UTAH GEOLOGICAL SURVEY
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INTERIM GEOLOGIC MAP OF THE WILDCAT MOUNTAIN AND EAST PART OF THE CURRIE 30′ X 60′ QUADRANGLES, TOOELE COUNTY, UTAH—PHASE 1

by

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2025

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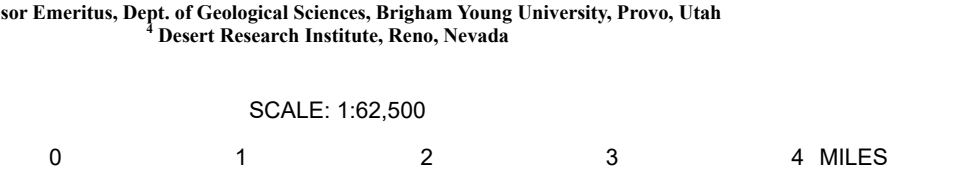
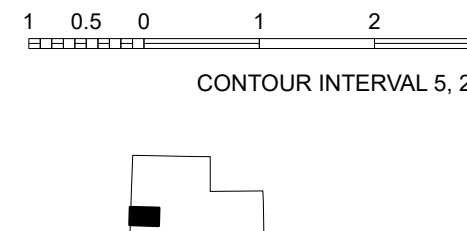
SCALE: 1:62,500



CONTOUR INTERVAL 5, 20, and 50 METERS



QUADRANGLE LOCATION

APPROXIMATE MEAN DECLINATION, 2025

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Base from U.S. Geological Survey Wildcat Mountain
30' x 60' Quadrangle (1979) and Currie 30′ x 60′ Quadrangle (1987)
Projection: UTM Zone 12
Datum: NAD 1983

Program Manager: Stefan M. Kirby
Project Manager: Zachary W. Anderson
GIS and Cartography: Rosemary Fasselin and Subigya Shah
GIS Reviews: Josh Dustin and Austin Jensen

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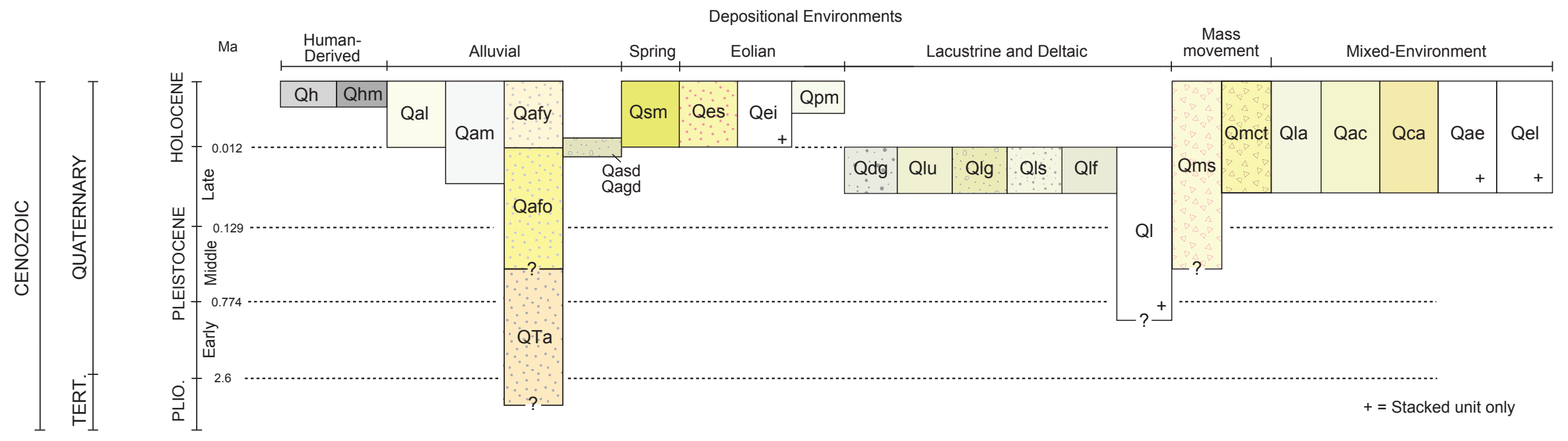
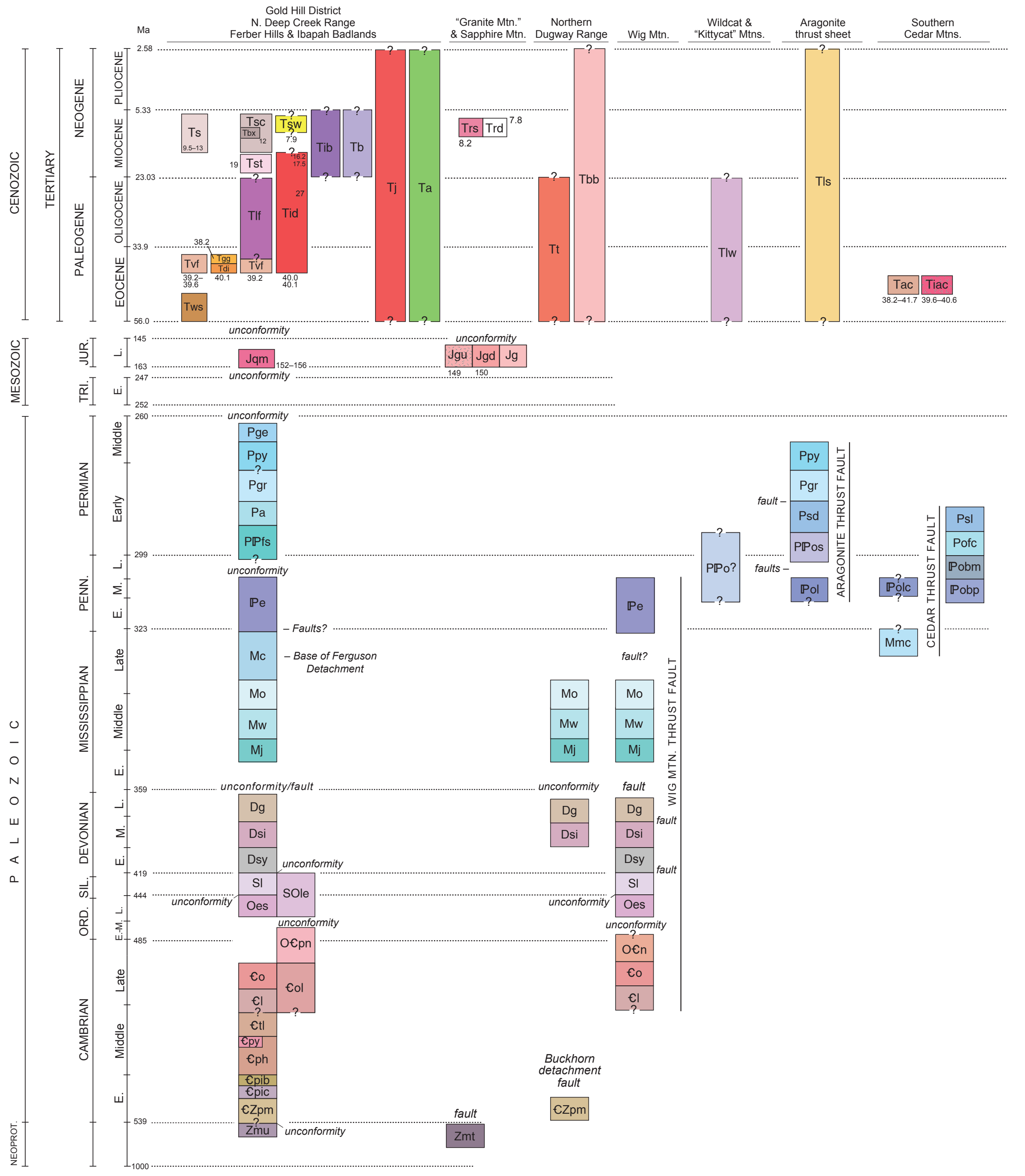
Plate 2
Utah Geological Survey Open-File Report 773
Interim Geologic Map of the Wildcat Mountain and East Part of the Currie 30' x 60' Quadrangles—Phase 1

