

DESCRIPTION OF GEOLOGIC UNITS

- Qal** Alluvial deposits – Sand, silt, clay and gravel; variable thickness; Holocene.
- Qp** Playa deposits – Silt, clay, and evaporites; deposited along the floor of active playa systems; variable thickness; Pleistocene through Holocene.
- Qsm** Spring and wetland related deposits – Clay, silt, and sand; variable thickness; Holocene.
- Qea** Eolian deposits – Sand and silt; deposited along valley floor margins, includes active and vegetated dunes; variable thickness; Pleistocene through Holocene.
- Qafy** Active alluvial-fan deposits, and undivided lacustrine deposits – Sand, gravel, boulders, silt and clay; variable thickness; Late Pleistocene to Holocene, deposits primarily postdate late Pleistocene pluvial period.
- Qls** Lacustrine deposits – Silt, clay, sand, and gravel; deposited along valley floors and low gradient toes of alluvial fans, includes intermixed eolian deposits; variable thickness; Pleistocene.
- Qlg** Lacustrine gravel – Gravel, sand, and silt; forms conspicuous bars associated with major lake levels; variable thickness; Pleistocene.
- Qlm** Lacustrine marl – White silty or sandy marl; associated with major lake levels; variable thickness; Pleistocene.
- Qgt** Glacial and periglacial deposits – Talus, poorly sorted sand, gravel, and boulders; mapped in the upper elevations above 10,000 ft (3050 m) in major mountain ranges; variable thickness; Pleistocene.
- Qafo** Inactive alluvial-fan deposits – Sand, gravel and boulders, calcrete and pedogenic carbonate cement commonly form resistant upper surface; forms dissected fan surfaces above pluvial level maximum, variable thickness; Pleistocene.
- QTs** Quaternary and Tertiary sedimentary rocks undivided – Conglomerate, sandstone, siltstone, and claystone; lithified and partially lithified early basin fill deposits; variable thickness; Miocene through Pleistocene.
- Tv3** Late Tertiary volcanic rocks, undivided – Basalt, rhyolite, tuff and tuffaceous sediments and volcanoclastic deposits; variable thickness; includes Quichapa Group in Utah; Miocene through Pliocene.
- Ts3** Late Tertiary sedimentary rocks, undivided – Sandstone, conglomerate, tuffaceous sandstone, siltstone, and claystone; variable thickness; includes Salt Lake Formation in Utah; Miocene through Pliocene.
- Tv2** Middle Tertiary volcanic rocks, undivided – Rhyolite, tuff and tuffaceous sediments, and volcanoclastic deposits; variable thickness; includes Needle Range Formation, Tunnel Spring Tuff, and Isom Formation; primarily Oligocene.
- Tc** Middle Tertiary conglomerate and interbedded limestone – interbedded with and overlies unit Tv2 in the Conger Range (Hose, 1965).
- Ts2** Middle Tertiary sedimentary rocks, undivided – Sandstone, conglomerate, tuffaceous sandstone, siltstone, and claystone; variable thickness; primarily Oligocene.
- Tv1** Early Tertiary volcanic rocks, undivided – Rhyolite, tuff, and tuffaceous sediments, and volcanoclastic deposits; variable thickness; primarily Eocene.
- Ts1** Early Tertiary sedimentary rocks, undivided – Sandstone, conglomerate, tuffaceous sandstone, fresh water limestone, and siltstone; variable thickness; includes the White Sage Formation in Utah and the Sheep Pass Formation in Nevada; primarily Eocene.
- Tv** Tertiary volcanic rocks, undivided – Basalt, rhyolite, tuff and tuffaceous sediments, and volcanoclastic deposits; variable thickness; Tertiary.
- Ti** Tertiary intrusive rocks, undivided – Plutons, stocks, dikes, and sills of various chemical composition, generally quartz monzonite or granodiorite; includes Ithapa stock (> 22 Ma) in the Deep Creek Mts; Tertiary.
- Ki** Cretaceous intrusive rocks, undivided – Plutons, stocks, dikes, and sills of various chemical composition, generally quartz monzonite or granodiorite.
- Ji** Jurassic intrusive rocks, undivided – Plutons, stocks, dikes, and sills of various chemical composition, generally quartz monzonite or granodiorite.
- Jn** Jurassic Navajo Sandstone – Eolian sandstone; incomplete thickness, exposed in the footwall of thrust plates in the southeast portion of the map area.
- T1** Triassic sedimentary rocks, undivided – Limestone, siltstone, claystone, and sandstone; includes the Thaynes Formation; about 1900 feet thick.
- P2** Upper Permian sedimentary rocks, undivided – variable thickness; includes the Kaibab Limestone and the Park City Group; thickness about 2250–2400 feet in Utah, 1750–2100 feet in Nevada.
- P1** Lower Permian sedimentary rocks, undivided – Dolomite, limestone, sandstone, and gypsum; thickness about 2700 feet in Utah, 3300 feet in Nevada; consists primarily of the Arcturus Formation.
- PPM** Lower Permian to Upper Mississippian sedimentary rocks, undivided – Limestone, cherty limestone, sandstone, and shale; consists primarily of the Ely Limestone; thickness about 1850–2000 feet in Utah, 1850–2950 feet in Nevada.
- Pc** Middle and Lower Pennsylvanian sedimentary rocks, undivided – Limestone, dolomite, and sandstone; variable thickness; includes the Ely Limestone in Nevada.
- M2** Upper Mississippian sedimentary rocks, undivided – Shale, limestone, and sandstone; includes Chainman Formation; thickness about 1600–1800 feet in Utah, 1000–1500 feet in Nevada.
- M1** Lower Mississippian sedimentary rocks, undivided – Limestone and dolomite; consists primarily of the Joana Limestone; thickness about 0–300 feet in Utah, 90–500 feet in Nevada.

