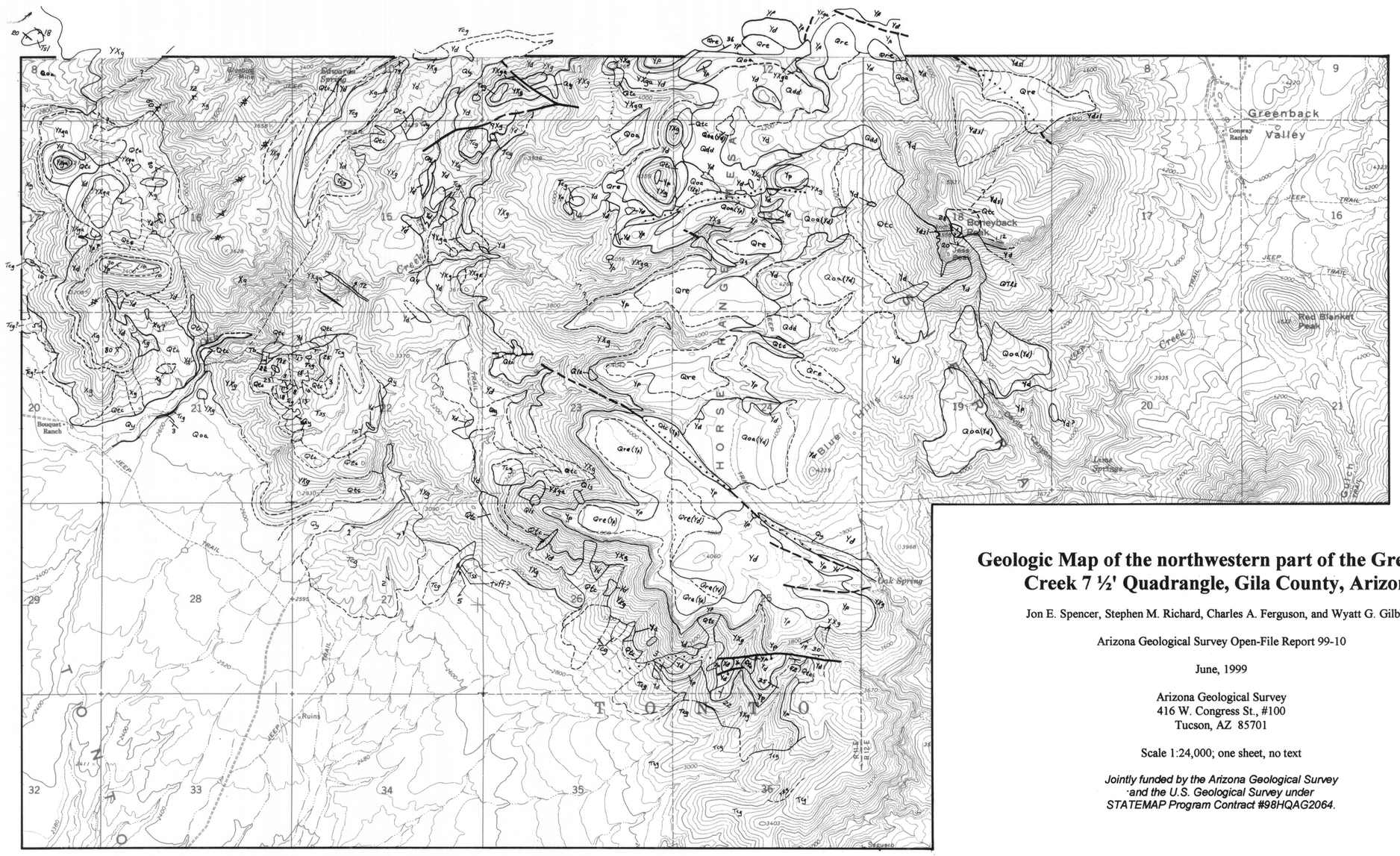

Geologic Map of the northwestern part of the Greenback Creek 7 ½' Quadrangle, Gila County, Arizona

Jon E. Spencer, Stephen M. Richard, Charles A. Ferguson, and Wyatt G. Gilbert.