CORRELATION OF QUATERNARY-TERTIARY GEOLOGIC UNITS



CORRELATION OF TERTIARY, MESOZOIC, PALEOZOIC AND NEOPROTEROZOIC GEOLOGIC UNITS



Boundary ages from International Chronostratigraphic Chart (Cohen et al., 2013; updated v2024/12)

LIST OF GEOLOGIC UNITS

Qh	Human disturbance
Qhm	Mining disturbance
Qal	Stream and floodplain alluvium
Qam	Alluvial mud
Qafy	Younger fan alluvium
Qafo	Older fan alluvium
QTa	Quaternary-Tertiary alluvium
Qasd	Alluvial sand of Old River Bed delta [lines only]
Qagd	Alluvial gravel of Old River Bed delta
Qsm	Spring and marsh deposits
Qes Qes?	Eolian sand deposits
Qpm	Playa mud
Qdg	Deltaic gravel
Qlu	Bonneville lacustrine deposits, undivided
Qlg Qlg?	Lacustrine gravel
Qls Qls?	Lacustrine sand
Qlf Qlf?	Lacustrine fine-grained deposits
Ql	Lacustrine deposits, undivided [subsurface only]
Qms	Landslide deposits
Qmct	Colluvial and talus deposits
Qla	Lacustrine and alluvial deposits
Qac	Alluvial and colluvial deposits
Qca	Colluvial and alluvial deposits
Qal/Qlf	Alluvium over lacustrine fine-grained deposits
QTa/Ts	Quaternary-Tertiary alluvium over Salt Lake Formation
QTa/Tsc	Quaternary-Tertiary alluvium over Salt Lake Formation conglomerate
Qes/Qafy	Eolian sand over younger fan alluvium deposits
Qes/Qlu	Eolian sand over undivided Bonneville lacustrine deposits
Qes/Qlg	Eolian sand over lacustrine gravel
Qes/Qlf	Eolian sand over lacustrine fine-grained deposits
Qes/Qla	Eolian sand over lacustrine and alluvial deposits
Qes/Tlw?	Eolian sand over latitic rocks of Wildcat Mountain?
Qes/Psd	Eolian sand over Permian sandstone, dolomite, and limestone
Qes/PIPos	Eolian sand over Oquirrh Group, sandstone and limestone unit
Qei/Qal	Eolian silt over stream and floodplain alluvium deposits
Qei/Qafy	Eolian silt over younger fan alluvium deposits
Qei/QTa	Eolian silt over Quaternary-Tertiary alluvium deposits
Qei/Qlf	Eolian silt over lacustrine fine-grained deposits
Qei/Qac	Eolian silt over alluvial and colluvial deposits
Qei/Ts?	Eolian silt over Salt Lake Formation, undivided
Qpm/Ql	Playa mud over undivided lacustrine deposits
Qlg/Tlw	Lacustrine gravel over latitic rocks of Wildcat Mountain
Qlg/Psl	Lacustrine gravel over Permian sandstone, limestone, and dolomite
Qlg/Pofc	Lacustrine gravel over Oquirrh Group, Freeman Peak and Curry Peak Formations, undivided
Qlg/IPolc	Lacustrine gravel over Oquirrh Group, limestone unit (Cedar thrust sheet)
Qlg/rx	Lacustrine gravel over undivided bedrock
Qlu/Jqm	Undivided Bonneville lacustrine deposits over quartz monzonite of Gold Hill
Qae/Qlf	Alluvial and eolian deposits over lacustrine fine-grained deposits
Qel/IPol	Eolian and lacustrine deposits over Oquirrh Group, limestone unit (Aragonite thrust sheet)

Tertiary Rock Units of Western Area

Ts Ts?	Salt Lake Formation, undivided
Tsc Tsc?	Salt Lake Formation, conglomerate
Tbx	Dolomite breccia
Tsw	Quartz vein stockwork
Tib	Basaltic dikes
Tb	Basaltic lava flows
Tid	Igneous dikes, undivided
Tst	Volcaniclastic sandstone and tuff
Tlf Tlf?	Intermediate lava flows
Tgg Tgg?	Granite of Gold Hill
Tvf Tvf?	Volcanic rocks of Ferber Hills-Pinyon Flat
Tdi	Diorite
Tws	White Sage Formation
Tj	Jasperoid
Ta	Alteration at Rodenhouse Wash

