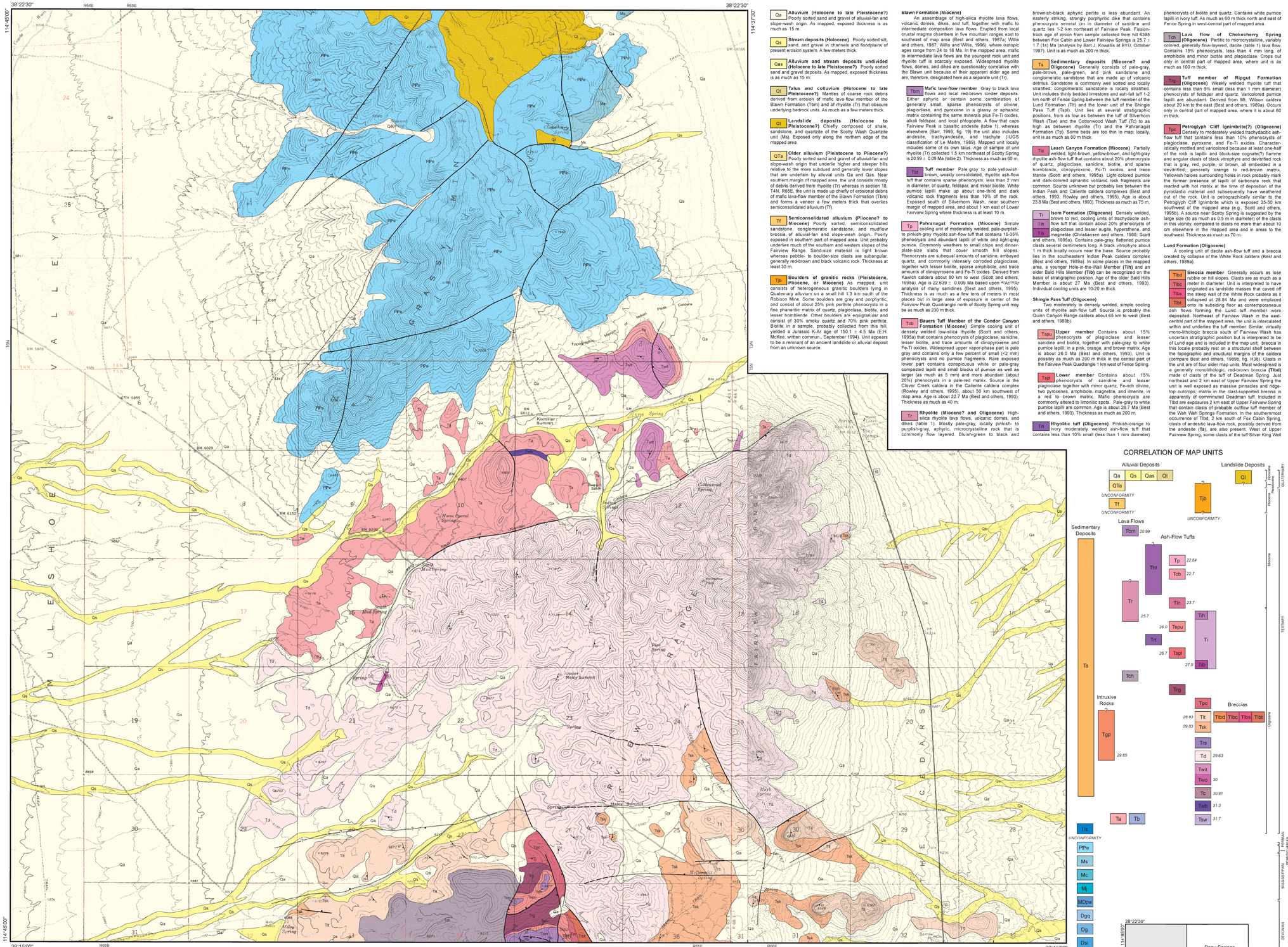


Scale 1:24,000

0 0.5 1 kilometer

0 0.5 1 mile

0 1000 2000 3000 4000 5000 feet

CONTOUR INTERVAL 40 FEET Grassy Mountain
CONTOUR INTERVAL 10 FEET Pony Springs

Base map: U.S. Geological Survey Grassy Mountain 7.5' Quadrangle, 1973 and Pony Springs 7.5' Quadrangle, 1973.