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Arizona Geological Survey
416 W. Congress St., #100
Tucson, AZ 85701

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Introduction

The Greenback Creek 7 ½' Quadrangle is located on the west flank of the Sierra Ancha and directly northeast of Theodore Roosevelt Lake (Figure 1). The geology is dominated by sedimentary rocks of the middle Proterozoic Apache Group and the middle Proterozoic diabase that commonly intrudes it (e.g. Bergquist et al., 1981; Wrucke, 1989). Early to middle Proterozoic granitic rocks are exposed beneath the Apache Group, primarily along the southwestern edge of bedrock exposures in the map area. Tertiary conglomerate and local sandstone are deposited on the bedrock and in the flanking Tonto Basin, and have been subjected to only minor faulting and tilting. Upper Cenozoic sedimentary units and geomorphic surfaces were not mapped for this study because they have been mapped previously (Anderson et al., 1987), and bedrock was not mapped in the southern and eastern parts of the quadrangle because this area also had been mapped previously (Bergquist et al., 1981). This map was prepared so that fairly good geologic-map coverage would be available for the entire Greenback Creek 7 ½' Quadrangle.

Map Units

Qyc **Young alluvium in channels (Holocene)**—Deposits of sand, silt, pebbles, cobbles, and boulders in the channels of ephemeral and perennial streams, typically coarse and very poorly sorted.

Qy **Young alluvium (Holocene)**—Deposits of poorly sorted silt, sand, cobbles, and in some areas, boulders, in small active channels, low stream terraces, active alluvial fans, and colluvial deposits that are suspected to have been transported short distances by water. Primarily consists of deposits from small active channels and low terraces along them. Soils are weakly developed and primary fluvial bedforms (gravel bars and finer-grained swales) are commonly preserved (description derived partially from Pearthree et al., 1997).

Qtc **Talus and colluvium (Quaternary)**—Weakly to non-indurated deposits mantling hill slopes on bedrock. Typically consists of 60 to 80%, angular clasts of locally derived rock in a sand and clay matrix, derived by weathering of bedrock and downslope movement of regolith material. Mapped where hill-slope deposits are thick enough to obscure the nature of the underlying bedrock. Nonconformably overlies all older deposits. Locally includes deposits with boulders > 1 m diameter. (Yp) = derivation from map unit Yp, etc.

Qre **Regolith (Quaternary)**—Red-brown soil with abundant pebbles to boulders of underlying bedrock on Horse Range Mesa. Cobble- to boulder-sized clasts of underlying bedrock make up 10 to 50% of unit. Soil is very fine grained and sandy. Sparse outcrops of underlying bedrock are present. Mostly developed on Pioneer Formation. (Yp) = derivation from map unit Yp, etc.

Qdd **Disaggregated diabase (Quaternary)**—Dark red-brown, clay-rich sand formed by disaggregation of diabase on Horse Range Mesa. Sand consists of moderately to strongly clay-altered plagioclase and pyroxene from diabase. Sparse diabase cobbles and boulders are present. This unit is not considered to be regolith because it has been transported small distances down gentle hill slopes.

Qoa **Old Alluvium (Quaternary)**—Cobble and boulder alluvium with red-brown soil developed on surface. Consists of 50-70% cobbles and boulders, mostly locally derived. Matrix is non-indurated to poorly indurated fine sand. Clasts are less than 1 m diameter. Bedrock outcrop is absent. (Yp) = derivation from map unit Yp, etc.

Qls **Landslide deposits (Quaternary)**

QTls **Landslide deposits (Quaternary to late Tertiary)**

Tcg **Conglomerate (Tertiary)**—Massive to poorly bedded cobble to boulder conglomerate with clasts of Pioneer Formation, Dripping Spring Quartzite(?), diabase, granite and, locally near north edge of map area, Mescal Limestone.

In a small basin interpreted as a half graben in the northwestern part of the map area (W½, sec. 22, E½, sec. 21, T. 6 N., R. 11 E.), this unit consists of lenticular-bedded, cobble conglomerate with rounded to subrounded clasts, interbedded with pebbly, granular, white arkosic sandstone. This unit is distinguished from underlying sandstone and mudstone (map unit Tss) by its lack of mudstone and by the reduced argillaceous content of its sandstones and conglomerates. This unit overlies conglomerate and sandstone of map unit Tss along an angular unconformity. Clasts consist of K-feldspar porphyritic granite, Apache Group lithologies (chiefly Pioneer Shale and Dripping Spring Quartzite) and rare basalt. The changes in sedimentary facies from the underlying sandstone and conglomeratic sandstone to this unit probably reflect a change from a restricted, poorly drained or confined basin proximal to the source area of the debris flows to a fluvially dominated environment in a basin with a through-going drainage system.

