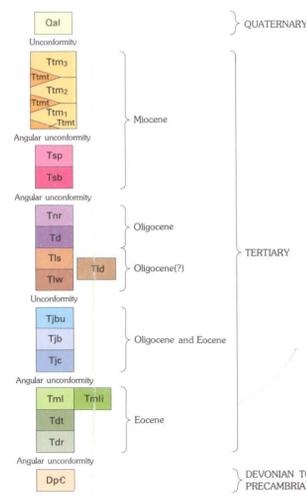


CORRELATION OF MAP UNITS

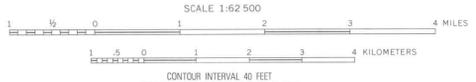


DESCRIPTION OF MAP UNITS

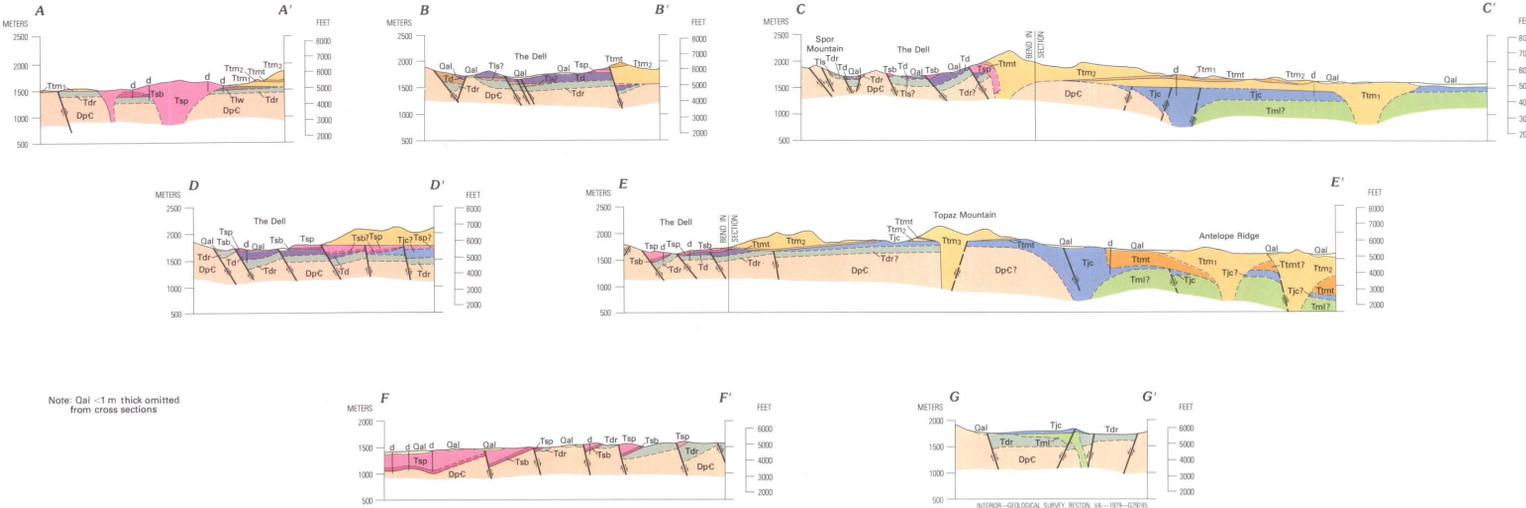
- Starred (*) formation names are newly defined and described here; Topaz Mountain Formation is redefined.
- Qal** ALLUVIUM AND COLLUVIUM (QUATERNARY)—Alluvial sediments and stream deposits of poorly sorted gravel, sand, and clay; colluvium consisting of slope-play sediments, beach sand and gravel deposits and lake-bottom clays deposited by Lake Bonneville at elevations below about 1,580 m (5,200 ft). Surficial deposits <1 m thick omitted from cross sections.
 - Ttm1, Ttm2, Ttm3** TOPAZ MOUNTAIN RHYOLITE (UPPER MIOCENE)—Flows and extrusive domes of alkali rhyolite, vitrophyre, and interbedded tuff. Named for Topaz Mountain, the terms "Topaz Mountain Rhyolite" and "Topaz Mountain Tuff" were originally applied by Erickson (1963) to the rhyolite and tuff underlying the stratified tuff member in the Thomas Range. The type locality is designated in secs. 8, 9, 16, and 17, T. 13 S., R. 11 W., where the Topaz Mountain Rhyolite unconformably overlies rocks of Oligocene to Paleozoic age. The Topaz Mountain Rhyolite forms bold escarpments in the Thomas Range. From the Thomas Range, the Topaz Mountain Rhyolite extends north into the Dagway Range, and east into the Keg Mountains. Maximum thickness is about 700 m.
 - Tsp, Tsb** ALKALI RHYOLITE AND VITROPHYRE—Flows and extrusive domes of three relative ages: gray to red alkali rhyolite and black vitrophyre erupted from local vents. The rhyolite contains sparse phenocrysts of quartz, sanidine, biotite, and plagioclase, except locally at Antelope Ridge and 2 km east of Penrose Knolls, where phenocrysts are abundant. Topaz garnet, beryl, bastnaesite, and pseudobrookite occur in lithophase in the rhyolite. Small plugs of alkali rhyolite that cut rocks of Paleozoic age on Spor Mountain; they may belong to either the Topaz Mountain Rhyolite or the Spor Mountain Formation, or both. Flows and domes are separated according to relative age, but such ages are local and no correlation is implied from one locality to another. Four fission track and two K-Ar dates of the various flows range from 1.1 to 4.4 to 4.8 to 0.3 m.y. Two fission track dates of flows in the Keg Mountains indicate an age of about 8 m.y.
 - Tnr** STRATIFIED TUFF—Stratified tuff underlies and is interbedded with flows and domes of alkali rhyolite. The tuff consists mostly of glassy to zeolitized pumice and shards erupted explosively from vents that produced flows and domes of rhyolite. Most tuff units are discontinuous and seldom exceed 30 m in thickness.
 - Tld** SPOR MOUNTAIN FORMATION (LOWER MIOCENE)—Named for Spor Mountain, the Spor Mountain Formation contains an upper porphyritic rhyolite member and a lower beryllium tuff member. The formation is limited to the Spor Mountain area and was originally included in the Topaz Mountain Rhyolite and Topaz Mountain Tuff of Erickson (1963). The type section is in secs. 8 and 9, T. 13 S., R. 12 W.