GEOLOGIC MAP OF THE FAIRVIEW RANGE AND GRASSY MOUNTAIN, LINCOLN COUNTY, NEVADA

Myron G. Best, Lehi F. Hintze, Alan L. Deino, and Larissa L. Maughan

1998

Qa **Alluvium (Holocene to late Pleistocene?)** Poorly sorted sand and gravel of alluvial-fan and slope-wash origin. As mapped, exposed thickness is as much as 15 m.

Qs **Stream deposits (Holocene)** Poorly sorted silt, sand, and gravel in channels and floodplains of present erosion system. A few meters thick.

Qas **Alluvium and stream deposits undivided (Holocene to late Pleistocene?)** Poorly sorted sand and gravel deposits. As mapped, exposed thickness is as much as 15 m.

Qt **Talus and colluvium (Holocene to late Pleistocene?)** Mantles of coarse rock debris derived from cliffs of mafic lava-flow member of the Blawn Formation (Tbm) and of rhyolite (Tr) that obscure underlying bedrock units. As much as a few meters thick.

Ql **Landslide deposits (Holocene to Pliocene?)** Chiefly composed of shale, sandstone, and quartzite of the Scotty Wash Quartzite unit (Ms). Exposed only along the northern edge of the mapped area.

QTa **Older alluvium (Pleistocene to Pliocene?)** Poorly sorted sand and gravel of alluvial-fan and slope-wash origin that underlie higher and steeper hills relative to the more subdued and generally lower slopes that are underlain by alluvial units Qa and Qas. Near southern margin of mapped area, the unit consists mostly of debris derived from rhyolite (Tr) whereas in section 19, T4N, R65E, the unit is made up chiefly of erosional debris of mafic lava-flow member of the Blawn Formation (Tbm) and forms a veneer a few meters thick that overlies semiconsolidated alluvium (Tf).

Tf **Semiconsolidated alluvium (Pliocene? to Miocene)** Poorly sorted, semiconsolidated sandstone, conglomeratic sandstone, and mudflow breccia of alluvial-fan and slope-wash origin. Poorly exposed in southern part of mapped area. Unit probably underlies much of the southern and western slopes of the Fairview Range. Sand-size material is light brown whereas pebble- to boulder-size clasts are subangular, generally red-brown and black volcanic rock. Thickness at least 30 m.

Tjb **Boulders of granitic rocks (Pleistocene, Pliocene, or Miocene)** As mapped, unit consists of heterogeneous granitic boulders lying in Quaternary alluvium on a small hill 1.3 km south of the Robison Mine. Some boulders are gray and porphyritic, and consist of about 25% pink perthitic phenocrysts in a fine phaneritic matrix of quartz, plagioclase, biotite, and lesser hornblende. Other boulders are equigranular and consist of 30% smoky quartz and 70% pink perthite. Biotite in a sample, probably collected from this hill, yielded a Jurassic K-Ar age of 150.1 ± 4.5 Ma (E.H. McKee, written commun., September 1994). Unit appears to be a remnant of an ancient landslide or alluvial deposit from an unknown source.

Blawn Formation (Miocene)

An assemblage of high-silica rhyolite lava flows, volcanic domes, dikes, and tuff, together with mafic to intermediate composition lava flows. Erupted from local crustal magma chambers in five mountain ranges east to southeast of map area (Best and others, 1987a; Willis and others, 1987; Willis and Willis, 1996), where isotopic ages range from 24 to 18 Ma. In the mapped area, mafic to intermediate lava flows are the youngest rock unit and rhyolite tuff is scarcely exposed. Widespread rhyolite flows, domes, and dikes are questionably correlative with the Blawn unit because of their apparent older age and are, therefore, designated here as a separate unit (Tr).

Tbm **Mafic lava-flow member** Gray to black lava flows and local red-brown cinder deposits. Either aphyric or sparsely phyric with some combination of generally small, sparse phenocrysts of olivine, plagioclase, and pyroxene in a glassy or aphanitic matrix containing the same minerals plus Fe-Ti oxides, alkali feldspar, and local phlogopite. A flow that caps Fairview Peak is basaltic andesite (table 1), whereas elsewhere (Barr, 1993, fig. 19) the unit also includes andesite, trachyandesite, and trachyte (IUGS classification of Le Maitre, 1989). Mapped unit locally includes some of its own talus. Age of sample of unit rhyolite (Tr) collected 1.5 km northeast of Scotty Spring is 20.99 ± 0.09 Ma (table 2). Thickness as much as 60 m.