- MDs** Lower Mississippian and Upper Devonian sedimentary rocks, undivided – Shale; consists primarily of the Pilot Shale; thickness about 850 feet in Utah, 300–400 feet in Nevada.
- D** Devonian sedimentary rocks, undivided – Limestone, dolomite, shale, and sandstone; includes the Guilmette Formation, Simonson and Sevy Dolomite, and portions of the Pilot Shale in Utah; thickness about 4400–4700 feet in Utah, 2100–4350 feet in Nevada.
- S** Silurian sedimentary rocks, undivided – Dolomite; consists primarily of the Laketown Dolomite; thickness about 900–1100 feet in Utah, 600–1850 feet in Nevada.
- SOc** Silurian and Ordovician sedimentary rocks, undivided – Dolomite, limestone, quartzite, and shale; thickness about 5650–5900 feet in Utah, 3050–6750 feet in Nevada.
- O** Ordovician sedimentary rocks, undivided – Dolomite, limestone, quartzite, and shale; thickness about 4700–4800 feet in Utah, 2450–4900 feet in Nevada; includes Pogonip Group and Eureka Quartzite.
- C3** Upper Cambrian sedimentary rocks, undivided – Limestone and Dolomite; includes the Notch Peak Formation; variable thickness; Upper Cambrian.
- Cc** Upper and Middle Cambrian sedimentary rocks, undivided – Limestone and dolomite; thickness about 2450–3400 feet in Utah, 4450–4700 feet in Nevada.
- C2** Middle Cambrian sedimentary rocks, undivided – Limestone and dolomite; thickness about 3450–5050 feet in Utah, 2450–4900 feet in Nevada.
- C1** Lower Cambrian sedimentary rocks – Quartzite; consists primarily of the Prospect Mountain Quartzite; thickness about 4400–4600 feet in Utah, 4200–5450 feet in Nevada.
- Zs** Neoproterozoic sedimentary rocks – Quartzite and argillite; consists primarily of the McCoy Creek Group, Sheeprock Group and Mutual Formation; up to 10,000 ft (3050 m) thick.
- pCx** Precambrian crystalline and metasedimentary rocks, and Mesozoic and Cenozoic intrusive rocks. Shown only on cross section B–B'.

MAP SYMBOLS

- · — · — · All faults – solid where well located, dashed where approximately located, dotted where concealed Sense of displacement unspecified
- |— Normal fault – ball and bar on downthrown side
- |— SRD Snake Range decollement low-angle normal fault – teeth on downthrown side
- |— Low-angle normal fault – teeth on downthrown side
- |— Thrust fault – teeth on upthrown side
- |— Reverse fault – teeth on upthrown side
- |— Attenuation fault – places younger rocks on older rocks and omits stratigraphic section, displacement sense uncertain
- Fault delineated from gravity data (chapter 3) – most are interpreted as steeply dipping normal faults, location approximate
- · — · — · All folds – solid where well located, dashed where approximately located, dotted where concealed
- |— Anticline – upright
- |— Anticline – overturned
- |— Syncline – upright
- |— Syncline – overturned

UGS Groundwater-Monitoring Network
Numeric label is UGS site number (table C.1)

- Monitor wells in basin-fill aquifer
- Monitor wells in volcanic-rock aquifer
- Monitor wells in basin-fill and carbonate-rock aquifers
- Monitor wells in carbonate-rock aquifer
- Monitor wells in Lower Cambrian-Neoproterozoic siliciclastic confining unit
- ▲ Carbonate-rock and basin-fill aquifers
- ▲ Carbonate-rock aquifers
- Agricultural area monitor wells
- Nested piezometers near spring
- UGS transducer in previously existing well (table C.2)
- ◆ UGS spring-flow gage site (table C.4)