Tertiary Rock Units of Southeastern Area

Trs	Rhyolite of Sapphire Mountain
Trd	Rhyolitic dikes of "Granite Mountain" [lines only]
Tt	Trachyte flows of northern Dugway Range
Tbb	Breccia body

Tertiary Rock Units of Northeastern Area

Tlw Tlw?	Latitic rocks of Wildcat Mountain
Tls	Tertiary limestone
Tac	Andesitic and dacitic rocks of southern Cedar Mountains
Tiac	Andesitic intrusions of southern Cedar Mountains

Jurassic to Neoproterozoic Rock Units of the Western and Southeastern Area

Jqm Jqm?	Quartz monzonite of Gold Hill
Jgu Jgu?	Granite and foliated granodiorite of "Granite Mountain", undivided
Jgd	Foliated granodiorite of "Granite Mountain"
Jg	Granite of "Granite Mountain"
Pge	Gerster Formation
Ppy	Plympton Formation
Pgr Pgr?	Grandeur Formation
Pa	Arcturus Formation
PIPfs PIPfs?	Ferguson Mountain Formation and Strathearn Formation, undivided
IPe IPe?	Ely Limestone
Mc	Chainman Shale
Mo Mo?	Ochre Mountain Limestone
Mw	Woodman Formation
Mj Mj?	Joana Limestone
Dg Dg?	Guilmette Formation
Dsi Dsi?	Simonson Dolomite
Dsy	Sevy Dolomite
SOle	Laketown Dolomite and Ely Springs Dolomite, undivided
Sl Sl?	Laketown Dolomite
Oes	Ely Springs Dolomite
O€pn	Lower Pogonip Group and Notch Peak Formation, undivided
O€n	Notch Peak Formation
€ol	Orr Formation and Lamb Dolomite, undivided
€o	Orr Formation
€l €l?	Lamb Dolomite
€tl	Trippe Limestone
€py €py?	"Pierson Cove" Formation, Young Peak dolomite member
€ph €ph?	"Pierson Cove," Wheeler Shale, Swasey Limestone, Whirlwind Formation, Dome Limestone, Chisholm Shale, and Howell Formation, undivided
€pib	Pioche Formation, Busby Quartzite Member
€pic	Pioche Formation, Cabin Shale Member
€Zpm €Zpm?	Prospect Mountain Quartzite
Zmu	McCoy Creek Group, undivided
Zmt	McCoy Creek Group and Trout Creek sequence, undivided

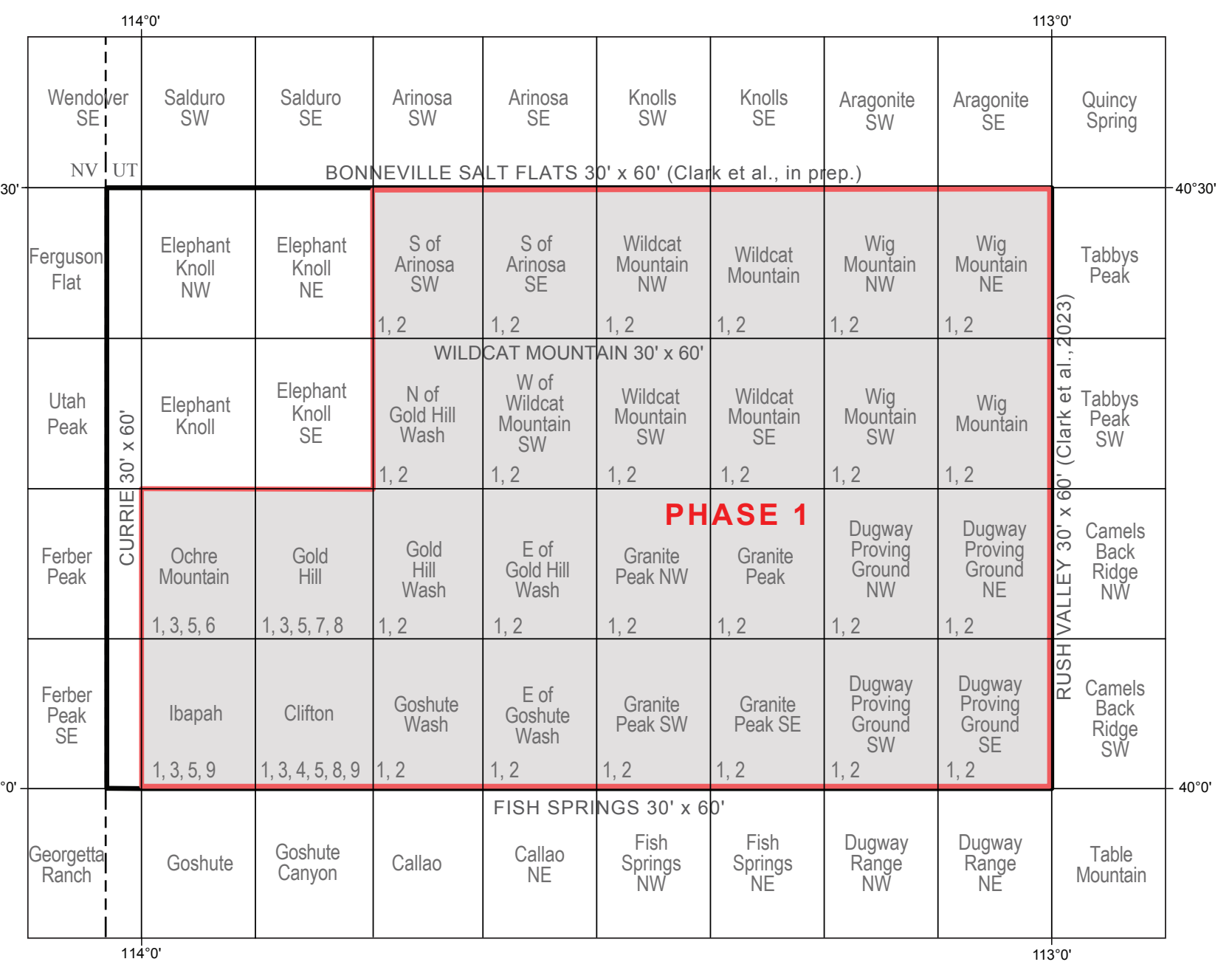
Permian to Mississippian Rock Units of the Northeastern Area