Tbt **Tuff member** Pale-gray to pale yellowish-brown, weakly consolidated, rhyolitic ash-flow tuff that contains sparse phenocrysts, less than 2 mm in diameter, of quartz, alkali feldspar, and minor biotite. White pumice lapilli make up about one-third and dark volcanic rock fragments less than 10% of the rock. Exposed south of Silverhorn Wash, near southern margin of mapped area, and about 1 km east of Lower Fairview Spring where thickness is at least 10 m.

Tp **Pahranagat Formation (Miocene)** Simple cooling unit of moderately welded, pale-purplish- to pinkish-gray rhyolite ash-flow tuff that contains 15-35% phenocrysts and abundant lapilli of white and light-gray pumice. Commonly weathers to small chips and dinner-plate-size slabs that cover smooth hill slopes. Phenocrysts are subequal amounts of sanidine, embayed quartz, and commonly corroded plagioclase, together with lesser biotite, sparse amphibole, and trace amounts of clinopyroxene and Fe-Ti oxides. Derived from Kawich caldera about 80 km to west (Scott and others, 1995a). Age is 22.639 ± 0.009 Ma based upon $^{40}Ar/^{39}Ar$ analysis of many sanidines (Best and others, 1995). Thickness is as much as a few tens of meters in most places but in large area of exposure in center of the Fairview Peak Quadrangle north of Scotty Spring unit may be as much as 200 m thick.

Tcb **Bauers Tuff Member of the Condor Canyon Formation (Miocene)** Simple cooling unit of densely welded low-silica rhyolite (Scott and others, 1995a) that contains phenocrysts of plagioclase, sanidine, lesser biotite, and trace amounts of clinopyroxene and Fe-Ti oxides. Widespread upper vapor-phase part is pale gray and contains only a few percent of small (<2 mm) phenocrysts and no pumice fragments. Rare exposed lower part contains conspicuous white or pale-gray compacted lapilli and small blocks of pumice as well as larger (as much as 5 mm) and more abundant (about 20%) phenocrysts in a pale-red matrix. Source is the Clover Creek caldera in the Caliente caldera complex (Rowley and others, 1995), about 50 km southwest of map area. Age is about 22.7 Ma (Best and others, 1993). Thickness as much as 40 m.

Tr **Rhyolite (Miocene? and Oligocene)** High-silica rhyolite lava flows, volcanic domes, and dikes (table 1). Mostly pale-gray, locally pinkish- to purplish-gray, aphyric, microcrystalline rock that is commonly flow layered. Bluish-green to black and brownish-black aphyric perlite is less abundant. An easterly striking, strongly porphyritic dike that contains phenocrysts several cm in diameter of sanidine and quartz lies 1-2 km northeast of Fairview Peak. Fission-track age of zircon from sample collected from hill 6385 between Fox Cabin and Lower Fairview Springs is 25.7 ± 1.7 (1s) Ma (analysis by Bart J. Kowallis at BYU, October 1997). Unit is as much as 200 m thick.

Ts **Sedimentary deposits (Miocene? and Oligocene)** Generally consists of pale-gray, pale-brown, and pink, poorly sorted, sandstone and conglomeratic sandstone that are made up of volcanic detritus. Sandstone is commonly well sorted and locally stratified; conglomeratic sandstone is locally stratified. Unit includes thinly bedded limestone and ash-fall tuff 1-2 km north of Oak Spring between the tuff member of the Lund Formation (Tlt) and the lower unit of the Shingle Pass Tuff (Tspl). Unit lies at several stratigraphic positions, from as low as between the tuff of Silverhorn Wash (Tsw) and the Cottonwood Wash Tuff (Tc) to as high as between rhyolite (Tr) and the Pahranagat Formation (Tp). Some beds are too thin to map; locally, unit is as much as 80 m thick.

Tlc **Leach Canyon Formation (Miocene)** Partially welded, light-brown, yellow-brown, and light-gray rhyolite ash-flow tuff that contains about 20% phenocrysts of quartz, plagioclase, sanidine, biotite, and sparse hornblende, clinopyroxene, Fe-Ti oxides, and trace titanite (Scott and others, 1995a). Light-colored pumice and dark-colored aphanitic volcanic rock fragments are common. Source unknown but probably lies between the Indian Peak and Caliente caldera complexes (Best and others, 1993; Rowley and others, 1995). Age is about 23.8 Ma (Best and others, 1993). Thickness as much as 75 m.