Other Features

- ◆ USGS surface-flow gage
- SNWA point of diversion
- Spring
- ◆ Petroleum-exploration well

SOURCES USED FOR MAP COMPILATION AND UNIT CORRELATION

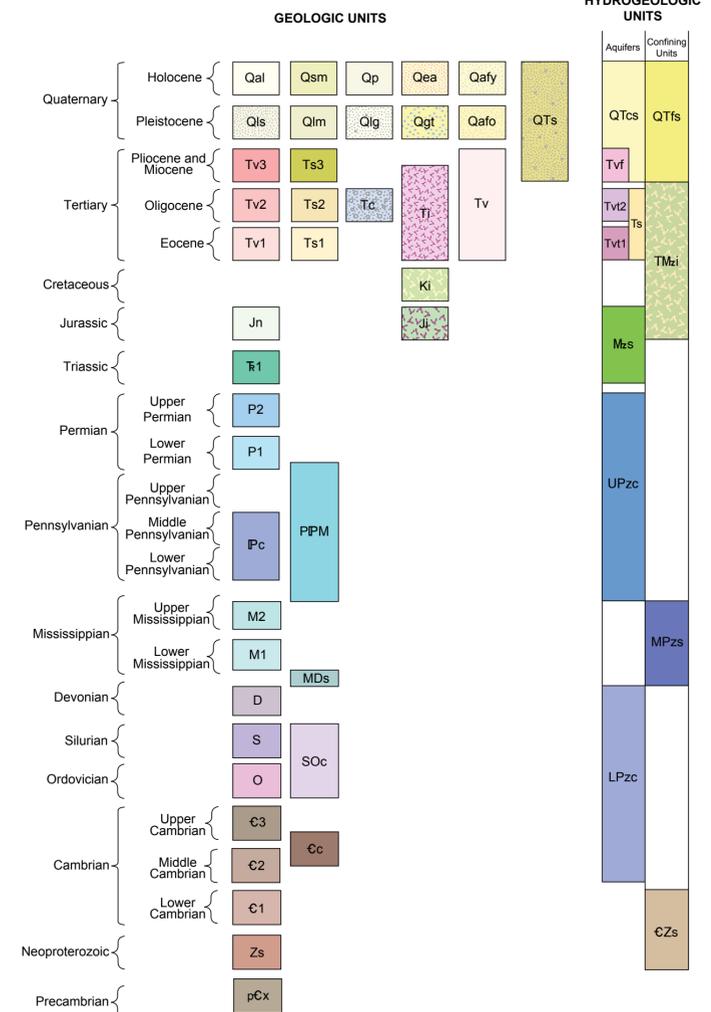
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Petroleum-exploration wells shown on plate 1.

| API NUMBER ¹ | OPERATOR | WELL NAME ² |
|-------------------------|-------------------------------|------------------------|
| 2701705206 | FLETCHER, C.H. | FLETCHER 1 |
| 2701705217 | FRONTIER EXPLORATION | COBB CREEK FED 11-1 |
| 2701705223 | FALCON ENERGY | HAMLIN WASH 19-1 |
| 2701705225 | FALCON ENERGY | HAMLIN WASH 18-1 |
| 2703305245 | EQUITABLE RESOURCES ENERGY CO | OUTLAW FEDERAL 1 |
| 2703305288 | J.R. BACON | BAKER CREEK 12-1 |
| 4302711037 | SHELL OIL COMPANY | 1 BAKER CREEK UNIT |
| 4302711474 | CHEVRON USA INC | 1 UNIT |
| 4302711476 | TIGER OIL CO | BISHOP SPRINGS 1 |
| 4302720292 | ELMER, G C | 1 J S LEE |
| 4302720295 | WILBURN J GOULD | 1 STATE |
| 4302730001 | PYRAMID OIL & GAS | 1 CEDAR PASS |
| 4302730002 | WILBURN J GOULD | 2 STATE |
| 4302730003 | WILBURN J GOULD | 1 FEDERAL |
| 4302730004 | WILBURN J GOULD | 3 STATE |
| 4302730005 | WILBURN J GOULD | 1-16 STATE |
| 4302730006 | NEWMAN, LARRY A | 1-25 ESKDALE-FEDERAL |
| 4302730007 | NEWMAN, LARRY A | 1-23 ESKDALE-FEDERAL |
| 4302730009 | COMMODORE RESOURCES CORP | 1 NEEDLE STATE |
| 4302730010 | NEEDLE EXPLORATION COMPANY | 1-A NEEDLE STATE |
| 4302730011 | COMMODORE RESOURCES CORP | 1-B NEEDLE ANTICLINE |
| 4302730013 | AMERADA HESS | 79-1 |
| 4302730021 | COMMODORE RESOURCES CORP | 1-16 ENSIGN-NEEDLES |
| 4302730022 | AMERICAN QUASAR PETROLEUM | 36-22 ANTELOPE VALLE |
| 4302730034 | EQUITABLE RECROCS ENERGY CO | COBRA STATE 12-36 |
| 4302730038 | EQUITABLE RECROCS ENERGY CO | MAMBA FED 31-22 |