 - Tsp** Porphyritic rhyolite member—Flows, domes, and plugs of gray to red porphyritic rhyolite and alkali rhyolite that erupted from vents around Spor Mountain. The rhyolite contains abundant phenocrysts of dark quartz, sanidine, plagioclase, and biotite and abundant microscopic topaz in the groundmass. It conformably overlies the beryllium tuff member (Tsb) along a sharp contact at most localities. An age of 21.3 ± 0.2 m.y. is estimated from one fission track date of 21.1 ± 1.1 m.y. and one K-Ar date of 21.2 ± 0.9 m.y. Maximum thickness is about 500 m.
 - Tsb** Beryllium tuff member—Stratified, tan, vitric tuff and thickessaceous with abundant clasts of carbonate rocks and a few clasts of quartzite and volcanic rocks. The tuff includes bentonite, thin beds of ash-flow tuff, and in the Dell, epiclastic tuffaceous sandstone and conglomerates. Much of the tuff has been hydrothermally altered to clay, fluorite, and potassium feldspar. The beryllium tuff member unconformably overlies the Dell Tuff (Tdr), Drum Mountains Rhyolite (Tdr), and rocks of Paleozoic age. Thickness varies from about 20 m to 60 m.
 - Tnr** NEEDLES RANGE FORMATION (OLIGOCENE)—Pink to gray to red-brown ash-flow tuff with abundant crystals of plagioclase, hornblende, and biotite in a welded matrix of devitrified shards and pumice. Locally, the basal few meters contain loosely indurated white to tan tuff. The formation unconformably overlies the Mt. Laird Tuff (Tml) and fills paleovalleys in the Drum Mountains Rhyolite (Tdr) and rocks of Paleozoic age on the northwestern side of the Drum Mountains. It also crops out on the south side of the Little Drum Mountains, just south of the map area, where Pierce (1974) tentatively correlated it with the Wah Wah Springs Member of the Needles Range Formation. Two fission track dates of 30.6 ± 1.2 and 32.2 ± 3.6 m.y. at the Little Drum Mountains confirm assignment of the tuff to the Needles Range Formation, which was estimated by Armstrong (1970) to be 30.4 ± 0.3 m.y. old (age adjusted from 29.7 ± 0.3 m.y. to account for different decay constants). Maximum thickness is about 30 m.
 - Td** DELL TUFF (OLIGOCENE)—Gray to pink rhyolitic ash-flow tuff that contains abundant crystals of quartz, sanidine, biotite, and plagioclase in a poorly welded to unwelded matrix of devitrified shards and pumice. The tuff resembles the older Joy Tuff, but may be distinguished from the Joy by the presence of abundant large quartz bipyramids and a loose, alkalic weathering aspect. The Dell Tuff unconformably overlies the Drum Mountains Rhyolite (Tdr) in much of the Dell, and locally overlies the breccia at Spor Mountain and rocks of Paleozoic age. The formation is named for the Dell, where the type locality is in secs. 23 and 24, T. 12 S., R. 12 W. Ten fission track dates range from 28.5 ± 1.2 m.y. to 33.8 ± 1.3 m.y. and yield an average age of 32.0 ± 0.6 m.y. The tuff crops out east of the Thomas Range at Keg Pass in the Keg Mountains. Maximum thickness is about 180 m.