Ti **Isom Formation (Oligocene)** Densely welded, brown to red, cooling units of trachydacite ash-flow tuff that contain about 20% phenocrysts of plagioclase and lesser augite, hypersthene, and magnetite (Christiansen and others, 1986; Scott and others, 1995a). Contains pale-gray, flattened pumice clasts several centimeters long. A black vitrophyre a few m thick locally occurs near the base. Source probably lies in the southeastern Indian Peak caldera complex (Best and others, 1989a). In some places in the mapped area, a younger, Hole-in-the-Wall Member **(Tih)** and an older Bald Hills Member **(Tib)** can be recognized on the basis of stratigraphic position. Age of the older Bald Hills Member is about 28.4 Ma (Best and others, 1993). Individual cooling units are 10-20 m thick.

Shingle Pass Tuff (Oligocene)

Two moderately to densely welded, simple cooling units of rhyolite ash-flow tuff. Source is probably the Quinn Canyon Range caldera about 65 km to west (Best and others, 1989b).

Tspu **Upper member** Contains about 15% phenocrysts of plagioclase and lesser sanidine and biotite, together with pale-gray to white pumice lapilli, in a pink, orange, and brown matrix. Age is about 26.0 Ma (Best and others, 1993). Unit is possibly as much as 200 m thick in the central part of the Fairview Peak Quadrangle's km-west of Fence Spring.

Tspl **Lower member** Contains about 15% phenocrysts of sanidine and lesser plagioclase together with minor quartz, Fe-rich olivine, two pyroxenes, amphibole, magnetite, and ilmenite, in a red to brown matrix. Mafic phenocrysts are commonly altered to limonitic spots. Pale-gray to white pumice lapilli are common. Age is about 26.7 Ma (Best and others, 1993). Thickness as much as 200 m.

Trt **Rhyolitic tuff (Oligocene)** Pinkish-orange to ivory moderately welded ash-flow tuff that contains less than 10% small (less than 1 mm diameter) phenocrysts of biotite and quartz. Contains white pumice lapilli in ivory tuff. As much as 60 m thick north and east of Fence Spring in west-central part of mapped area.

Tch **Lava flow of Chokecherry Spring (Oligocene)** Peritic to microcrystalline, variably colored, generally flow-layered, dacite (table 1) lava flow. Contains 15% phenocrysts, less than 4 mm long, of amphibole and minor biotite and plagioclase. Crops out only in central part of mapped area, where unit is as much as 100 m thick.

Tfs **Tuff member of Ripgut Formation (Oligocene)** Weakly welded rhyolite tuff that contains less than 5% small (less than 1 mm diameter) phenocrysts of feldspar and quartz. Varicolored pumice lapilli are abundant. Derived from Mt. Wilson caldera about 20 km to the east (Best and others, 1989a). Occurs only in central part of mapped area, where it is about 60 m thick.

Tpc **Petroglyph Cliff Ignimbrite(?) (Oligocene)** Densely to moderately welded trachydacitic ash-flow tuff that contains less than 10% phenocrysts of plagioclase, pyroxene, and Fe-Ti oxides. Characteristically mottled and varicolored because at least one-half of the rock is lapilli- and block-size cognate(?) fiamme and angular clasts of black vitrophyre and devitrified rock that is gray, red, purple, or brown, all embedded in a devitrified, generally orange to red-brown matrix. Yellowish haloes surrounding holes in rock probably mark the former presence of lapilli of carbonate rock that reacted with hot matrix at the time of deposition of the pyroclastic material and subsequently have weathered out of the rock. Unit is petrographically similar to the Petroglyph Cliff Ignimbrite which is exposed 25-50 km southwest of the mapped area (e.g., Scott and others, 1995b). A source near Scotty Spring is suggested by the large size (to as much as 0.5 m in diameter) of the clasts in this vicinity compared to clasts no more than about 10 cm elsewhere in the mapped area and in areas to the southwest. Thickness as much as 70 m.

Lund Formation (Oligocene)

A cooling unit of dacite ash-flow tuff and a breccia created by collapse of the White Rock caldera (Best and others, 1989a).

