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**Geologic Map of the Western Half, Fourth of July Mountain Quadrangle,
Southern Nevada**

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This information should be considered preliminary.
It has not been edited or checked for completeness
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Stratigraphy of the Northern Newberry Mountains

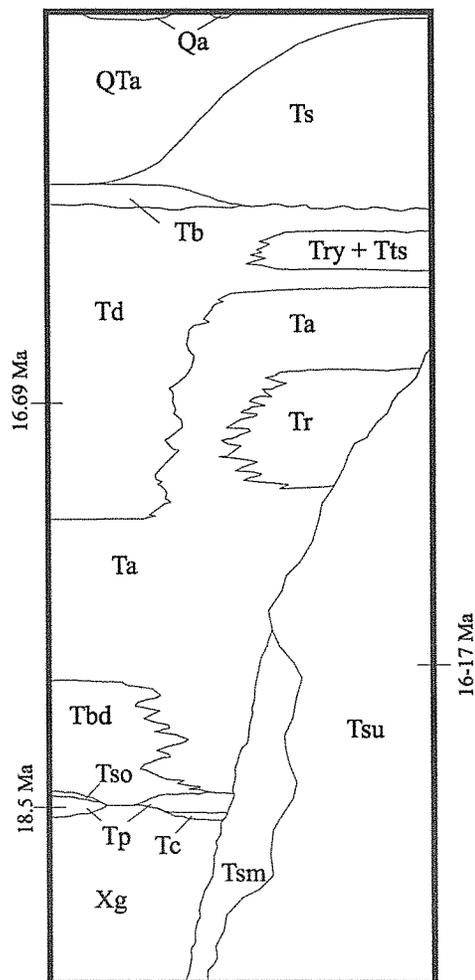
Qa **Alluvium (Holocene)** Tan to gray, poorly sorted, unconsolidated, subangular to subrounded gravel, sand, and silt in recently active washes. Unit is erosionally inset into all older units. Thickness is as much as ~20 m.

QTa **Alluvium (Pleistocene to late Miocene)** Light-brown to gray, poorly indurated to unconsolidated conglomerate; calcite cemented, matrix supported by a moderately sorted, subangular, fine- to coarse-grained sand; matrix constitutes 60-70% of the rock. Subangular to subrounded pebble to cobble size clasts, up to 30 cm in diameter, make up the other 30-40% of the rock. The clasts are locally derived from Miocene lavas and Proterozoic orthogneiss and are moderately sorted. Beds are 1 to 30 cm thick. Maximum thickness is ~500 m.

Ts **Conglomerate (late to middle Miocene)** Brown to gray, poorly to moderately indurated conglomerate. The unit is calcite cemented and matrix supported by a moderately sorted, silt to coarse-grained sand comprising 60-70% of the rock. Subangular to subrounded, pebble to cobble size clasts make up 30-40% of the rock. Clasts are composed of Proterozoic orthogneiss and Miocene andesites, dacites, basalts, and scoria. Beds range in thickness from 2 to 100 cm. This unit accumulated in a developing half graben (i.e., growth-fault basin) in the southeastern part of the map area, as evidenced by a progressive decrease in tilt up-section. Thickness is as much as ~600 m.

Tb **Breccias and basaltic andesite lavas (early to middle Miocene)** Reddish-brown to dark gray, basaltic autobreccias and subordinate basaltic andesite lava and scoria. Clasts in breccia range in size from 5 mm to 50 cm; contains ~10% phenocrysts of plagioclase (andesine), hornblende, olivine, and clinopyroxene. Plagioclase is slightly altered to sericite, whereas the mafic minerals are largely altered to titanomagnetite and hematite. This unit may correlate with the upper member of the Patsy Mine Volcanics or the Mt. Davis Volcanics of Anderson (1971) and Anderson and others (1972). Individual lava flows range in size from 1 to 10 m. The unit crops out only in the southeastern part of the map area. Thickness is as much as ~75 m.

