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Geologic Map of the Bullwhacker Springs Quadrangle, Nye County, Nevada

by

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ABSTRACT

This 1:24,000-scale geologic map of the Bullwhacker Springs 7.5-minute quadrangle covers part of the central Grant Range in northern Nye County, Nevada. The Grant Range overall consists of Paleozoic sedimentary and metasedimentary strata, a Cretaceous granitic stock, and Tertiary volcanic and subaerial sedimentary rocks. The units exposed in the range were deformed by east-directed thrust faults in Mesozoic time, and by east-directed and west-directed normal faults during Cenozoic time.

The map area consists mostly of Paleozoic sedimentary units, of which the Cambrian units have been metamorphosed. These units have been intruded by a Cretaceous granitic stock, which is mylonitically sheared in its upper portions. Overlying the bedrock units are a series of alluvial deposits, with one small basalt flow intercalated between older and younger alluvial units.

Structurally, the older units have been faulted along low-angle normal faults which are younger than the granite. Most of the surficial units also contain normal faults, related to the opening of Railroad Valley to the west. A Pleistocene lakeshore gravel is preserved in the northern portion of the map.

DESCRIPTION OF MAP UNITS

Qal Alluvium in intermittently active stream channels (Holocene) Cobbles, pebbles, coarse to medium sand. Clast lithologies include granite rocks, limestone, cherty limestone, and dolostone. Thickness ranges up to 2 m.

Qp Ephemeral playa deposits (Holocene) White to very light gray or tan, well-sorted, silt and clay deposits containing minor amount of salic and gypsic minerals. Surfaces commonly marked by distinctive polygonal mudcracks. Estimated thickness 1.0–1.5 m.

Qsp Spring deposits surrounding permanent and intermittent springs and seeps (Holocene) Light to dark gray to greenish-brown clay and fine silt. Commonly water saturated and capable of supporting dense phreatic vegetation. Many deposits occur along fault traces. Estimated thickness 5 m.

Qf_1 Youngest alluvial-fan deposits (Holocene) Pebble- to cobble-sized, moderately well-rounded clasts derived from Cretaceous granitic and lower Paleozoic carbonate rock units. Clasts and their coarse sandy matrix commonly not cemented. Qf_1 units are not offset by the larger range-bounding faults. Estimated thickness 2–6 m.

Qls Pluvial lacustrine sediments (Pleistocene) Most commonly white to medium gray, fine grained, moderately well-sorted fine sand and silt with minor clay. Exposed thickness up to 6.5 m. Comparable sediments from Coal Valley 25 mi (40 km) to the southeast have radiocarbon ages ranging from 20,280 ±140 to 37,220 ± 925 years (Feig, 1998).

Qls_1 Stabilized lacustrine sediments (Pleistocene) Pluvial lacustrine sediments (Qls) but with the surface stabilized by a thin pavement of pebble-size clasts. Incipient in situ soil development. Surface coating protects against deflation except where disturbed. This unit is separated from Unit Qls on the basis of its geomorphic properties rather than its sedimentology or age.

Qlg Pluvial lake gravels (Pleistocene) A single deposit is present in the north-central portion of the map. The shape of the deposit suggests an offshore gravel bar shaped by lake currents into a hooked spit. Orientation of the gravel bar suggests the prevailing shoreline current was from south to north. The gravel bar comprises extremely well-rounded and well-sorted pebble-size clasts of dense, fine-grained

Paleozoic sediments. The lake-gravel deposit is in conjunction with several well-developed pluvial lake shorelines. Well-developed features indicating dynamic lacustrine conditions are not surprising given that Railroad Valley held one of the largest pluvial lakes in east-central Nevada (Mifflin and Wheat, 1979).

Qf_2 Older alluvial-fan deposits (Pleistocene) Cobble-size clasts of Cretaceous granitic and Paleozoic sedimentary rocks in places moderately well cemented. Qf_2 units are thicker than Qf_1 units and in places support a moderately well-developed soil including a reddish "B" horizon. Qf_2 units are also more dissected than Qf_1 units. Thickness ranges up to 10+ m.

Qb Basalt lava (Pleistocene) Basalt lava flows that overlie Qf_3 and are overlapped by Qf_2. Upper portions of flows are vesicular. Eastern portions are pahoehoe in texture. Small bombs litter the ground surface in that area. Contains olivine and kaersutite xenocrysts and peridotite xenoliths.

Qf_3 Oldest alluvial- fan deposits (Pleistocene) These may be late Tertiary in age (?). More thoroughly dissected than Qf_2 deposits. In places clearly cross cut, infilled, and separated by Qf_2 deposits. Lithology is similar to Qf_2 deposits by degree of cementation is somewhat greater. Thickness ranging up to 20 m.

Td Diabase dikes (late Tertiary) Fine-grained diabase with an ophitic texture, and contain plagioclase, clinopyroxene, and chlorite. Fresh surfaces are medium to dark gray and weather to a distinctive khaki color.

Ktg Granite of Troy Canyon (Cretaceous) Medium- to coarse-grained biotite muscovite granite. In places, also contains garnet leucogranite. Dated at 86.4 Ma (Taylor et al., 2000). Most exposures are to the south of this quadrangle in the Troy Canyon area (Fryxell, 1984, 1988). Upper portions of the granite and some of the roof rocks to the pluton are ductilely sheared with well-developed C planes, S planes, and elongation lineations. In all cases, the shear direction indicated is top to the north. Therefore, all lineation arrows are shown pointing in the shear direction, even when that is up-dip on the C plane foliation.