Tlbd **Tlbc** **Tlbs** **Tlbt** **Breccia member** Generally occurs as lose rubble on hill slopes. Clasts are as much as a meter in diameter. Unit is interpreted to have originated as landslide masses that caved off the steep wall of the White Rock caldera as it collapsed at 28.84 Ma and were emplaced into its subsiding floor as contemporaneous ash flows forming the Lund tuff member were deposited. Northeast of Fairview Wash in the east-central part of the mapped area, the unit is interstratified within and underlies the tuff member. Similar, virtually mono-lithologic breccia south of Fairview Wash has uncertain stratigraphic position but is interpreted to be of Lund age and is included in the map unit; breccia in this locale probably rest on a structural shelf between the topographic and structural margins of the caldera (compare Best and others, 1989b, fig. K38). Clasts in the unit are of four older map units. Most widespread is a generally monolithologic, red-brown breccia **(Tlbd)** made of clasts of the tuff of Deadman Spring. Just northeast and 2 km east of Upper Fairview Spring the unit is well exposed as massive pinnacles and ridge-top outcrops; matrix in the clast-supported breccia is apparently of comminuted Deadman tuff. Included in Tlbd are exposures 2 km east of Upper Fairview Spring that contain clasts of probable outflow tuff member of the Wah Wah Springs Formation. In the southernmost occurrence of Tlbd, 2 km south of Fox Cabin Spring, clasts of andesitic lava-flow rock, possibly derived from the andesite **(Ta)**, are also present. West of Upper Fairview Spring, some clasts of the tuff of Silver King Well are included with the dominant Deadman tuff fragments. A second more or less monolithologic breccia **(Tlbc)** consists of clasts of Cottonwood Wash Tuff and is found as rubble on a hill slope 0.5 km north of Fox Cabin Spring. Clasts, which are to as much as 15 cm in diameter, are commonly bounded by sickensides. A third monolithologic breccia **(Tlbs)** is made of clasts of Scotty Wash Quartzite and occurs as intensely Fe- and Mn-stained rubble on a hill slope 0.5 km north of Fox Cabin Spring. The fourth type of breccia **(Tlbt)** is composed of clasts of the tuff of Silver King Well and is exposed 2-3 km south of Meloy Summit, 1.5 km north of Fairview Peak, and 1.5-2.5 km north of Bailey Spring. In this latter area, the unit consists of chaotic blocks of the tuff of Silver King Well and the tuff of Deadman Spring that have been subject to slight argillic alteration and pervasive shearing and cataclasis. Outcrops are sparse but hill slopes in this kilometer-square area are littered with abundant angular chunks of rock bounded by one or more slickensided surfaces. Unit is as much as 100 m thick.

Tlt **Tuff member** Pale-brown, gray, and red-brown moderately to densely welded, dacite ash-flow tuff. A densely welded, black vitrophyre a few meters thick is prominent near the base of the unit east of Meloy Summit where it rests on the tuff of Silver King Well. Light-gray flattened pumice lapilli are locally conspicuous but in many places the tuff is massive, free of pumice lapilli, and lacks obvious compaction foliation. As much as 55% of tuff consists of phenocrysts, mostly plagioclase, but including lesser amounts of quartz, hornblende, biotite, Fe-Ti oxides, sanidine, and titanite. Compared to the similar underlying tuff of Silver King Well, the Lund tuff member has a greater concentration of generally larger biotite and hornblende phenocrysts and the latter is conspicuous in hand sample. Modal analyses of thin sections disclose hornblende/biotite ratios > 0.5 in the Lund tuff, compared to ratios < 0.5 in the tuff of Silver King Well (Maughan, 1996). The Lund tuff member is normally magnetized (C.S. GrommÉ, written commun., 1993). Laser-fusion analysis of sanidines gives an $^{40}Ar/^{39}Ar$ age of 28.84 Ma (A.L. Deino, written commun., 1997). Unit in northeastern part of Fairview Peak quadrangle appears to be at least a kilometer thick.