Td **Dacite lavas with interbedded andesite and rhyolite (early Miocene)** Red to purplish-gray, weathering reddish-brown, porphyritic dacite lavas containing ~35-45% phenocrysts composed of 25-40% plagioclase (oligoclase-andesine), 15-40% biotite, 0-30% hornblende, 0-15% quartz, 0-15% titanomagnetite, and 0-10% aegirine augite. Feldspars are partially to mostly altered to sericite and the



Try + Tts Younger rhyolite lavas and tuffaceous sediments that crop out directly west of the map area.

mafic minerals are slightly to highly altered to titanomagnetite and hematite. Secondary quartz and calcite locally form veinlets, ranging in width from .05 mm to 5 mm. This unit is found in both the hanging wall and footwall of the major low-angle normal fault in the southeastern part of the map area. Biotite from a sample collected southwest of Fourth of July Mountain yielded a $16.69 \pm .10$ Ma $^{40}\text{Ar}/^{39}\text{Ar}$ age (Heizler, unpub. data). This unit probably correlates with the volcanics of Dixie Queen Mine of Faulds and others (1995) and Faulds (1995). Overall thickness ranges up to ~900 m.

Ta **Andesite lavas with subordinate rhyolite (early Miocene)** Purplish-gray to brown, weathering dark brown, porphyritic andesite lavas and in the upper part of the unit, subordinate interbedded light gray to light purplish-gray porphyritic rhyolite lavas; most commonly consists of massive conformable lava flows. The andesite lavas contain ~10-35% phenocrysts consisting of plagioclase (oligoclase-andesine), biotite, hornblende, clinopyroxene (augite), and titanomagnetite. Locally, feldspars and mafic minerals are partially to largely altered to sericite and titanomagnetite, respectively. Hornblende is locally altered to chlorite. The rhyolite lavas contain 7-10% phenocrysts composed of 40-50% quartz, 30-35% biotite, and 20-25% plagioclase. The plagioclase is partially to largely altered to sericite. This unit probably correlates with the lower member of the Patsy Mine Volcanics of Anderson (1971) and Anderson and others (1972) and the 18.5 to 15.8 Ma volcanics of Dixie Queen Mine of Faulds and others (1995) and Faulds (1995). Individual flows range in thickness from 1 m to 40 m; overall thickness is as much as ~1,600 m.

Tr **Rhyolite lavas with subordinate andesite and dacite (early to middle Miocene)** Light pink to purplish-gray, weathering rust-brown, porphyritic rhyolite lavas containing ~15-20% phenocrysts of feldspar, biotite, hornblende, and quartz. The rhyolite section is locally interbedded with Ta and Td lavas. Rocks within this unit are hydrothermally altered; feldspar and mafic minerals are mostly altered to sericite and titanomagnetite, respectively. The more resistant rhyolite lavas typically form a series of ridges separated by alluvium-filled valleys. This unit is probably time correlative to the lower member of the Patsy Mine Volcanics of Anderson (1971) and Anderson and others (1972) and the 18.5 to 15.8 Ma volcanics of Dixie Queen Mine of Faulds and others (1995) and Faulds (1995). Thickness is as much as ~850 m.

Tbd **Flow breccias with interbedded andesite lavas (lower Miocene)** Purple to brownish-red volcanic breccia, including both sedimentary and flow breccia, containing 80-90% pebble to cobble size clasts of dacites and andesites consisting of sericitized feldspars, biotite, hornblende, and quartz. Mafic constituents are locally altered to chlorite and titanomagnetite. Near the base of the unit, the breccias contain less matrix and the flows have a rolled, pillow-like appearance. Farther up-section, the matrix becomes more abundant as do lavas of andesite. The transition into the overlying andesite section (Ta) is gradational with the contact marked by the last occurrence of thick volcanic breccias. This unit probably correlates to the lower member of the Patsy Mine Volcanics of Anderson (1971) and Anderson and others (1972) and the 18.5 to 15.8 Ma volcanics of Dixie Queen Mine of Faulds and others (1995) and Faulds (1995). Thickness is as much as ~400 m.