PIPo?	Oquirrh Group, undivided?
Ppy	Plympton Formation
Pgr	Grandeur Formation
Psd	Permian sandstone, dolomite, and limestone [stacked unit only]
PIPos	Oquirrh Group, sandstone and limestone unit [stacked unit only]
IPol	Oquirrh Group, limestone unit [stacked unit only]
IPolc	Oquirrh Group, limestone unit, Cedar thrust sheet
Mmc	Manning Canyon Formation
Psl	Permian sandstone, limestone, and dolomite
Pofc	Oquirrh Group, Freeman Peak and Curry Peak Formations, undivided
IPobm IPobm?	Oquirrh Group, Bingham Mine Formation
IPobp	Oquirrh Group, Butterfield Peaks Formation

GEOLOGIC SYMBOLS

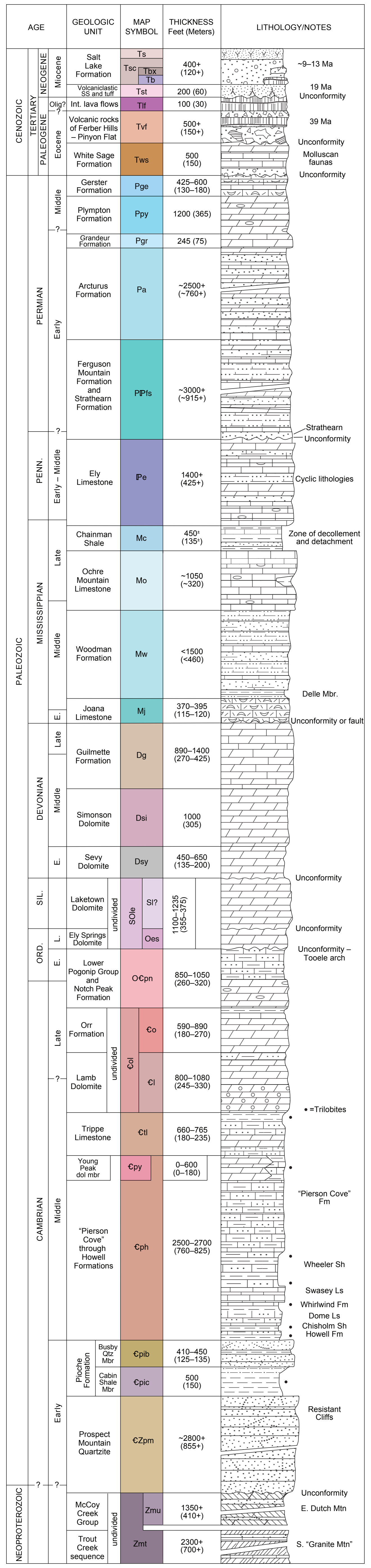
Contact
High-angle normal fault – Dashed where approximately located, dotted where concealed, queried where uncertain; bar and ball on down-thrown side
Normal fault, geophysical, gravity – Located from gravity data; concealed and very aproximately located; bar and ball on down-thrown side
Strike-slip or oblique-slip fault – Dashed where approximately located, dotted where concealed; arrows and bar/ball indicate relative movement
Fault of unknown geometry and kinematics – Dashed where approximately located, dotted where concealed; queried where uncertain
Thrust fault – Dashed where approximately located, dotted where concealed, queried where uncertain; teeth on upper plate; bar and ball where later normal movement
Low-angle normal fault – Dashed where approximately located, dotted where concealed, queried where uncertain; teeth on upper plate; open teeth for older faults at Dutch Mountain
Detachment fault – Dashed where approximately located, dotted where concealed, queried where uncertain; teeth on upper plate
Lineament
Igneous dike (units Tid, Tib) – Dashed where approximately located
Axial trace of anticline – Dashed where approximately located, dotted where concealed
Axial trace of overturned anticline – Dashed where approximately located, dotted where concealed
Axial trace of syncline – Dashed where approximately located, dotted where concealed
Axial trace of overturned syncline – Dashed where approximately located
Lake Bonneville shorelines and shoreline zones – Dashed where approximately located
B Bonneville shoreline
P Provo shoreline
S Stansbury shoreline zone
r Regressive shoreline zone
V Pilot Valley shoreline zone
Lake Bonneville, Lake Currey, and Great Salt Lake shorelines
U Unnamed shorelines
Channel systems of the Old River Bed delta
Exposed (eroded) – Center line, map unit Qasd
Buried (uneroded) – Center line, map unit Qasd
Qagd Gravel – Channel extent, map unit Qagd
Old River Bed delta ridge crest and beach ridge crest
Strike and dip of bedding (refer to index map for mapping sources)
20 Inclined
30 Inclined approximate
60 Inclined approximate, photo-interpreted
Vertical
40 Overturned
20 Strike and dip of foliation
Strike of steeply dipping joint from aerial photo interpretation
Minor syncline
Sand and gravel pit
Mine
Adit
Shaft
Spring
SC1 Sediment core and ID
3 Geochemistry and geochronology sample and ID
4 Geochronology sample and ID
Geochemistry sample
Fossil sample
Qei/Qlf Stacked unit – Indicates thin cover of the first unit overlying the second unit