Mc Chainman Shale (Mississippian) Brown-weathering black shale. Forms poor exposures, but the chippy colluvium it forms is distinctive, and the underlying shale can be found by digging.

Mj Joana Limestone (Mississippian) Lower part is thick bedded, medium to coarse grained, light gray crinoidal limestone. Locally contains white to light gray chert, which may weather to a dark surface. Upper part is thin-bedded, dark-gray limestone with silty interbeds. The upper part is fossiliferous, with a varied assemblage. The lower contact in this area is gradational, which is unusual, as in most areas the Pilot Shale is present, and where it is not, it is generally considered to be an unconformity.

Dg Guilmette Formation (Devonian) Thick limestone and dolomite sequence, containing thin silty layers. Lower part is interbedded limestone and dolomite. The dolomite layers strongly resemble the underlying Simonson Dolomite. Chert nodules and stringy layers occur in parts of the formation. The Guilmette Formation typically weathers to a distinctive light gray to yellowish pitted and mottled surface. Karst collapse breccias with coarse sparry white calcite matrix present in places. The lower contact is placed at a yellow sandy zone a few meters thick. In this area, the upper contact with the Joana Limestone is gradational.

Dsi Simonson Dolomite (Devonian) Thick dolomite sequence, divided into three members in this area. The base is identified by the first appearance of medium- to dark-brown, coarse-grained dolomite above the pale gray, very fine-grained dolomite of the Sevy Dolomite. Generally this transition is also marked by stringers and beds of orange-weathering sandy dolomite, but in some places, the sandy layers are found up to a few meters above or below the dolomite transition.

The lower member is an alternating series of light brownish gray fine- to medium-grained dolomite with medium to dark brown striped dolomite. Both are well bedded. They gray layers have fine (mm to cm) laminations, though not as obvious as in the brown layers. Some layers are burrow mottled, but still clearly layered. Above the well-bedded to laminated gray/brown alternating sequence come a more massive light gray to light brown medium- to coarse-grained dolomite. Stromatoporoids occur, and some flat-pebble conglomerate. Some light, finely mottled patches that may be recrystallized spaghetti corals occur, as well.

1998 upper part has "tiger stripe" dolomite—very white anastomosing but mostly bedding-parallel layers of dolomite infilling, exhibiting axial growth to center of fractures on a scale of a few to several mm.

SDu Dark dolomite, brecciated (Silurian and Devonian) Dark brown to black on weathered surfaces, dark gray to dark brown on fresh surfaces, thoroughly brecciated, coarse-grained dolomite. Some fragments contain spaghetti coral fossils.

Oes Ely Springs Formation (Ordovician) Medium brown on weathered surfaces, dark gray on fresh surfaces, medium-grained dolomite with some nodular to bedded chert, which is gray to brown to orangish in color. Chert is in lower part of formation only.

Lower: light to medium gray-brown dolomite with reticulated orange to white silicification. Some faint pinkish cast to weathered surfaces. Some mottled bedding to stripes in shades of brown.

Upper: silicification more intense (Horse Range) with a prominent layer that has more or less completely replaced the carbonate. This layer resembles quartzite—all silica, sparkly, but differs from Eureka in containing a variety of dark colors. Also, it retains a honeycombed texture in places, where holed that used to contain angular breccia fragments are surrounded by a network of silica.

Upper, from 1998: Above silicified zone, a few meters of very dark brown dolomite occur. These have some mottling and some sparry white blobs. The color resembles dark chocolate, but with a grayish cast. Fresh surfaces are grayer; weather surfaces are browner.

Opg Pogonip Group, Goodwin Limestone (Ordovician) Thick bedded, resistant light- to medium-gray limestone. Generally has abundant bedded chert that is dark gray to dark brown.

Ꞓss Sidehill Springs formation (Cambrian) An informal name applied by Cebull (1970) to the sequence of beds between the middle Cambrian Pole Canyon Limestone below and the upper Cambrian Little Meadows Formation above. This interval includes the Lincoln Peak Formation and the Dunderberg Shale. In places, this unit is metamorphosed and highly folded. This unit is thin-bedded limestone with silty partings. Where metamorphosed, thin marble is interlayered with schist layers composed of muscovite, biotite, and some chlorite.

Ꞓpc Pole Canyon Limestone (Cambrian) Middle Cambrian limestone. Lower and members are very dark gray to bluish-black limestone with brown to black siliceous interlayers. Middle member is medium- to light-gray limestone with little to no siliceous material.

Ꞓp Pioche Shale (Cambrian) A heterogeneous formation including mudstone, dark limestone, and various colors of quartzite. The limestone layers strongly resemble the overlying Pole Canyon Limestone, and the quartzite layers strongly resemble the underlying Prospect Mountain Quartzite. Therefore, care must be taken to identify this formation based on position and sequence, as well as on heterogeneity. In the map area, the Pioche Shale is metamorphosed, particularly in proximity to the Troy Granite, to a well-foliated, medium-grained, muscovite, biotite, garnet schist. Staurolite has also been found in exposures near the granite contact.

Ꞓpm Prospect Mountain Quartzite (Cambrian) A minimum of 1000 m thick of dominantly quartzite. The basal layers coarsen to quartz pebble conglomerate, but the bulk of the formation is quartz-rich, silica-cemented arenite. An interval in the upper portion of the unit includes reddish brown to very dark brown silty (or micaceous where metamorphic) quartzite. The upper 10–20 meters is a resistant, vitreous, white, orthoquartzite, with a well-defined upper boundary with the overlying mudstones of the Pioche Shale. Cross-bedding is observed in places within this unit.

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