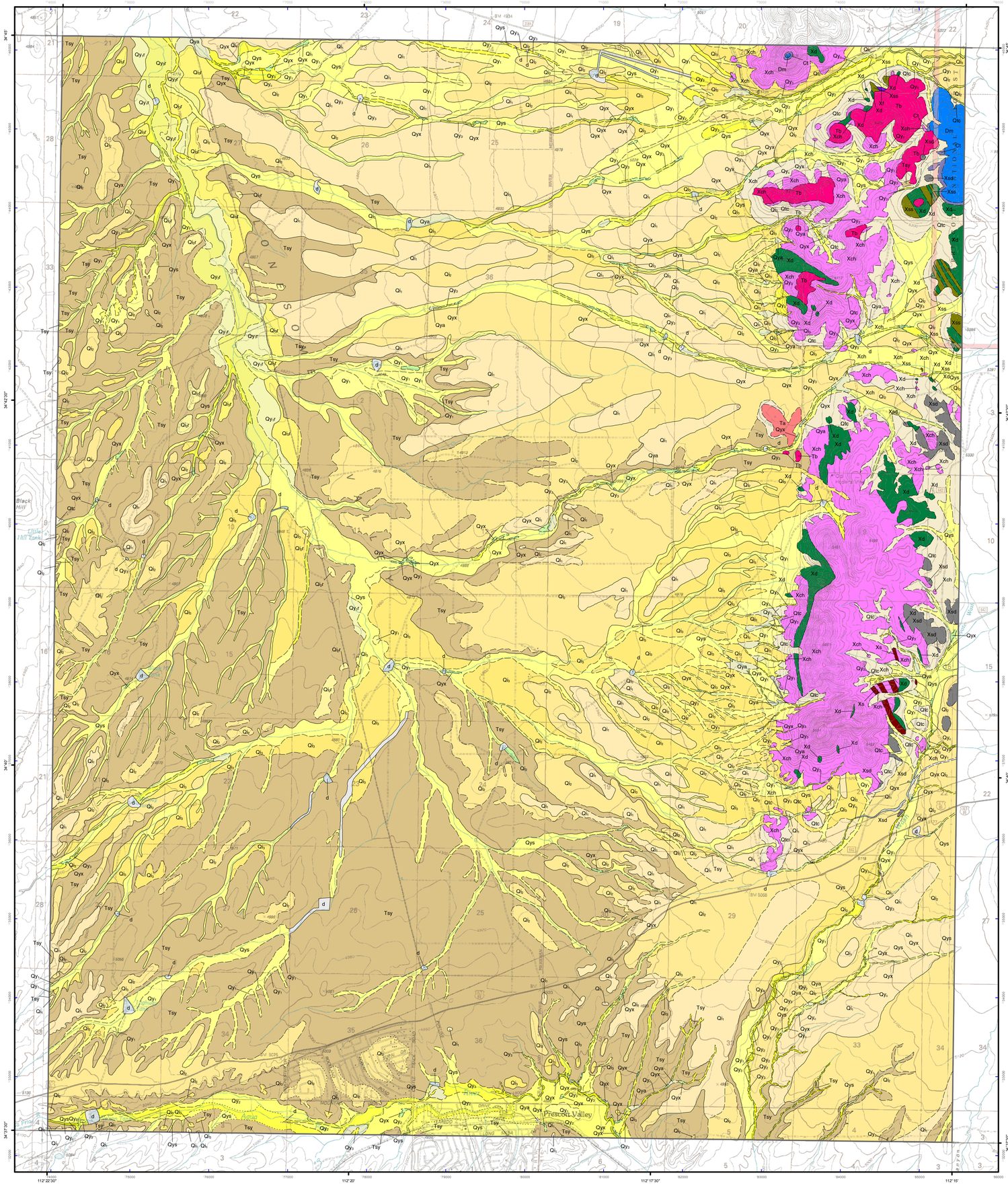



Topographic base from USGS 1:24,000 Quadrangle Series; generated using iGage AII Topo Pro software
Contour interval: 20 feet