Tsk **Tuff of Silver King Well (Oligocene)** Generally light-gray to white, moderately to densely welded, dacite ash-flow tuff. A densely welded, black vitrophyre a few meters thick is prominent near the base of the unit east of Frying Pan Spring where it rests on the tuff of Deadman Spring. Slightly flattened pumice lapilli are generally conspicuous. 28-48% of tuff consists of phenocrysts, mostly plagioclase, but including lesser amounts of quartz, biotite, sanidine, hornblende, Fe-Ti oxides, and titanite. Hornblende phenocrysts are inconspicuous in hand sample. Several minute yellow titanites are commonly obvious in a hand sample. In many places where it directly underlies the Lund tuff, the units is brecciated and cataclastic. The unit is reversely magnetized (C.S. GrommÉ, written commun., 1993). Laser-fusion analysis of sanidines gives an $^{40}Ar/^{39}Ar$ age of 29.03 Ma (A.L. Deino, written commun., 1997). As much as 600 m thick.

Tts **Tuff member of Ryan Spring Formation (Oligocene)** Low-silica rhyolite tuff that contains less than 15% phenocrysts of plagioclase and minor biotite. Exposures of the unit 1 km south-southwest and 4 km south of Bailey Spring and 1.5 km north-northeast of Upper Fairview Spring have abundant white pumice lapilli and minor amounts of small (<2 cm), dark volcanic fragments embedded in a yellow-brown matrix. The unit in the wash 1 km south of Robison Spring is a mottled black and brown vitrophyre which, though poorly exposed, appears to underlie vitrophyre of the tuff member of the Lund Formation and overlie sedimentary deposits (Ts) that cap the tuff of Deadman Spring. No more than 30 m thick.

Td **Tuff of Deadman Spring (Oligocene)** Densely welded, generally red, but also brown and gray, compound cooling unit of rhyolite ash-flow tuff. About one-third of the rock is made of phenocrysts, chiefly sanidine and slightly less, but subequal amounts of plagioclase and quartz and no more than a few percent biotite. Compaction foliation is only locally evident because of the small amount of biotite and general absence of pumice clasts. In most places the unit resembles a lava flow; this similarity is even greater just west of Meloy Summit where outcrops have a well-developed, closely spaced set of joints not unlike lava flows. Outcrops of sheared, cataclastic rock are widespread. In the northeastern part of the Fairview Peak Quadrangle, some outcrops are crudely layered and consist of layers that contains small (<1 mm) phenocrysts alternating with layers that contain larger phenocrysts. Age is 29.63 ± 0.05 Ma (table 2). Unit is named for exposures in the Deadman Spring Quadrangle about 25 km to the southwest where it is an outflow sheet less than 100 m thick (Scott and others, 1995b). The unit is at least 380 m thick in the southwestern corner of the mapped area, where it is outflow, but is thicker northward, about 1 km, in the northeastern corner of the Fairview Peak Quadrangle, to an apparent thickness of 2 km in the Grassy Mtn. Quadrangle; here obscure faults may have repeated parts of the featureless unit. Thicker sections represent accumulation within the source caldera of the unit (see discussion of calderas in accompanying text).

Ta **Andesitic lava flows (Oligocene)** Generally poorly exposed, variably propylitically altered, gray, greenish-gray, pink, brown, and red-brown, commonly flow-layered, aphanitic lava flows. Locally black perlitic vitrophyre. Contain abundant phenocrysts of plagioclase and some combination of lesser biotite, pyroxene, and amphibole. Exposed 1-2 km east of Silverhorn Mine, where unit is as much as 300 m thick and in the topographically low area between the Fairview Range and Grassy Mountain where the thickness is unknown.

Tb **Rhyolite lava flow of Bailey Spring (Oligocene)** Massive, nonvesicular, gray-green aphanitic rock that breaks along randomly oriented fractures to form a gravelly rubble on hill slopes. Altered and commonly clotted phenocrysts of plagioclase make up about 15% of rock. Altered and unidentifiable mafic phenocrysts are less abundant. Unit is a low-silica rhyolite (table 1) that petrographically resembles an unanalyzed older "andesite" unit that underlies the Escalante Desert Formation in the Wah Wah Mountains east of the Indian Peak caldera complex (Abbott and others, 1983). Unit is exposed in a small area in the southeastern corner of the mapped area and more extensively in the western part around Bailey Spring where the unit is at least 30 m thick.

Tsw **Tuff of Silverhorn Wash (Oligocene)** Pale-gray to moderately to densely welded ash-flow tuff that contains about 40% phenocrysts of (in decreasing order of abundance) plagioclase, quartz, biotite, sanidine, hornblende, and Fe-Ti oxides. White pumice lapilli are common. Unit name is from Taylor and others (1994) who reported $^{40}Ar/^{39}Ar$ incremental release ages on sanidine and biotite from a sample collected in the southern part of the mapped area; their preferred age is 31.7 Ma. Thickness less than 40 m.