PRIMARY SOURCES OF GEOLOGIC MAPPING



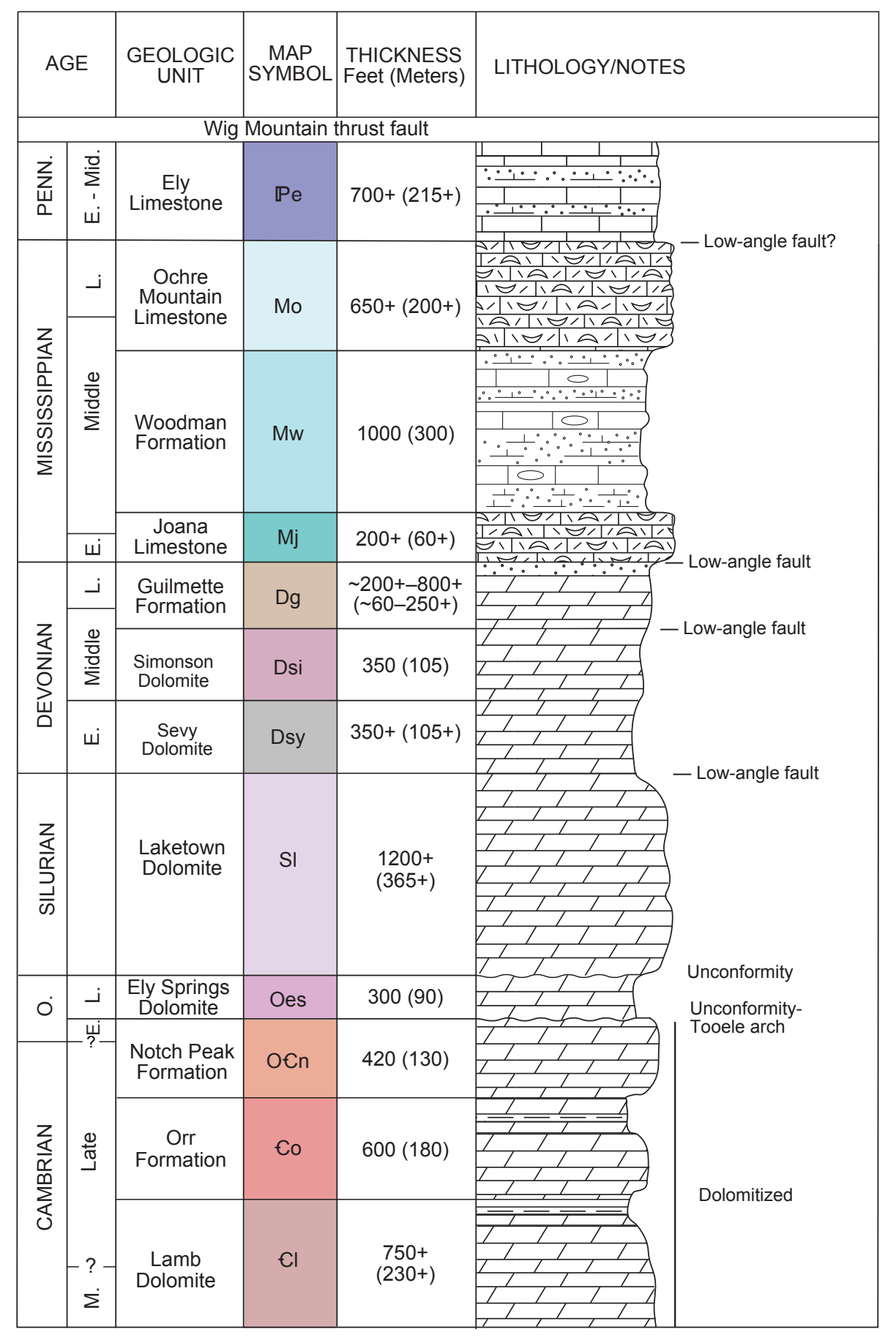
1. Clark [UGS] (2023-25), photogeologic and limited field mapping, revisions to prior mapping, fault mapping from gravity data
2. Clark et al. (2016)
3. Malan (1989)
4. Mills et al. (2023)
5. Nolan (1935)
6. Potter et al. (1995)
7. Robinson (1993, 2023)
8. Robinson (2006 unpublished, 2016)
9. Rodgers (1989)

LITHOLOGIC COLUMN
Gold Hill District
N. Deep Creek Range
Ferber Hills & Ibapah Badlands
"Granite Mountain"

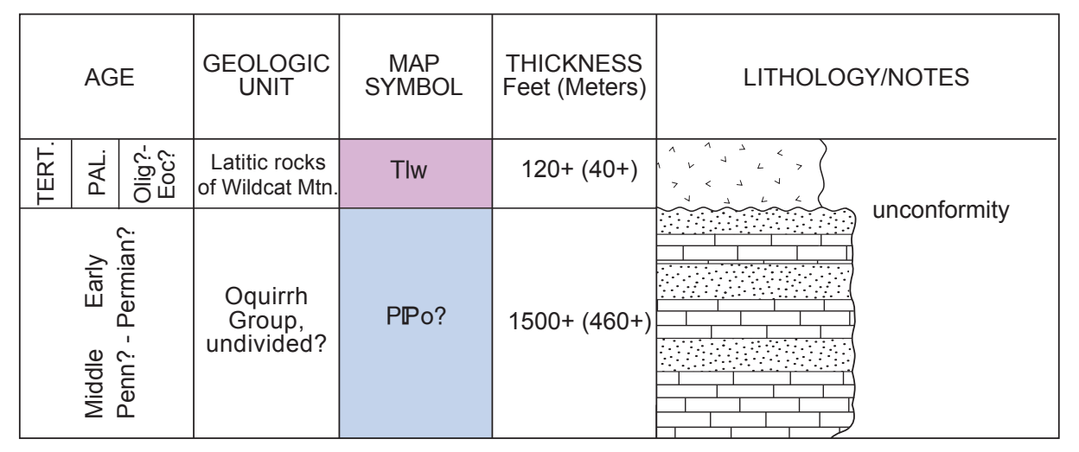


Lithologic columns are schematic.