Projection: UTM Zone 12N
Datum: NAD83

TRUE NORTH
MAGNETIC NORTH
10.8°
APPROXIMATE MEAN DECLINATION, 2011

scale 1:24,000

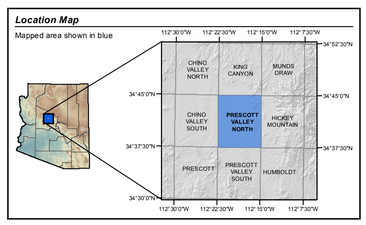
1000 500 0 1000 2000 3000 4000 5000 6000 7000 Feet

1 0.5 0 1 Miles

1 0.5 0 1 Kilometers

### Location Map

Mapped area shown in blue

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# GEOLOGIC MAP OF THE PRESCOTT VALLEY NORTH 7 ½' QUADRANGLE, YAVAPAI COUNTY, ARIZONA

**Arizona Geological Survey Digital Geologic Map DGM-92, version 1.0**
Scale 1:24,000

**By**
**Ann Youberg, Jon E. Spencer, Joseph P. Cook**
**October 2012**

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## Introduction

The Prescott Valley North 7 ½' Quadrangle extends over Lonesome Valley and the western foothills of Mingus Mountain, and is southeast of Chino Valley. Production of this new geologic map continues the Arizona Geological Survey mapping program of central Yavapai County. This mapping was done under the joint State-Federal STATEMAP program, as specified in the National Geologic Mapping Act of 1992, and was jointly funded by the Arizona Geological Survey and the U.S. Geological Survey under STATEMAP assistance award G10AC00428. Mapping was compiled digitally using ESRI ArcGIS software.

This map represents new mapping for Quaternary units, and partial new bedrock mapping in the hills in the northeastern corner of the quadrangle. Youberg mapped the surficial geology, Spencer mapped the bedrock geology, and Cook added to the surficial mapping along the southern boundary of the map area. Mapping by Krieger (1965) was incorporated into this map for much of this area. However, the Indian Hills Volcanics unit of Krieger (1965) was remapped and reinterpreted here as a Paleoproterozoic sedimentary unit with dioritic intrusions. Contacts between bedrock and Quaternary deposits were also modified based on field observation and aerial photograph interpretation. The regional geologic map of DeWitt et al. (2008) was used in evaluating map-unit correlations and names. Mineral deposits in the area consist of sparse, small quartz veinlets in zones with associated silicified iron oxides and rare pyrite. The Hopkins mine was not examined as permission was not obtained to enter the property.

Quaternary surficial and Tertiary basin-fill deposits form rolling, grass-covered hills, drained mainly by unincised swales, over much of the quadrangle. The area is drained by two major watersheds. Approximately 80% of the quadrangle is drained to the north through Poquito Wash in Lonesome Valley to Granite Creek in the Verde River watershed. The extreme southern portion of the quadrangle is drained to the south by the Aqua Fria River. Highway 89A approximately follows the basin boundary between these two watersheds.

There are very few exposures in outcrop of the Quaternary or Tertiary surficial units. Rounded, eroded ridges of fine-grained Tertiary basin-fill deposits with thin, isolated, capping remnants of Quaternary alluvium comprise the western and southern areas of the quadrangle. The eastern and northern areas of the quadrangle are covered by more extensive Quaternary alluvial fan deposits emanating from the Black Hills to the east of the quadrangle.

Surficial geologic units were mapped using field observations, stereo aerial photographs, digital orthophotographs, digital elevation models (DEMs) and high-resolution (2') topography. Relative ages of alluvial deposits were estimated using characteristics of clast weathering, soil development, carbonate accumulation, and position in the landscape (Gile and others, 1981; Machette, 1985; Bull, 1991; Birkland, 1999). Soil development and carbonate accumulation begins once a deposit is isolated from active alluvial processes.