Tls **Limestone (Oligocene)** Pale-brown to pale-gray, thinly bedded limestone of probable lacustrine origin. Exposed only in a small area in the southeastern corner of mapped area, where it is at least 20 m thick.

PPe **Ely Limestone (Permian and Pennsylvanian)** Fine- to medium-grained, medium-gray, thin- to thick-bedded, commonly cherty, locally bioclastic limestone that characteristically forms ledge-slope topography. The slopes represent argillaceous and thin-bedded shaly limestone beds that seldom crop out. Westgate and Knopf (1932) reported the formation to be about 700 m thick near Bailey Spring, where the most complete exposures of the formation in the Fairview Peak Quadrangle are found, but Brill (1953) reported it to be only 400 m thick at the same location. The formation was originally called Bailey Spring Limestone by Westgate and Knopf (1932), but geologists working in this part of the Great Basin have stopped using this term, which has been superseded by regional usage of the term Ely Limestone. Westgate and Knopf (1932) reported that the formation may include some Mississippian strata in its basal few meters. In the southeastern part of Grassy Mountain the upper 200 m or so of Nil 1963 is limestone of Permian age (Wolfcamp) that is identical to the underlying Ely (Ischana and Pampean, 1910) and is here included in the unit. At Grassy Mountain, more than 1 km of Pennsylvanian and lower Permian strata are exposed.

Ms **Scotty Wash Quartzite (Mississippian)** Interbedded, dark-reddish-brown shale and light- to medium-gray fine-grained quartzose sandstone which is slightly calcareous except for the basal 15 m of the unit which is a pale purplish-brown orthoquartzite. Named by Westgate and Knopf (1932). Sadlick (1965) measured the unit at its type area near Scotty Spring, in the southern part of the Fairview Peak Quadrangle, and reported it to be 150 m thick, of which 66 m is sandstone and the remainder reddish-brown shale. Sadlick (1965) regarded the Scotty Wash as the upper member of the Chainman Formation in the mapped area. Contacts with map units above and below the Scotty Wash appear to be conformable and show minor interfingering of lithologies.

Mc **Chainman Formation (Mississippian)** Strata mapped by Westgate and Knopf (1932) as the Peers Spring Formation are here reassigned to the Chainman Formation on the basis of current usage. Near Peers Spring, these rocks are almost entirely yellowish- to pinkish-gray, strongly bioturbated calcareous siltstone with uneven bedding. Minor interbeds include dense, dark-gray thin-bedded siliceous limestone. The unit in the Fairview Peak Quadrangle probably represents the lower part of the Chainman Formation which was called the Needles Siltstone Member by Sadlick (1965). Westgate and Knopf's (1932) estimate of 760 m for the thickness of the unit near Peers Spring should be disregarded because of structural complications and poor exposures. Just beyond the northern margin of the map area, the unit is better exposed and was reported by Poole and Claypool (1984) to be about 160 m thick.

Mj **Joana Limestone (Mississippian)** Medium-gray, medium- to coarse-grained massive limestone which commonly shows crinoidal debris and solitary and colonial corals on weathered surfaces. The basal 6 m is thin-bedded and commonly concealed by colluvium. Unit gives off a petrolleroeus or foetid odor when struck with a hammer. The most complete exposure of the Joana in the mapped area is near Fox Cabin Spring, where about 100 m are exposed, but the top is not preserved. Goebel (1991) reported a thickness of 130 m for the Joana in the southern part of Dutch John Mountain a few kilometers north of the mapped area where the entire unit is exposed. The Joana has been britttely attenuated in the south-central part of the mapped area and the thickness shown on our cross sections is our estimate of the attenuated thickness rather than the original regional depositional thickness. Near the Silverhorn Mine the Joana is scarcely recognizable because of intense hydrothermal alteration that has created jasperoid.