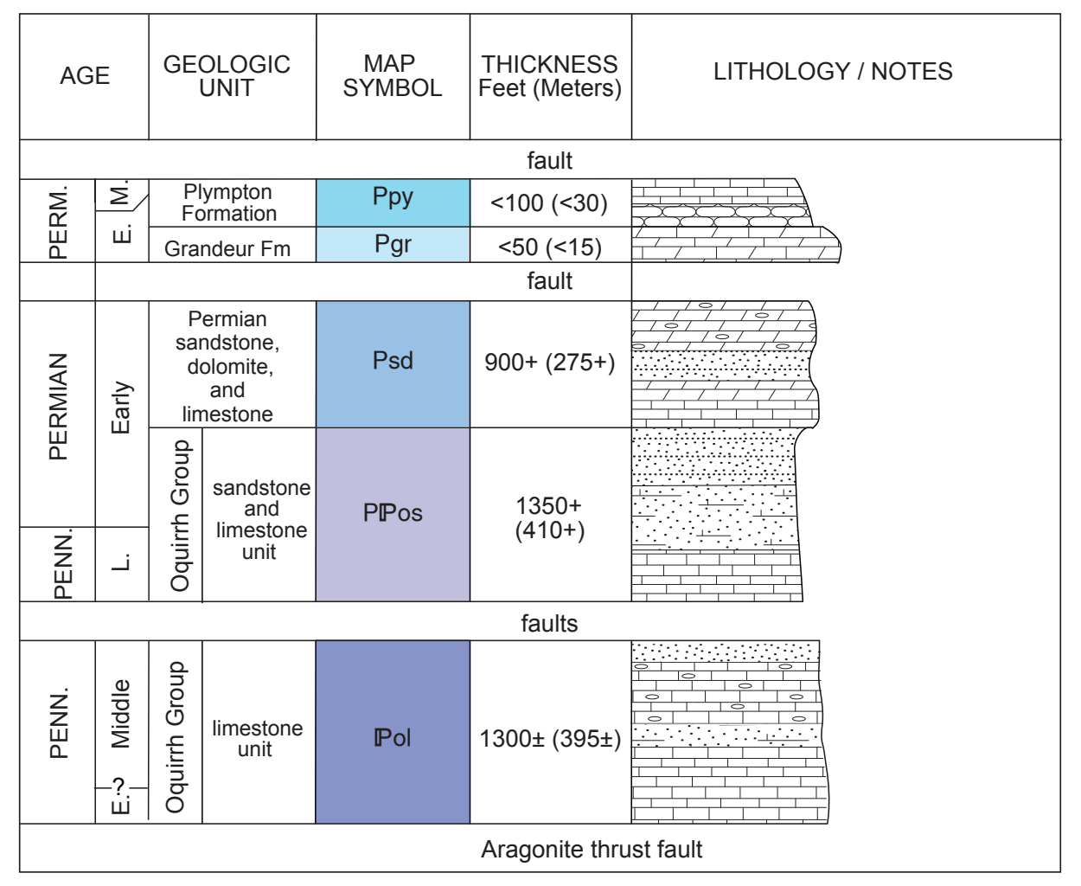
LITHOLOGIC COLUMN
Wig Mountain



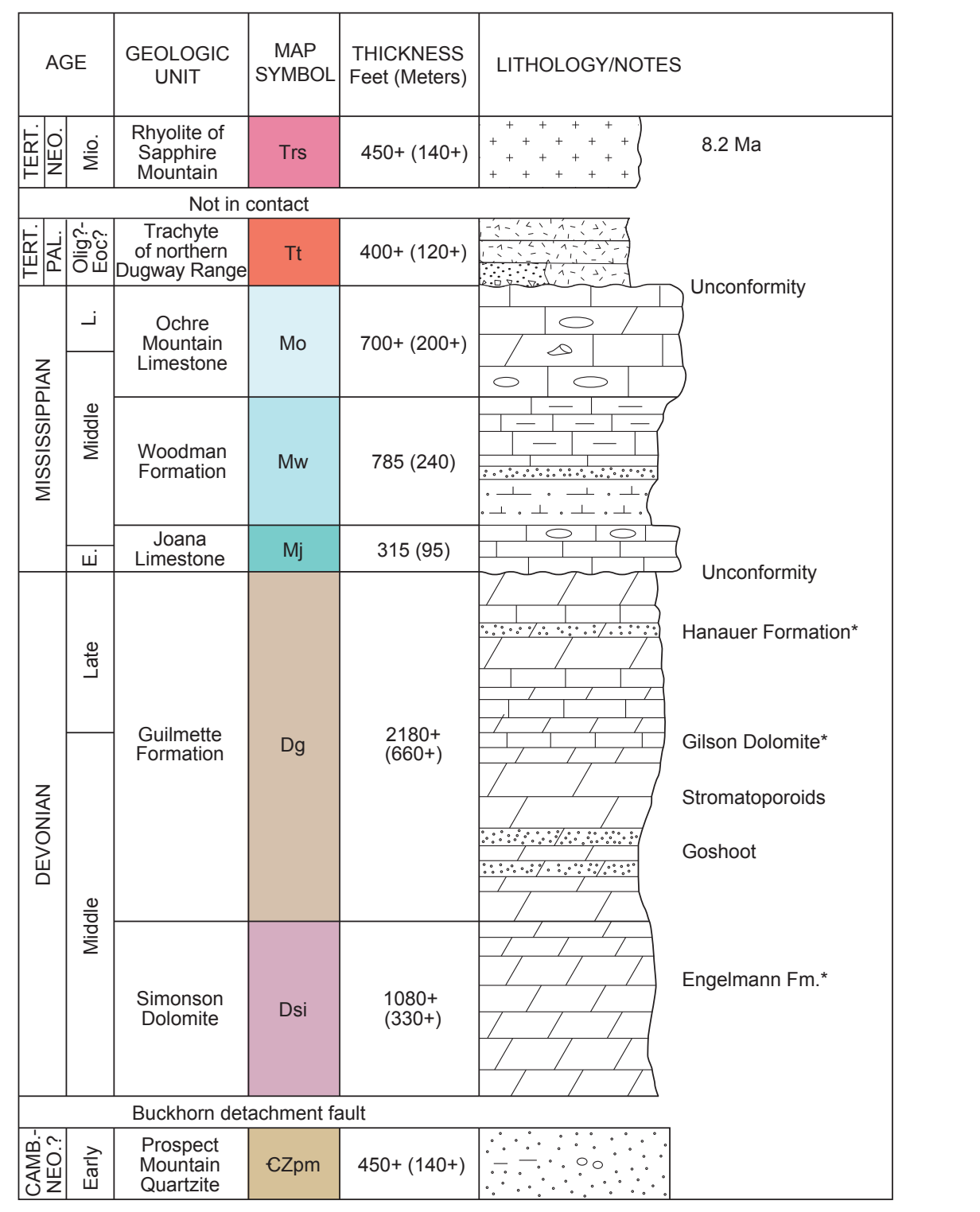
LITHOLOGIC COLUMN
Wildcat Mountain



LITHOLOGIC COLUMN
Unnamed hills (Aragonite thrust sheet)