Tss **Sandstone, silty sandstone, and conglomeratic sandstone (Tertiary)**—Very fine grained white beds in this rock unit could be airfall tuff, but the rock is too fine grained in hand sample to identify phenocrysts (SE¼, NE¼, sec. 27, T. 6 N., R. 11 E.).

In a small basin interpreted as a half graben in the northwestern part of the map area (west half of section 22 and east half of section 21, T. 6 N., R. 11 E.), this unit consists of tan, thin-bedded mudstone or silty mudstone interbedded with ≤30% medium-bedded, fine-grained, arkosic sandstone or medium- to thick-bedded, sub-angular to angular clast, sandy-matrix, debris flows. Measured dips are between 8° and 23° to the west. This unit rests on crystalline basement along a gently west-dipping nonconformity to the east. On the west the basal strata change sharply into massive, poorly exposed, angular- to subangular-clast, boulder diamictite which probably represents mass-flow deposits mantling a steeply east-dipping, degraded footwall scarp bounding the west side of the half graben. On the north, this unit overlaps basement along a moderately south-dipping nonconformity that is mantled locally by carbonate-cemented, bedded, basaltic scoria. A basalt flow (map unit Tb) forms the floor of the basin at its deepest point, in the northwest corner. Clasts consist of K-feldspar porphyritic granite, Apache Group lithologies (chiefly Pioneer Shale and Dripping Spring Quartzite) and basalt. Clasts in the younger unit are similar except that basalt clasts are rare to nonexistent.

Ts **Siltstone, mudstone, marl, and limestone (Tertiary)**—Thin bedded. Exposed only in extreme northwestern corner of map area.

Tb **Basalt (Tertiary)**—Autobrecciated basalt flow and minor, bedded, basaltic scoria.

Yd **Diabase (Middle Proterozoic)**—Dark gray, dark greenish gray, and grayish black sills and dikes with typical sub-ophitic, diabasic texture. Consists of 35-45%, 1-3 mm plagioclase lathes in black groundmass of pyroxene(?); accessory magnetite(?) is common. In central part of thick sill above Horse Mesa (elevation about 4300 feet) there are zones of common plagiogranite or diorite dikes. These range from fine to medium-grained, and are homogranular (this means all grains are approximately the same size; same as "equigranular").

Yds **Dripping Spring Quartzite (Middle Proterozoic)**—Generally orangish brown to reddish brown, medium grained, quartz-rich to K-feldspar rich psammite, locally with fine grained and silty psammite. Basal Barnes conglomerate contains moderately well rounded cobbles and pebbles of chert and quartzite.

Yp **Pioneer Formation (Middle Proterozoic)**—Maroon, maroonish gray, tan, and brown psammite, silty psammite, and sandy phyllite, commonly with a basal conglomerate.

YXg **Granite (early to middle Proterozoic)**—Pink, leucocratic, medium- to coarse-grained, porphyritic, biotite granite. Typically contains abundant 1 to 3 cm diameter K-feldspar in a medium-grained groundmass. Quartz locally forms large (up to 1 cm) phenocrysts. This granite is characteristically unfoliated and free of inclusions or quartz veins. This granite is locally invaded by swarms of northwest-striking aplite dikes (for example SW ¼, sec. 15, T. 6 N., R. 11 E.) and is typically in gradational contact with heterogeneous aplitic granite of map unit YXga. Coarse-grained granite locally contains weak foliation defined by aligned K-feldspar crystals or biotite concentrations. Contains more abundant K-feldspar crystals than aplitic granite and porphyritic aplitic granite of map unit YXga. Resembles granite of Cottonwood Creek exposed in Salt River Canyon, Theodore Roosevelt Dam 7 ½' Quadrangle (Spencer and Richard, 1999).

Above the diabase sill (map unit Yd) in the center of the eastern edge of section 15, much of the granite of this unit is medium-grained, equigranular, non-foliated, and contains: 3-5% biotite; 30-40% of the rock is quartz, 1-2 mm in diameter, that forms an almost connected framework. Granite forms rounded outcrops. Contacts between various granitic phases are gradational to sharp.