Younger alluvial deposits have little to no soil development, retaining the original grey or brown color of the alluvial sediments, and no carbonate accumulation. Clasts in these deposits have no weathering rinds or surface patinas and thus appear brighter and fresher than older clasts. Young alluvial surfaces often retain original depositional characteristics such as bars and swales. Conversely, older alluvial deposits have better developed soils that appear orange or red in color, with soil horizons reflecting clay and carbonate accumulations. Clasts in older alluvial deposits often exhibit darkened weathering rinds or some degree of oxidation (orange surface patina), and thus appear darker on the ground and in aerial photographs. Preserved alluvial surfaces may be smooth and flat (Qi3), becoming more rounded and coarser with age (Qi2). The oldest alluvial surfaces (Qi1) are often eroded, rounded ridges with no soils preserved and the carbonate horizon exposed. These deposits appear white in photographs.

Landscape position and drainage development often provide clues to deposit ages, with younger surfaces inset below older surfaces. Drainages on older surfaces will typically be more incised and exhibit a dendritic pattern. In this quadrangle, however, the rounded, grass-covered ridges were minimally dissected, making it difficult to use landscape position for relative age dating.

## Map Unit Descriptions

### Piedmont Deposits

**Qyc** — **Active channel deposits (Modern)** - Unconsolidated, very poorly sorted sandy to bouldery ephemeral, upper piedmont, channel deposits in active, open, incised channels of washes that are large enough to depict at the map scale. This unit is composed of moderately to poorly sorted sand, pebbles, cobbles and boulders. Channels are typically incised less than 2 m below adjacent late Holocene terraces and alluvial fans, but may be as deep as 4 m. This unit is typically associated with arroyo headcutting, unit Qyx. Channel morphologies generally consist of a single-thread, deep, high-flow channel. There is no soil development in these deposits.

**Qyx** — **Active arroyo formation (Modern)** - Actively headcutting meter-scale sections of entrenched, ephemeral streams with vertical walls, hanging valleys and small inset terraces eroding into fine-grained units Qys and $Qy_1f$. These units are typically connected with incised units Qyc, $Qy_3$, and $Qy_2f$.

**Qya** — **Active alluvial fan deposits (Modern)** - Unconsolidated sand, pebble and cobble deposits on active alluvial fans at the downstream segment of discontinuous ephemeral gullies composed of units Qyx, Qyc, and $Qy_3$. The active alluvial fans are typically deposited on top of unit Qys.

**$Qy_3$** — **Latest Holocene alluvium (Latest Holocene alluvium)** - Ephemeral tributary-channel deposits and low-lying channel terraces flanking active drainages. Channels with unit $Qy_3$ deposits are often incised up to 2 m into adjacent surfaces, typically Qys. This unit consists of unconsolidated sand, pebbles and cobbles with no soil development.

**Qys** — **Sheetflow deposits (Late Holocene)** - Laterally extensive deposits of sheetflow transported sand and silt with minor sand, pebble and cobble channel deposits and irregular patches of eolian deposits in active swales. These active swales are unincised to minimally incised with intermittent, discontinuous, concentrated flow. Where flows become more concentrated arroyo headcutting forms (unit Qyx) and flow is channeled downstream (Qyc, $Qy_3$) to eventually deposit on active fans (Qya). Soil development is weak to none.

**$Qy_2$** — **Late Holocene alluvium (Late Holocene alluvium)** - Planar, historically abandoned terrace deposits located along incised drainages and broad low-relief distal fan deposits. Unit $Qy_2$ terrace deposits consists of moderately to poorly sorted sand, pebbles, cobbles and small boulders. Distastal fan deposits are fine-grained with sand, silt and pebbles. Soil development is minimal.

**$Qy_1$** — **Early to late Holocene alluvium (Early to late Holocene alluvium)** - Broad, low-relief, undulating fine-grained fan and sheetflow deposits exhibiting widespread, shallow braided drainage patterns with irregular patches of eolian deposits. Soil development is weak.