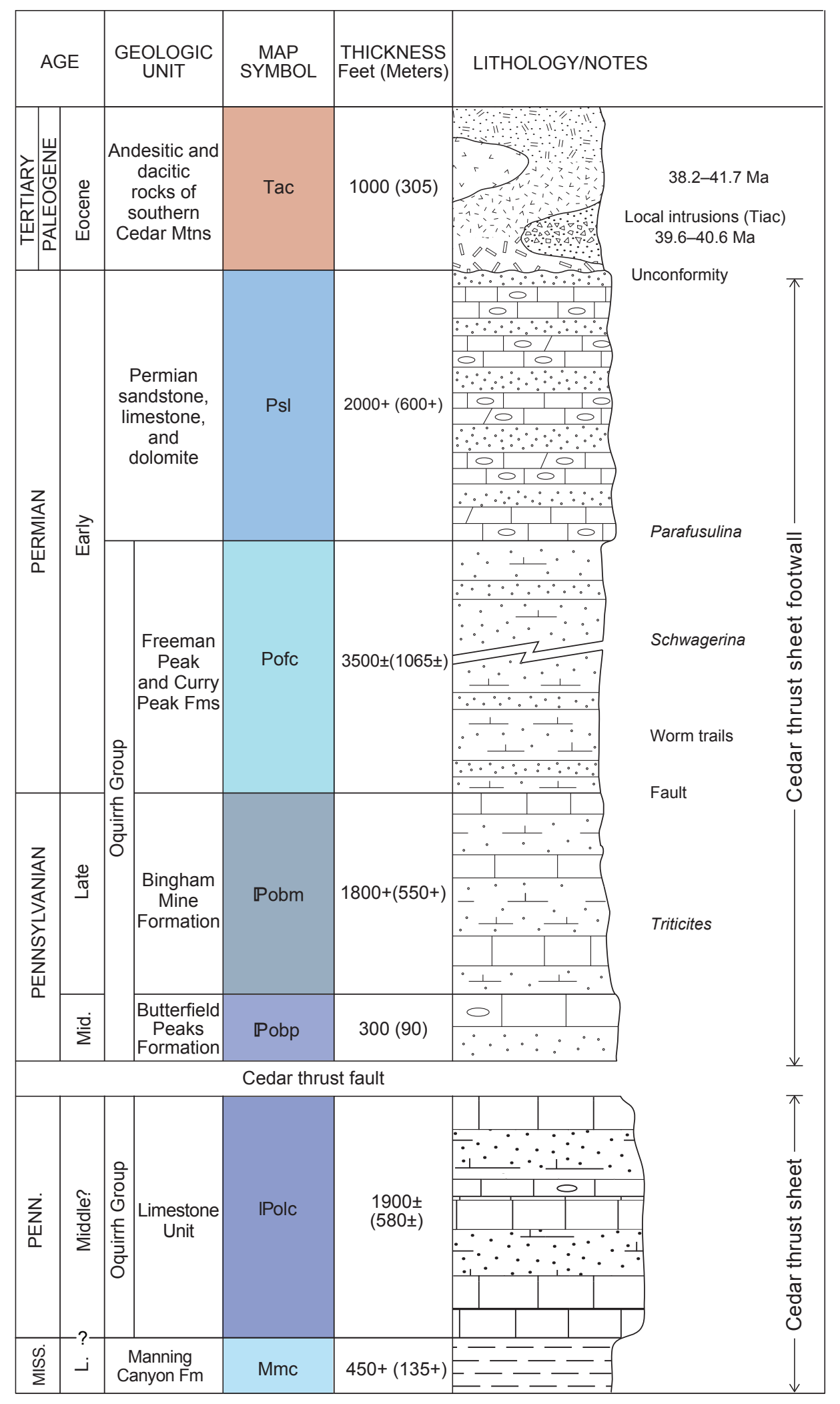


LITHOLOGIC COLUMN
Northern Dugway Range and Sapphire Mountain



*Local names of Staatz (1972) not used on this map.

LITHOLOGIC COLUMN
Southern Cedar Mountains
(Cedar thrust sheet and footwall)



INTERIM GEOLOGIC MAP OF THE WILDCAT MOUNTAIN AND EAST PART OF THE CURRIE 30' X 60' QUADRANGLES, TOOELE COUNTY, UTAH—PHASE 1

by

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OPEN-FILE REPORT 773
UTAH GEOLOGICAL SURVEY
UTAH DEPARTMENT OF NATURAL RESOURCES
2025

INTRODUCTION

The Wildcat Mountain and east part of the Currie 30' x 60' quadrangles span a remote part of southwestern Tooele County, northwest Utah (Figure 1). The map area is situated 14 miles (23 km) west of the village of Dugway, just south of Blue Lake, and includes the villages of Gold Hill and Ibapah. It is in the eastern Basin and Range Province and covers the southern Great Salt Lake Desert. In the east are Wildcat and Kittycat Mountains, part of the southern Cedar Mountains, Wig Mountain, "Granite" and Sapphire Mountains, the northern tip of the Dugway Range, and the Old River Bed terminus. On the west are the northern Deep Creek Range, Deep Creek Valley, Gold Hill area (Dutch, Ochre, Red Mountains and Clifton Hills), and parts of the Ferber and Lead Mine Hills. Most of the map area is low elevation, restricted-access military land including parts of Dugway Proving Ground (DPG) (U.S. Army) and the Utah Test and Training Range-South area (UTTR-South) (U.S. Air Force). The remaining areas are public land (Federal and State administered), private land, and a small area of the Goshute Tribal Reservation. Mining districts (in decreasing production value order) include Gold Hill, Willow Springs, Dugway, Granite Peak, and Wildcat, and the Ferber district in adjacent Nevada. Parts of the Cedar Mountains and Deep Creek Range contain Wilderness and Wilderness Study Areas, respectively. Note that the military uses the term "Granite Mountain" for an unnamed mountain on Dugway Proving Ground.

This map continues the intermediate-scale geologic mapping campaign of the Utah Geological Survey (UGS). The map represents a progress report of multi-year project to map the geology of the Wildcat Mountain 30' x 60' quadrangle and the Utah part of the Currie 30' x 60' quadrangle at 1:62,500 scale (Plate 1, Figure 1).

