age of 188 Ma (Layer and others, 2001).

Trt - TAYLOR MOUNTAIN BATHOLITH (Triassic) 3/4 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. 40Ar/39Ar 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 40Ar/39Ar 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 40Ar/39Ar hornblende plateau age of 197.5 Ma (sample 11; 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) 3/4 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) 3/4 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) 3/4 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 40Ar/39Ar hornblende plateau ages ranging from 287.7 Ma to 304.6 Ma (sample 13; table 1; Layer and others, 2001).

uPzmg - HORNBLENDE METAGABBRO AND METADIABASE (upper Paleozoic) 3/4 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 40Ar/39Ar 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 ridge line 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 40Ar/39Ar fraction ages of 190-214 Ma and stepped pseudo-plateau, plateau, and saddle ages of 188-204 Ma (Cushing, 1984; Hansen and others, 1991). Biotites far from known Jurassic or younger plutons have yielded 40Ar/39Ar 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) 3/4 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 km2 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) 3/4 Medium- to coarse-grained, variably foliated, biotite-quartz-feldspar gneiss. Lacks K-feldspar porphyroclasts but possesses relict equigranular to slightly porphyritic igneous textures and granitic to granodioritic to trondhjemitic bulk composition and mineralogy. Typical modal mineralogy is 20-30 percent quartz, 0-20 percent K-feldspar, 30-80 percent plagioclase, 0-15 percent biotite (typically chloritized), and 0-6 percent white mica. Spatial association with augen gneiss (MDag) and igneous composition implies a plutonic origin for this rock type. Present as irregular bodies, generally <8 km2 in surface area; interlayering with surrounding metamorphic rocks suggests a sill morphology for most bodies. Locally cut by quartz ± iron carbonate veins with pyrite. Magnetic susceptibility generally low to moderate, 0.02-3 x 10-3 SI. There are no published dates for this unit, but spatial association with augen gneiss (MDag) suggests a similar age.

pMoq - ORTHOGNEISS AND QUARTZITE (Pre-Mississippian) 3/4 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) 3/4 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).

pMqgs - QUARTZITE, GNEISS, AND SCHIST (Pre-Mississippian) 3/4 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.

pMsg - SCHIST AND GNEISS (Pre-Mississippian) 3/4 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) 3/4 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) 3/4 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) 3/4 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) 3/4 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 quartzite, schist, and marble.

pMam - AMPHIBOLITE (Pre-Mississippian) 3/4 Mixed unit defined by amphibolite with within-plate chemistry (Dusel-Bacon and Cooper, 1999), and lesser gneiss and quartzite. Amphibolite is green to dark green, fine- to coarse-grained, locally plagioclase-porphyroblastic, and consists of hornblende, plagioclase, ± garnet, ± biotite. Magnetic susceptibilities are generally low, 0.1-0.8 x 10-3 SI, with locally high values (1-50 x 10-3 SI). Interlayered with fine- to coarse-grained biotite (1-10 percent)-feldspar-quartz gneiss ± garnet ± hornblende. Gneiss locally compositionally banded with thin amphibolite- and biotite-rich layers. Includes minor layers of biotite-feldspar-quartzite ± carbonate, ± white mica, ± garnet, and biotite-quartz-feldspar schist ± garnet ± hornblende. Rarely contains siliceous and (or) calc-silicate-bearing marble.

pMu - UNDIFFERENTIATED (Pre-Mississippian) 3/4 Undifferentiated pre-Mississippian-age metamorphic rocks.

REFERENCES CITED

Aleinikoff, J.N., Dusel-Bacon, C., and Foster, H.L., 1986, Geochronology of augen gneiss and related rocks, Yukon-Tanana terrane, east-central Alaska: Geological Society of America Bulletin, v. 97, p. 626-637.

Cathrall, J.B., Albanese, Mary, VanTrump, G., Mosier, E.L., and Lueck, Larry, 1989, Geochemical signatures, analytical results, mineralogical data, and sample locality map of placer and lode gold, and heavy-mineral concentrates from the Fortymile mining district, Eagle Quadrangle, Alaska: U.S. Geological Survey Open-File Report 89-451, 52 p.

Cushing, G.W., 1984, The tectonic evolution of the eastern Yukon-Tanana upland, Alaska: unpublished M.S. Thesis, State University of New York, Albany, NY, 255 p.

Dusel-Bacon, Cynthia, and Cooper, K.M., 1999, Trace-element geochemistry of metabasaltic rocks from the Yukon-Tanana Upland and implications for the origin of tectonic assemblages in east-central Alaska: Canadian Journal of Earth Sciences, v. 36, p. 1671-1695.

Dusel-Bacon, Cynthia, Hansen, V.L., and Scala, J.A., 1995, High-pressure amphibolite facies dynamic metamorphism and the Mesozoic evolution of an ancient continental margin, east-central Alaska: Journal of Metamorphic Geology, v. 15, p. 9-24.