**$Qi_3$** — **Late Pleistocene alluvium (Late Pleistocene alluvium)** - Terrace and fan deposits with light to moderately developed, slightly reddened (7.5 YR) soils. $Qi_3$ surfaces are <2 m above adjacent Holocene surfaces and <2 m below adjacent older Pleistocene fans. $Qi_3$ surfaces vary from loose gravel-pebble lags throughout most of the quad, to coarse deposits of pebbles, cobbles and small boulders, many of which are vesicular basalt, in the northeastern portion of the quad. These coarser surfaces appear dark on air photos. Soil development is moderate with stage II carbonate. Unit $Qi_3$ deposits are a few meters thick, at best, overlying unit Tsy.

**$Qi_2$** — **Middle to late Pleistocene alluvium (Middle to late Pleistocene alluvium)** - Fan deposits of sand, pebbles and cobbles overlying unit Tsy. Well-preserved surfaces have moderately developed and reddened (5 YR) soil with stage III-IV carbonate. Unit $Qi_2$ was deposited around and over unit $Qi_1$. On the upper fans there is little, if any, relief between these 2 units. On the lower fans, $Qi_2$ is <1 - 2 m below $Qi_1$ surfaces. Isolated capping deposits are coarse pebble, cobble and small boulder deposits with little remaining soil. These capping deposits are very thin (< 1m) overlying unit Tsy.

**$Qi_1$** — **Early to middle Pleistocene alluvium (Early to middle Pleistocene alluvium)** - Eroded, remnant alluvial fans deposits composed of pebbles, cobbles and boulders. Isolated, small, preserved surfaces have reddened (5 YR), well-developed, clay-rich soils. Preserved surfaces have clasts of cobbles, pebbles and carbonate chips and nodules. Eroded $Qi_1$ surfaces are white, rounded ridges composed of coarse, carbonate-coated cobbles, pebbles and boulders with stage IV carbonate. $Qi_1$ deposits are thin (1-2 m thick) overlying Tsy. $Qi_1$ deposits are <1 - 2 m above $Qi_2$ deposits.

### River alluvium

**$Qy_1f$** — **Active channel, swale, and low terrace deposits (Modern)** - Active sheetflow swales and low-lying channel terraces alongPoquito Wash in northern Lonesome Valley. This mainly fine-grained unit is composed of unconsolidated sand and silt with minor pebble and no soil development.

**$Qy_2f$** — **Latest Holocene to historical river terrace deposits (Latest Holocene to historical river terrace deposits)** - Unconsolidated silt, clay, sand and minor pebble deposits with no soil development along Poquito Wash in northern Lonesome Valley.

**$Qy_3f$** — **Holocene river terrace deposits (Early to late Holocene)** - Terrace deposits along Poquito Wash in Lonesome Valley. $Qy_3f$ deposits are composed of unconsolidated silt, clay, and sand with minor pebbles, and weak soil development. $Qy_3f$ terraces are ~1 m above the historical floodplain ($Qy_2f$).

**$Qi_3f$** — **Latest Pleistocene to early Holocene river terrace deposits (Late Pleistocene to early Holocene )** - Isolated, remnant river terrace deposits 2-4 m above the historical floodplain ($Qy_2f$) along Poquito Wash in Lonesome Valley. $Qi_3f$ deposits are fine-grained silt, sand and minor pebbles. Where preserved surface soils are slightly reddened (7.5 YR), and weakly to moderately developed soil with stage II carbonate accumulation.

**$Qi_2f$** — **Mid- to late Pleistocene river terrace deposits (Mid- to late Pleistocene)** - Isolated, remanant river terrace deposits 3 - 6 m above the historical floodplain ($Qy_2f$) along Poquito Wash. Where preserved, soils are reddened (5 YR) and moderately developed with clay accumulations and stage III carbonate. $Qi_2f$ is composed of sand, pebbles, cobbles and small boulders.

### Basin Fill

**Tsy** — **Tertiary basin fill (Pliocene)** - Semi-consolidated sand, silt and clay deposits. Pliocene basin fill deposits (unit Tsy) forms eroded, broadly rounded ridges and is capped by thin (<2 m thick) Quaternary alluvial deposits.

### Other Units

**Qtc** — **Talus and colluvium (Holocene to late Pleistocene)** - Locally derived hillslope colluvium and coarse boulder and cobble talus.