Tso **Sandstone and conglomerate with interbedded tuffaceous sediment (early Miocene)** Pale-red to dark reddish-brown, matrix supported, hematite cemented, fine-grained sandstone to pebble conglomerate. Both the conglomerate and sandstone contain 30-70% clasts of Proterozoic gneiss and Miocene lava. The matrix consists of 40-50% feldspar, 35-45% quartz, 5-15% biotite, and 5-10% titanomagnetite. The feldspars and biotite are largely altered to sericite and chlorite, respectively; secondary calcite is locally present. The unit is locally interbedded with light blue-gray, weathering to dark gray, matrix supported, tuffaceous sediment consisting of 85-90% very fine to fine grains composed of 50-60% feldspar, 35-45% quartz, and minor biotite and titanomagnetite. The feldspars and biotite are generally altered to sericite and chlorite, respectively. This unit is restricted to the area directly south of the transverse fault near Tip Top well in the southwestern part of the map area. Individual beds range in thickness from 1-30 cm; overall thickness is as much as ~35 m.

Tp **Peach Springs Tuff (early Miocene)** Pale purple, weathering orangish-brown, moderately welded, rhyolitic ash-flow tuff containing ~10-20% phenocrysts, composed of 80-90% feldspar (andesine and sanidine), 10% biotite, and minor quartz, zircon, and sphene. Feldspars are commonly largely altered to sericite, whereas the mafic constituents are largely altered to titanomagnetite. This unit correlates with 18.5 Ma Peach Springs Tuff (cf., Glazner and others, 1986; Nielson and others, 1990; Faulds and others, 1995), as evidenced by stratigraphic position, lithology, and phenocryst composition. The tuff is a

prominent ridge former but locally pinches out in the southern part of the map area. Thickness is as much as ~75 m.

Tc **Conglomerate (early Miocene)** Reddish-brown, poorly sorted, pebble to cobble, pre-volcanic arkosic conglomerate. This unit is calcite cemented and matrix supported, consisting of 50-60% angular to subangular clasts of Proterozoic orthogneiss and large feldspar grains derived from early Proterozoic granite and gneiss. The matrix is a poorly sorted silt to subangular medium-grained sandstone and comprises 40-50% of the rock. The conglomerate is thickest directly south of the transverse fault near Tip Top Well and is absent in many areas. This unit correlates with the ~20 Ma conglomerate of Cottonwood Pass of Faulds (1995). Thickness is as much as ~10 m.

Xg **Orthogneiss (Early Proterozoic)** Olive-green, weathering to dark brown, quartzo-feldspathic orthogneiss containing 30% quartz, 25% potassium-feldspar (microcline), 20% plagioclase (oligoclase-andesine), 15% biotite, 10% titanomagnetite, and accessory epidote, zircon, garnet (almandite), and hornblende. The feldspars and biotite are locally altered to sericite and chlorite, respectively; hornblende is largely altered to actinolite. Maximum exposed thickness is as much as ~3 km.

INTRUSIVE ROCKS

Tri **Rhyolite dikes (early to middle Miocene)** Light-gray to purplish-gray, weathering to brownish-gray, porphyritic rhyolite dikes containing ~7-30% phenocrysts of quartz, plagioclase, biotite, sanidine, and hornblende. The feldspars are mostly altered to sericite; mafic minerals are partially to totally altered to titanomagnetite and chlorite. Secondary calcite is present locally. Some dikes contain spherulites. The rhyolite dikes generally strike east-northeast in the central part of the map area; a few north-striking rhyolite dikes are present in the northwest part of the map area. Biotite from a sample collected from a north-striking dike in the Eldorado mountains north of the map area yielded a $15.84 \pm .12$ Ma $^{40}\text{Ar}/^{39}\text{Ar}$ age (Heizler, unpub. data).

Tai **Andesite dikes (early Miocene)** Light-green to gray, weathering dark brown, porphyritic andesite dikes containing ~30-40% phenocrysts of plagioclase, biotite, clinopyroxene (augite), and \pm hornblende. Feldspar is mostly altered to sericite; biotite and hornblende are partially to totally altered to titanomagnetite and hematite. The andesite dikes strike approximately north and dip gently to the east. Some Tai intrusions may be cogenitic with the Searchlight pluton (Tsu).