A gradational boundary trending northerly in the eastern half of sections 14 and 11 (T. 6 N., R. 11 E.) separates relatively homogeneous medium- to coarse-grained biotite granite from mixed aplitic and texturally variable equigranular granite, but both are included in map unit YXg (contact is represented by dotted line).

YXga **Aplitic granite (early to middle Proterozoic)**—Unfoliated, aplitic granite and sparsely porphyritic aplitic granite. Commonly heterogeneous, either with no phenocrysts or with K-feldspar and quartz phenocrysts of variable abundance and size. Aplite porphyry consists of a fine-grained homogranular to seriate groundmass of quartz and feldspar with rounded, subhedral quartz phenocrysts 3-5 mm in diameter and subhedral to euhedral feldspar phenocrysts up to 1 cm in diameter. Phenocrysts typically form 20-30% of aplite porphyry.

Rocks of this unit commonly form dikes and small irregular bodies that intrude the medium to coarse grained granite of map unit YXg, and may form rounded, ellipsoidal enclaves in coarser-grained granite, as well as dikes. Some non-porphyritic aplite dikes have lenses of quartz-feldspar pegmatite in their core. It appears that aplite and aplitic granite intrudes and forms inclusions in the coarser grained granite, which indicates that the two rocks are coeval. The finer-grained dike rock does not disaggregate as readily as the coarser-grained granite, and pieces of the aplitic rocks dominate the float, making it difficult to estimate the relative abundance of coarser-grained granite and aplitic rocks.

A large body of aplitic, variably foliated, variably K-feldspar porphyritic granite occurs along the mountain front in the northwest (E½, sec. 20, and E½, sec. 17, T. 6 N., R. 11 E.) and is tentatively interpreted as a phase of the older granite (map unit Xg).

Xg **Granite (early Proterozoic)**—Heterogeneous granite that ranges from coarse- to medium-grained K-feldspar porphyritic granite to fine-grained equigranular granite. This granite is cut by northeast-striking tectonic fabric and is intruded by elongate stocks of the younger granite (map unit YXg) that parallel to the structural grain. This could be the same unit that was designated "quartz monzonite" (map units Xgs and Xgo) by Ferguson et al. (1998).

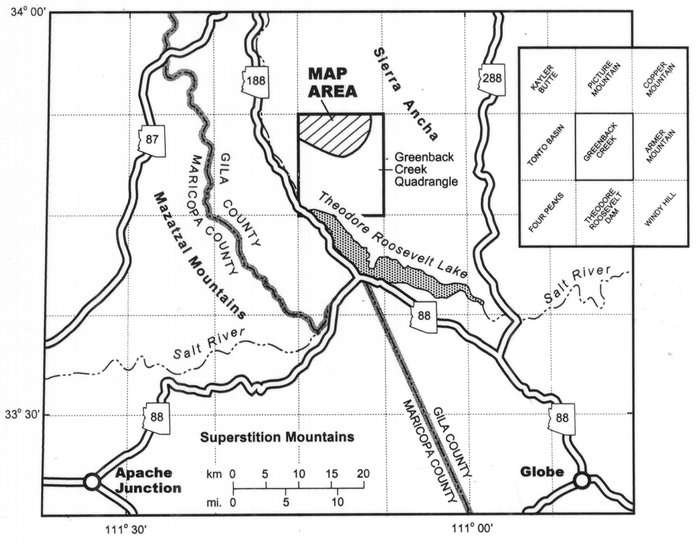

Figure 1. Location of map area.

Mineral Deposits

Mineralization at the Bluebird Mine is associated with foliation-parallel quartz veins and chalky white alteration. Host rock is granite of map unit Xg. Some veins have horizontal fibers growing normal to the vein walls, and others consist of bladed quartz crystals with gossan-filled gaps between the crystals. Faint copper oxide stain is present along some of the veins.

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Map Symbols

***CONTACTS** (dashed where approximately located, dotted where concealed)*

Intrusive or depositional contact

High-angle fault, showing dip, ball on downthrown side

***ATTITUDES** (orientation of planar features)*

Bedding:

Upright

Approximate (upright)

Apparent dip

Foliation:

Non-mylonitic fabric defined by lithologic layering or preferred orientation of crystals (primarily biotite and K-feldspar)

Vertical non-mylonitic fabric defined by lithologic layering or preferred orientation of crystals (primarily biotite and K-feldspar)