MDpw **Pilot Shale and West Range Limestone, undivided (Mississippian and Devonian)** Units are combined units because the lithologic distinction between the Pilot Shale and underlying West Range Limestone in the mapped area is subtle, and because the Pilot is too thin to show separately at the map scale. Pilot Shale in the mapped area is a yellowish-gray, clayey, thin-bedded limestone about 15 m thick that contains Mississippian brachiopods at its base. According to C.A. Sandberg and F.G. Poole (U.S. Geological Survey, oral commun., 1994), who have traced the Pilot Shale throughout its extent in the Great Basin, these brachiopods characterize the middle part of the regional Pilot Shale. They examined the best exposure of the Pilot Shale and West Range Limestone near the mapped area that is located 0.9 km west and 1.6 km north of the southeastern corner of the Fairview Peak Quadrangle. The West Range Limestone beneath the Pilot is a medium-gray to light-medium-gray, thin-bedded platy limestone with about 20% interbeds of yellowish-gray silty limestone. It contains sparse fragmented crinoid and brachiopod debris and is about 200 m thick. However, in the south central part of the mapped area the unit has been attenuated, likely by bedding plane faults, so that the thickness is as little as 60 m.

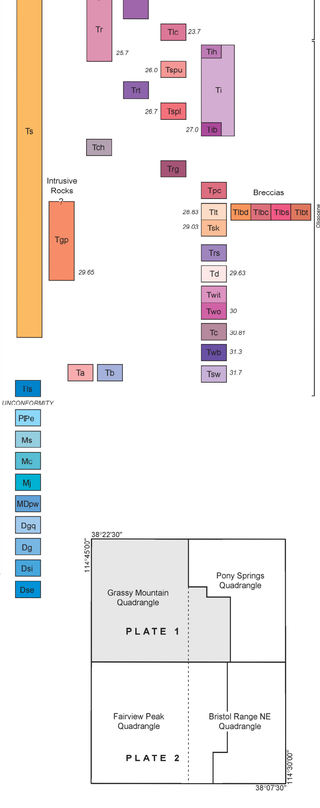
Dqg **Guilmette Formation, quartzite member (Devonian)** The upper part of the Guilmette Formation is an orange-weathering, vitreous quartzite that forms resistant topography throughout its extent and serves as a useful marker unit. Locally, it includes a few dark-gray dolomite interbeds and is 60-80 m thick.

Dg **Guilmette Formation, carbonate member (Devonian)** Mostly dark-gray, medium- to coarse-grained, thin- to medium-bedded dolomite which contains interbeds of medium-gray limestone and yellowish-orange sandstone in its upper part. Stromatoporoidal "spaghetti" beds are common enough to make the unit readily identifiable. Westgate and Knopf (1932) called the unit the Silverhorn Dolomite, but this term has been superseded by the widespread usage of Guilmette Formation (Langenheim and Larson, 1973). Thickness of the unit southeast of the Silverhorn Mine is about 800 m (Langenheim and others, 1971).

Dsi **Simonson Dolomite (Devonian)** Banded, dark- and medium-gray, fine- to coarse-grained, medium- to thick-bedded dolomite. Langenghiem and others (1971) estimated its thickness to be about 300 m.

Dse **Sevy Dolomite (Devonian)** Light-gray, fine-grained, faintly laminated, thin- to medium-bedded, unfossiliferous dolomite. Thin stringers of brown-weathering sandstone occur locally in its upper part. Base of the Sevy is not exposed in mapped area but at least 100 m is present south of Peers Spring (Langenheim and others, 1971).

CORRELATION OF MAP UNITS



Contact Dashed where approximately located on cross sections.

Dip-slip fault Ball on downthrown side where relative movement known. Dashed where approximately located or inferred; dotted where concealed; queried where uncertain.

Topographic margin of White Rock caldera Approximately located.

Strike and dip of beds

Inclined

Strike and dip of compaction foliation in welded tuff

Inclined Horizontal Vertical

Strike of flow layering in rhyolite

Vertical

Jasperoid Dark red to brown or black, commonly brecciated rock generally formed by silicification of Joana Limestone.

Hornfels Dark brown or black.

Marble White to light gray recrystallized Simonson Dolomite.

Cataclastic rock Conspicuous brittley deformed and argillically altered rock; has anastomosing seams of aphanitic, red, pulverized wall rock; commonly broken so that angular chunks of rock bounded by slickensided selvages litter hill slopes.

Argillically altered rock Southeast of Meloy Summit.

Trace of compaction foliation in welded tuff in cross section

See accompanying text for references, tables, figures and a discussion of the geology of the Fairview Range and Grassy Mountain.

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