**d** — **Disturbed (Modern)** - Disturbed areas due to development, drainage diversions, ditches, stocktanks and quarries.

### Tertiary map units

**Tb** — **Basalt (Tertiary)** - Basalt lava flows, undivided, mapped by Krieger (1965, USGS PP-467).

**Ta** — **Andesite (Tertiary)** - A single outcrop area of "andesite" mapped by Krieger (1965, USGS PP-467) in SW¼, sec. 5, T. 15 N., R. 1 E.

**Ts** — **Sedimentary rocks, undivided (Tertiary)** - A single outcrop area of sedimentary rocks mapped by Krieger (1965) in SW¼, sec. 28, T. 16 N., R. 1 E. Unit rests on Proterozoic rocks and is overlain by Tertiary basalt. Most such sedimentary rocks in the region consist of poorly sorted fanglomerate and fluvial sandstone (Krieger, 1965, USGS PP-467; Gootee et al., 2010, AZGS DGM-80).

### Paleozoic map units

**Dm** — **Martin Limestone (Devonian)** - Rocks of this map unit are described by Krieger (1965, USGS PP-467, p. 57) as "dolomite, dolomitic limestone, disseminated argillaceous and arenaceous material, and minor amounts of limy siltstone and sandstone."

**Ct** — **Tapeats Sandstone (Cambrian)** - Rocks of this map unit are described by Krieger (1965, USGS PP-467, p. 52) as "medium- to coarse-grained sandstone" with "lenses of granule to pebble conglomerate" and siltstone. The unit is finer grained up section, where it is typically slope forming and "consists principally of mudstone and siltstone."

### Early Proterozoic Rock Units

**Xch** — **Cherry Tonalite (lower Proterozoic)** - Fine grained to very fine grained, typically leucocratic tonalite to granodiorite. Mafic minerals, generally <2% but locally up to 10%, are typically too fine to identify but include hornblende. Locally, the tonalite contains sparse to abundant, <50 cm, hornblende-rich mafic inclusions. At one location tonalite is interlayered with hornblende-rich tonalite/diorite to form a rock that appears as layered gneiss. At some localities reddish minerals are suspected to be K-feldspar, in which case the unit could include granodiorite or even granite. Rocks of this unit are locally foliated and lineated, but with no evidence of grain-size reduction during fabric development (i.e., with sufficient recrystallization during or after foliation-producing deformation that vestiges of mylonitic fabric are not apparent, and may never have been produced).
Cherry Tonalite in the northeastern Prescott Valley 7 ½' Quadrangle was previously mapped as the "Mineral Point mass" of the Prescott Granodiorite (Krieger, 1965, USGS PP-467). Unlike the Prescott Granodiorite in the Prescott area, the Mineral Point mass contains hornblende, as noted by Krieger (1965, p. 40), which suggests that the two are not correlative. The Mineral Point mass was correlated with the Cherry Tonalite by DeWitt et al. (2008, USGS SIM-2996). Modal mineral analysis of six samples of the Mineral Point mass determined a composition of tonalite (two samples) to granodiorite (four samples) (Krieger, 1965). The dominantly granodioritic composition raises the possibility that the Mineral Point mass is not correlative with the Cherry Tonalite, but this possibility was not studied sufficiently to warrant differentiation into two units and the name Cherry Tonalite is retained.

**Xd** — **Hornblende diorite (lower Proterozoic)** - Fine to coarse grained, equigranular diorite composed largely or entirely of hornblende and feldspar, with highly variable phenocryst proportions and size. Phenocrysts are up to 10 mm diameter. Quartz is present in concentrations up to 15%. Up to ~5% epidote is present at some localities. Some samples consist of hornblendite containing >50% hornblende. The presence of quartz and, possibly, minor K-feldspar, indicates that modal mineral compositional range probably includes tonalite and, possibly, granodiorite. Nearby intrusive contact with Cherry Tonalite is sufficiently complex, with fragments of diorite floating in leucotonalite, that magma mixing is suspected as the origin of complex contact relationships. Paleo-weathering zone beneath Tapeats Sandstone consists of dark reddish brown, indurated, soil-like weathering product. The hornblende diorite unit was mapped as gabbro by Krieger (1965, USGS PP-467), with the map unit description based primarily on extensive exposures southeast of Prescott where some intrusions contain pyroxene, olivine, and cumulate textures. All areas in the northeastern Prescott Valley 7 ½' Quadrangle that were examined for this study consist hornblende diorite to hornblendite to, possibly, granodiorite. Therefore, the hornblende diorite unit is here differentiated from the gabbro unit of Krieger (1965).