Tbi **Basaltic andesite dikes (early to middle Miocene)** Reddish-brown to dark gray, weathering to dark brown, basaltic dikes containing ~5-10% phenocrysts of plagioclase, clinopyroxene (augite), \pm biotite, and \pm hornblende. Plagioclase is locally altered to sericite; biotite and hornblende are partially to mostly altered to hematite and titanomagnetite.

Tsm **Searchlight pluton—fine-grained marginal facies (early to middle Miocene)** Light gray, quartz monzonite porphyry containing ~60% phenocrysts composed of 40% potassium-feldspar (microcline), 35% plagioclase (oligoclase), 15% biotite, and 10% titanomagnetite. Feldspars and biotite are partially altered to sericite and chlorite, respectively. Groundmass consists of feldspars (mostly altered to sericite), quartz, and lesser biotite and titanomagnetite. Small stoped blocks of Miocene volcanic strata, Cretaceous two-mica granite, and Proterozoic gneiss are locally engulfed by, and included within, Tsm. The large intrusion of Tai in section 17, T29S, R64E, is possibly a more fine-grained groundmass component of the quartz monzonite porphyry. Thickness is as much as ~800 m.

Tsu **Searchlight pluton (early to middle Miocene)** Light gray, medium- to coarse-grained, quartz monzonite that consists of 30-35% potassium-feldspar (microcline), 25% plagioclase (oligoclase), 15% quartz, 10% biotite, 5% titanomagnetite, hornblende, and accessory clinopyroxene (augite) and sphene. The intrusion becomes more mafic in the northeast part of the map area, where hornblende locally makes up as much as 15% of the rock. Elsewhere in the map area, hornblende is generally found in only trace amounts. Locally, feldspars and biotite are partially altered to sericite and chlorite, respectively. The rock weathers to large rounded boulders. The age of the pluton is constrained between 16 and 17 Ma by $^{40}\text{Ar}/^{39}\text{Ar}$ ages on biotite and hornblende (Faulds, 1995; Heizler, unpub. data). Paleomagnetic data indicate that the pluton is tilted at least 50° to the west. Overall thickness is estimated between ~10 and 15 km.

SYMBOLS

-  Approximately located contact
-  56 Approximately located fault showing dip; bar and ball on downthrown side; dotted where concealed
-  Strike and dip of inclined bedding
-  Strike and dip of overturned bedding
-  Strike and dip of foliation in metamorphic and volcanic rocks
-  Sample locality for geochronologic age determination
-  Paleomagnetic site locality

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Sample	Latitude North	Longitude West	West Tilt	Lithology	Material Dated	Apparent Age (Ma)
A(JF98-197)	35°26'31"	114°53'11"	20-25°	non-welded tuff	biotite	15.85±0.12
B(JF98-195)	35°26'11"	114°53'10"	70°	rhyolite lava	sanidine	16.10±0.07
C(JF97-89)	35°26'50"	114°52'14"	80°	dacite lava	biotite	16.69±0.10
D(JF98-193)	35°26'03"	114°51'34"	90°	andesite lava	whole-rock	17.29±0.35
E(JF98-185)	35°24'52"	114°51'47"	90°	dacite lava	biotite	18.57±0.05
F(JF98-186)	35°23'56"	114°49'09"	50°	basaltic andesite lava	whole-rock	17.00±0.11
G(IR3)	35°32'05"	114°49'21"	55°	N-S rhyolite dike	biotite	15.84±0.12
H(NNV-2)	35°25'50"	114°50'55"	--	E-W rhyolite dike	K-spar	15.44±0.20
I(SL-73)	35°28'28"	114°49'30"	>55°	upper Searchlight pluton	biotite	16.33±0.06
J(SL-101)	35°28'08"	114°49'21"	>55°	upper Searchlight pluton	biotite	16.69±0.09

Table 1. $^{40}\text{Ar}/^{39}\text{Ar}$ data for the northern Newberry and southern Eldorado Mountains, Nevada, from the geochronologic laboratory at the New Mexico Bureau of Mines (M. Heizler, personal communication, 1998). See map for sample locations C through F and H through J; samples A, B, and G were obtained from outside the map area. Samples A and B were obtained directly west of the central part of the map area, whereas sample G was taken from a north-northeast striking dike (N20°E, 35°SE) ~4 km north of the map area.