- Tls** LANDSLIDE BRECCIA (OLIGOCENE?)—Includes three units: the breccia at Spor Mountain, the breccia at Wildhorse Spring, and the megabreccia of the northern Drum Mountains. The breccia at Spor Mountain and Wildhorse Spring were originally mapped as rocks of Paleozoic age but are now considered as a large landslide mass of Oligocene(?) age. Breccia at Spor Mountain—Breccia of Ordovician and Silurian dolomite, limestone, and quartzite. East of the crest of Spor Mountain, a crackle breccia of shattered dolomite, which relates to original stratigraphy, is interpreted as a former breakaway zone of an Oligocene(?) landslide. Eastward the crackle breccia grades into breccia with clasts of various rocks of Paleozoic age mixed together and faintly stratified. Fragments of volcanic rocks are rare. The breccia unconformably overlies the breccia at Wildhorse Spring near that locality, and underlies the Dell Tuff in the Dell. Maximum thickness is estimated at 80 m.
- Tlw** Breccia at Wildhorse Spring—Breccia of mixed angular to subrounded clasts of rocks of Paleozoic age and Drum Mountains Rhyolite (Tdr) in a matrix of rhyolitic fragments. The breccia underlies and passes laterally into the breccia at Spor Mountain (Tls), and is stratified near the contact. Maximum thickness is estimated at 20 m.
- Tld** Megabreccia of the northern Drum Mountains—Megabreccia of Cambrian limestone and dolomite in the northern Drum Mountains. The megabreccia retains the original stratigraphy of the Cambrian strata but contains intensely brecciated and rotated clasts of Cambrian rocks locally. It overlies the stratified upper part of the black glass tuff member of the Joy Tuff, suggesting an age close to the early Oligocene age of that unit. Maximum thickness is about 60 m.
- Tjbu** JOY TUFF (LOWER OLILOCENE AND UPPER EOCENE)—Contains two members: (1) the upper black glass tuff member, and (2) the lower crystal tuff member. Named for excellent exposures northwest of the Joy townsite in the southeastern part of the mapped area. The type locality is in secs. 16, 17, and 22, T. 14 S., R. 11 W. A reference section, for the black glass tuff member, is designated in secs. 25 and 36, T. 13 S., R. 11 W.
- Tjc** Black glass tuff member—Gray to black rhyolitic ash-flow tuff with sparse crystals of sanidine, quartz, plagioclase, and biotite. It is a matrix of limestone and volcanic rocks. Most of the tuff is densely welded, with abundant flame of black pumice in the lower part. The black glass tuff is confined to the northeastern Drum Mountains and southeastern Thomas Range, indicating that it probably was erupted from vents in that area. It overlies the crystal tuff member of the Joy Tuff along a sharp contact east of Topaz Mountain. One fission track date of 37.0 ± 4.1 m.y. indicates an age close to that of the underlying crystal tuff member. Maximum thickness is about 20 m.
- Tjbu** Upper part—Tan, unwelded tuff. Tuff contains abundant pumice and shards and a few lithic fragments. Contact with underlying welded zones of black glass tuff is transitional but abrupt. Thickness about 10 m.
- Tjc** Crystal tuff member—Gray-pink to red-brown rhyolitic ash-flow tuff with abundant crystals of quartz, sanidine, plagioclase, and biotite in a moderately welded matrix of devitrified shards and pumice. The lower 10 m of tuff contains abundant collapsed black pumice; light-colored pumice is present higher in the section. The tuff contains abundant accessory spherule and rare cogenetic inclusions of lathlike plagioclase, biotite, and spherule that distinguish it from the Dell Tuff. The crystal tuff was probably erupted from vents east of Topaz Mountain, where foliation is nearly vertical, welding is moderate to strong, and breccia occurs. The crystal tuff crops out on low rounded hills in the Thomas Range and forms high cliffs in the Joy townsite northwest of the Joy townsite. It unconformably overlies the Mt. Laird Tuff (Tml), Drum Mountains Rhyolite (Tdr), and rocks of Paleozoic age. Eight fission track dates range from 34.5 ± 1.3 m.y. to 40.0 m.y., with an average age of 38.0 ± 0.7 m.y. The tuff crops out southeast of the Thomas Range in the Picture Rock Hills and about 30 km east of the mapped area on the east side of Desert Mountain. Thickness of the crystal tuff member is about 180 m to the type locality.