**Xf** — **Fine-grained feldspar porphyry (lower Proterozoic)** - Fine grained, intermediate composition felsite, with 4-7%, 1-2 mm feldspar interpreted as pre-metamorphic, and 3-6%, 0.1-0.4 mm biotite that defines weak foliation and is interpreted as syn-metamorphic. Foliation is defined by elongation of feldspar and quartz(?) that now forms monomineral aggregates, and by preferential orientation of biotite. Foliation is parallel to contacts with adjacent units and to transposed bedding in adjacent metasandstone. Except for foliation, the rock appears massive and it is suspected that the protolith is a fine-grained, intermediate-composition sill.

**Xs** — **Metasiltstone and biotite schist (early Proterozoic)** - Metasiltstone and very fine-grained biotite schist derived from siltstone or very fine grain sandstone. Lithologic layering is preserved in light/dark layers and laminations with thickness of 1-10 mm. This unit was included within the Indian Hills Volcanics by Krieger (1965, USGS PP-467). However, except possibly for map unit Xf, no volcanic units were identified in this study, and it is suspected that rocks interpreted here as clastic sedimentary rocks were interpreted by Krieger (1965) as rhyolitic and tuffaceous volcanic rocks.

### Early Proterozoic Rock Units, cont. . .

**Xss** — **Metasandstone (lower Proterozoic)** - Generally fine grained to very fine grained, thin bedded to laminated metasandstone. Locally includes metasiltstone and, at one locality, quartz pebble conglomerate with subrounded, 5-30 mm clasts. Sandstone appears in hand sample to be slightly to moderately arkosic. Variable and very minor iron-oxide staining preferentially affects some bedding planes. At one location, low-angle cross beds are truncated and indicate stratigraphic top direction to the northeast. Unit also contains sparse granitoid veinlets, with sparse isoclines within bedding/foliation. These rootless isoclines within the metasandstone indicate that what appears to be bedding is actually transposed bedding. This unit was included within the Indian Hills Volcanics by Krieger (1965, USGS PP-467). However, except possibly for map unit Xf, no volcanic units were identified in this study, and it is suspected that rocks interpreted here as clastic sedimentary rocks were interpreted by Krieger (1965) as rhyolitic and tuffaceous volcanic rocks.

**Xsd** — **Metasandstone, metasiltstone, schist, and diorite, undivided (Early Proterozoic)** - Metasandstone, metasiltstone, biotite schist, and hornblende diorite. These units were mapped by Krieger (1965, USGS PP-467) as Indian Hills volcanics, but are here interpreted to represent sedimentary units (map units Xs and Xss) and diorite (map unit Xd). Unit assignments are based on aerial photograph interpretation, prior mapping by Krieger (1965), and extrapolation from nearby outcrops mapped during the course of this study.

## Line Symbols

- accurately located contact
- approximately located contact
- approximately located fault

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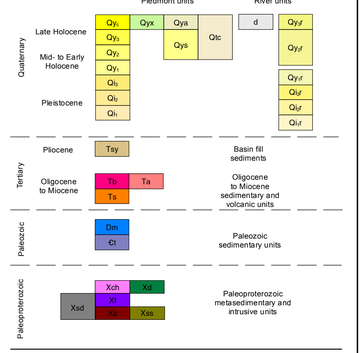
Both sets of data were very helpful in mapping the surficial geology.

## Mapping Responsibility

## Stratigraphic Correlation Diagram