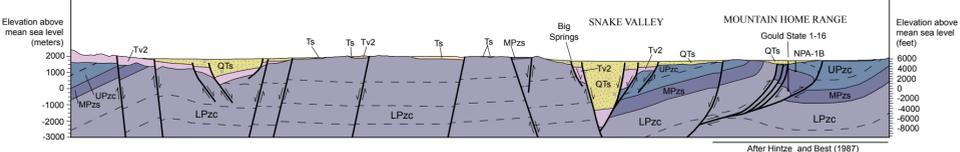
1. American Petroleum Institute number. See Utah Division of Oil, Gas & Mining database <http://oilgas.ogm.utah.gov/Data_Center/LiveData_Search/logs.htm> for more information.
2. Label on plate 1.

UNIT CORRELATION



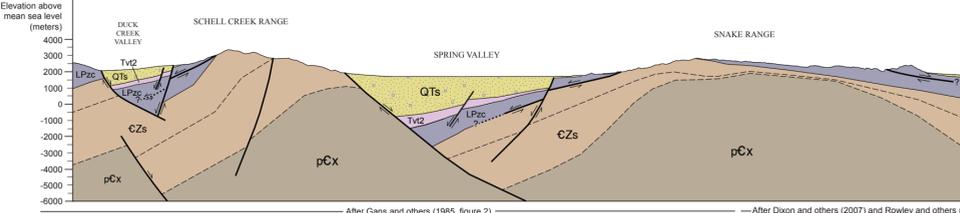
| Eon | Era | Period | Epoch | Age (Ma) | | |
|---------------|-----------------|------------------|-------------|------------|----------|------|
| Phanerozoic | Cenozoic | Quaternary | Holocene | 0.0117 | | |
| | | | Pleistocene | 2.6 | | |
| | | Tertiary | Neogene | Pliocene | 5.3 | |
| | | | | Miocene | 23.0 | |
| | | | | Oligocene | 33.9 | |
| | | | Paleogene | Eocene | 55.8 | |
| | | | | Paleocene | 65.5 | |
| | | | | Cretaceous | Late | 99.6 |
| | | | | | Early | 146 |
| | | | | Mesozoic | Jurassic | Late |
| Middle | 176 | | | | | |
| Early | 200 | | | | | |
| Late | 229 | | | | | |
| Triassic | Middle | 245 | | | | |
| | Early | 251 | | | | |
| Permian | Late | 271 | | | | |
| | Early | 299 | | | | |
| Pennsylvanian | Late | 307 | | | | |
| | Middle | 312 | | | | |
| | Early | 318 | | | | |
| | Late | 340 | | | | |
| Mississippian | Early | 359 | | | | |
| | Late | 385 | | | | |
| Paleozoic | Devonian | Middle | 397 | | | |
| | | Early | 416 | | | |
| | Silurian | Late | 423 | | | |
| | | Early | 444 | | | |
| Ordovician | Middle | 461 | | | | |
| | Early | 472 | | | | |
| Cambrian | Late | 488 | | | | |
| | Early | 501 | | | | |
| Proterozoic | Neoproterozoic | Middle | 513 | | | |
| | | Early | 542 | | | |
| | Mesoproterozoic | | 900 | | | |
| | | Paleoproterozoic | 1600 | | | |
| | | 2500 | | | | |

B' SW

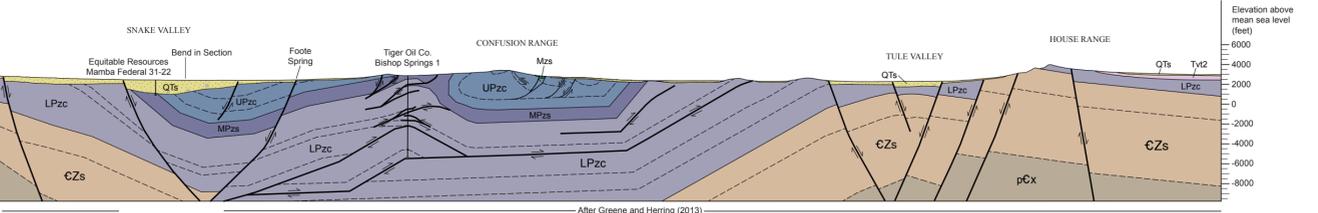


DESCRIPTION AND CORRELATION OF GEOLOGIC UNITS, CROSS SECTION, AND GEOLOGIC TIME SCALE

A' SW



A' NE



After Greene and Herring (2013)