- Tmi** MT LAIRD TUFF (UPPER EOCENE)—Pink, rhyolitic to quartz lathic ash-flow tuff with abundant euhedral crystals of large white plagioclase (10 mm long), large brown biotite (5 mm across), hornblende, and pyroxene. Quartz phenocrysts with resorbed outlines occur in tuff northeast of the Thomas Range. The source of the Mt. Laird Tuff, as indicated by vent or collapse breccia and hydrothermally altered tuff, was northwest of Joy townsite. The Mt. Laird Tuff is named for excellent exposures near Mt. Laird in the Drum Mountains; its type locality is in secs. 23 and 26, T. 14 S., R. 11 W. One fission track date is 36.4 ± 1.6 m.y., but the true age of the Mt. Laird Tuff is probably close to 39 m.y. because it underlies the well-dated Joy Tuff. The tuff also crops out northeast of the Thomas Range and in the Keg Mountains. The maximum exposed thickness in the map area is about 80 m, but as much as 500 m of Mt. Laird Tuff is interbedded with tuffaceous lakebeds in the subsurface of Dagway Valley.
- Tml** Intrusive porphyry—Dikes and plugs of hydrothermally altered porphyry very similar to the Mt. Laird Tuff intrude rocks of Cambrian and Precambrian age 2-3 km south of Joy townsite. Mapped as quartz monzonite porphyry by Crittenden and others (1961), the dikes and plugs are believed to be intrusive phases of the Mt. Laird Tuff.
- Tdr** DIORITE (UPPER EOCENE)—Plugs of dark-gray, massive, fine-grained diorite that intrude rocks of Cambrian age 3 km southeast of Joy townsite. Locally, the diorite is intruded by dikes of the Mt. Laird Tuff. The diorite contains abundant calcic plagioclase and hornblende and lesser amounts of biotite and interstitial potassium feldspar.
- Tdr** DRUM MOUNTAINS RHYOLITE (UPPER EOCENE)—Rusty, weathering black rhyolitic flows and breccias with phenocrysts of intermediate-composition to calcic plagioclase and pyroxene in an aphanitic to glassy matrix. Modally, the rock is a hypersthene andesite, but chemical analyses show the rock to range from rhyolite to andesite in the classification of Rittmann (1952). The formation includes some interbedded tuffaceous sandstone and lathic debris flows around a small central volcano in the Black Rock Hills as well as some aphanitic flow or dike rocks nearby. Everywhere, the rhyolite overlies rocks of Paleozoic age. South of the mapped area, the Drum Mountains Rhyolite underlies flows, breccias, and tuffs that were erupted from a central volcano in the Little Drum Mountains (Ledson, 1974). The Drum Mountains Rhyolite was named for exposures in the Drum Mountains and a type locality is designated in secs. 32, 33, and 34, T. 14 S., R. 11 W. A single fission track date of 41.8 ± 2.3 m.y. indicates a late Eocene age.
- DpC** UNDIFFERENTIATED ROCKS OF DEVONIAN TO PRECAMBRIAN AGE—Limestone, dolomite, quartzite, and shale. Formations in the Thomas Range are differentiated on maps of Staats and Carr (1964), and formations in the Drum Mountains on maps of Newell (1971) and Crittenden and others (1961). Maximum exposed thickness exceeds 1,200 m.

Base from U.S. Geological Survey
Dagway Range and Topaz Mt., 1953



Geology remapped and revised in 1977 and 1978 from maps by Staats and Carr (1964), Shawe (1972), Newell (1971), Crittenden and others (1961), and Morris (1978).



Note: Qal <1 m thick omitted from cross sections

GEOLOGIC MAP AND CROSS-SECTIONS OF TERTIARY ROCKS IN THE THOMAS RANGE AND NORTHERN DRUM MOUNTAINS, JUAB COUNTY, UTAH

By
David A. Lindsey
1979