Foley, J.Y., Burns, L.E., Schneider, C.L., and Forbes, R.B., 1989, Preliminary report of platinum group element occurrences in Alaska: Alaska Division of Geological & Geophysical Surveys Public-Data File 89-20, 33 p.

Foster, H.L., 1969, Reconnaissance geology of the Eagle A-1 and A-2 Quadrangles, Alaska: U.S. Geological Survey Bulletin 1271-G, 30 p.

Foster, H.L., 1976, Geologic map of the Eagle Quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Series Map I-922, scale 1:250,000.

Foster, H.L., Keith, T.E.C., and Menzie, W.D., 1994, Geology of the Yukon-Tanana area of east-central Alaska, in Plafker, George, and Berg, H.C., eds., The geology of Alaska: Boulder, Colorado, Geological Society of America, The Geology of North America, v. G1, p. 205-240.

Hansen, V.L., Heizler, M.T., and Harrison, T.M., 1991, Mesozoic thermal evolution of the Yukon-Tanana composite terrane: new evidence from 40Ar/39Ar data: Tectonics, v. 10, p. 51-76.

Hansen, V.L. and Dusel-Bacon, Cynthia, 1998, Structural and kinematic evolution of the Yukon-Tanana upland tectonites, east-central Alaska: a record of late Paleozoic to Mesozoic crustal assembly: Geological Society of America Bulletin, v. 110, p. 211-230.

Layer, P.W., Drake, J., and Szumigala, D.S., 2001, 40Ar/39Ar dates for mineralization and igneous and metamorphic rocks in a portion of the Fortymile mining district, Eagle Quadrangle, Alaska: Alaska Division of Geological & Geophysical Surveys Preliminary Interpretive Report 2001-2.

Mortensen, J.K., 1986, U-Pb ages for granitic orthogneiss from western Yukon Territory: Selwyn Gneiss and Fiftymile Batholith revisited, in Current Research, Part B: Geological Survey of Canada, Paper 86-1B, p. 141-146.

Naeser, N.D., Westgate, J.A., Hughes, O.L., and Péwé, T.L., 1982, Fission-track ages of late Cenozoic distal tephra beds in the Yukon Territory and Alaska: Canadian Journal of Earth Sciences, v. 19, p. 2167-2178.

Newberry, R.J., Bundtzen, T.K., Clautice, K.H., Combellick, R.A., Douglas, T., Laird, G.M., Liss, S.A., Pinney, D.S., Reifenstuhl, R.R., and Solie, D.N., 1996, Preliminary geologic map of the Fairbanks mining district, Alaska: Alaska Division of Geological & Geophysical Surveys Public Data File 96-16, 2 sheets, 32 p.

Newberry, R.J., Bundtzen, T.K., Mortensen, J.K., and Weber F.R., 1998a, Petrology, geochemistry, age, and significance of two foliated intrusions in the Fairbanks District, Alaska, in Gray, J.E., and Riehle, J.R., eds., Geologic studies in Alaska by the U.S. Geological Survey, 1996: U.S. Geological Survey Professional Paper 1595, p. 117-129.

Newberry, R.J., Layer, P.W., Solie, D.N., and Burleigh, R.E, 1998b, New 40Ar/39Ar dates for intrusions and mineral prospects in the eastern Yukon-Tanana Terrane, Alaska-regional patterns and significance, in Gray, J.E., and Riehle, J.R., eds., Geologic studies in Alaska by the U.S. Geological Survey, 1996: U.S. Geological Survey Professional Paper 1595, p. 131-159.

Prindle, L.M., 1909, The Fortymile Quadrangle, Yukon-Tanana region, Alaska: U.S. Geological Survey Bulletin 375, 52 p.

Roe, J.T., and Stone, D.B., 1993, Paleomagnetism of the Fairbanks basalts, Interior Alaska, in Solie, D.N., and Tannian, Fran, eds., Short Notes on Alaskan Geology 1993, Alaska Division of Geological & Geophysical Surveys Professional Report 113, p. 61-69.

Werdon, M.B., Szumigala, D.J., Newberry, R.J., Grady, J.C., and Munly, W.C., 2000, Major oxide, minor oxide, trace element, rare-earth element, and geochemical data from rocks collected in Eagle and Tanacross quadrangles, Alaska in 2000: Alaska Division of Geological & Geophysical Surveys Raw-Data File 2000-4, 3 sheets, scale 1:63,360, 27 p.

Wilson, F.H., Smith, J.G, and Shew, Nora, 1985, Review of radiometric data from the Yukon crystalline terrane, Alaska and Yukon Territory: Canadian Journal of Earth Sciences, v. 22, p. 525-537.

Yeend, Warren, 1996, Gold placers of the historical Fortymile River region, Alaska; U.S. Geological Survey Bulletin 2125, 1 sheet, scale 1:63,360, 74 p.