METHODS

The mapping of the east and central areas is compiled from the Dugway Proving Ground area map by Clark et al. (2016) with revisions, and compilation and new mapping in the western part of the map area by Clark (see Phase 1 area, Primary Sources of Geologic Mapping on Plate 2). Oviatt consulted on Quaternary deposit mapping. Christiansen was instrumental in deciphering the igneous geology of "Granite Mountain." Hardwick and Smith gathered gravity data in the western part of the map area. Page provided some of the delta distributary channel mapping data on DPG and UTTR-South. New field mapping data were collected with a field notebook, recreational-grade Global Positioning System (GPS) device, Brunton® compass, and tablet computer. In-office mapping relied on imagery from Google® and the U.S. Department of Agriculture - National Aerial Imagery Program (USDA–NAIP), lidar (Utah Geographic Resource Center [UGRC], 2020, 2022 [no coverage in U.S. Department of Defense areas]), and mapping data were compiled in ESRI ArcGIS® software in a UGS Geologic Mapping Schema (GeMS) database. Rosemary Fasselin and Subigya Shah (UGS) organized the Geographic Information System (GIS) data, while Austin Jensen and Subigya Shah organized the newly acquired lidar data.

Volcanic rock names were determined through the total alkali-silica (TAS) diagram (Le Maitre et al., 2002), while plutonic rock names were determined through the total alkali-silica (TAS) diagram of Middlemost (1994). Both rock types used major element compositions that were normalized to 100% water-free. Whole-rock major-element and trace-element data has not been compiled for release with this interim map.

We extended recent intermediate-scale geologic mapping from adjacent areas (Plate 2) including the Bonneville Salt Flats and eastern Wendover 30' x 60' quadrangles (Clark et al., 2020a, in prep.), Tooele 30' x 60' quadrangle (Clark et al., 2020b), and Rush Valley 30' x 60' quadrangle (Clark et al., 2023). This map updates prior, less detailed (1:250,000-scale) geologic maps by Stokes (1963) and Moore and Sorensen (1979). Our map area adjoins the 1:250,000-scale Elko County, Nevada, geologic map to the west (Coats, 1987).

DESCRIPTION OF MAP UNITS

QUATERNARY-TERTIARY (NEOGENE) SURFICIAL DEPOSITS

Human-Derived Deposits

Qh **Human disturbance** (historical) – Fill and disturbance from human development including Ibapah landfill, and target area and treatment ponds on Dugway Proving Ground; thickness generally less than about 10 to 20 feet (3–6 m).

Qhm **Mining disturbance** (historical) – Includes mining areas of the Gold Hill district and small sand and gravel pits; the former has disturbed land with waste rock, tailings, and exposures from past (Yellow Hammer, Clifton Shears) and active (Kiewit) mining operations; only larger areas of disturbance are mapped; most historical mining locations are too small for the map scale, for more detail see the UGS Utah Mineral Occurrence System (UMOS) database and Robinson (1993, Plate 3); thickness is variable, modern operations such as Keiwit and Yellow Hammer may have over 100 feet (30 m) of waste rock or excavation, whereas historical operations are probably less than 50 feet (15 m).

Alluvial Deposits

Qal **Stream and floodplain alluvium** (Holocene to Late Pleistocene) – Primarily sand, silt, clay, and pebble and cobble gravel deposited by streams in channels; grades into alluvium and colluvium in mountain valleys, not mapped separately; locally merges with younger alluvial-fan deposits; locally includes alluvial-fan, colluvial, low-level terrace, lacustrine, and eolian deposits too small to map separately; thickness generally less than about 20 feet (6 m).

Qam **Alluvial mud** (Holocene to Late Pleistocene) – Silt, clay, some sand, and minor gravel deposited by streams and sheet wash within former lagoonal areas related to Lake Bonneville shorelines at south and west margin of Cedar Mountains, on Wildcat Mountain, and in Bar Creek valley; bottom of lagoonal basins may include some unexposed, thin, fine-grained lacustrine deposits; thickness less than about 40 feet (12 m).

Qafy **Younger fan alluvium** (Holocene to Late Pleistocene) – Poorly sorted gravel, sand, silt, and clay; deposited by streams, debris flows, and debris floods on alluvial fans and in mountain valleys; grades to stream alluvium and alluvium and colluvium in mountain valleys; may include small areas of lacustrine fine-grained deposits below the Bonneville shoreline; includes active and inactive fans younger than Lake Bonneville (levels 1 and 2), but may include older alluvial deposits where mapped above the Bonneville shoreline; locally includes eolian silt and sand cover commonly less than 3 feet (1 m) thick; locally, unit Qafy spreads out on lake terraces and abuts Lake Bonneville shorelines even though it is not cut by these shorelines; Qafy also locally drapes over, but does not completely conceal shorelines; thickness variable, up to 50 feet (15 m) or more.

Qafo **Older fan alluvium** (Late to Middle? Pleistocene) – Poorly sorted gravel, sand, silt, and clay; similar to unit Qafy, but locally consolidated with carbonate and forms higher-level incised deposits located above the highstand of Lake Bonneville and locally etched by the lake; incised by younger alluvial deposits; may locally include small areas of lacustrine or eolian deposits; thickness possibly as much as 100 feet (30 m) or more.

QTa **Quaternary-Tertiary alluvium** (Middle Pleistocene? to Pliocene?) – Gravel and sand deposits at higher levels in highly dissected surfaces; subangular to rounded pebbles, cobbles, and boulders of local rocks; carbonate rinds common clasts; also mapped as stacked units QTa/Ts and QTa/Tsc in the western area; thickness up to 100 feet (30 m) or more.

Old River Bed Deposits

A unique feature of the map area is the Old River Bed and its associated delta complex. The Old River Bed is an abandoned river valley that extends northward into the map area from the Old River Bed topographic threshold, located at the northern edge of the Sevier Desert basin near Keg Mountain, north of Delta, Utah. The Old River Bed formed during the most recent episode of overflow from the Sevier basin (Lake Gunnison) to the Great Salt Lake Basin (Lake Bonneville) (Oviatt, 1987; Oviatt et al., 1994; Madsen et al., 2015; Bradbury et al, in review). Where the river flowed out onto the flat basin floor, a delta formed with numerous distributary channels dated at about 13,000 to 10,000 cal yr B.P. (Oviatt et al., 2003).

This delta complex was occupied by prehistoric humans that have been the focus of archeological studies (see, for example, Shaver, 1997; UGS, 2000; Madsen, 2001; Madsen et al., 2015). Additional distributary channels were observed on the mudflats southwest of the Old River Bed delta. The streams that formed these channels flowed northward from the Deep Creek/Fish Springs area west of "Granite Mountain" (see Figure 3.3 in Madsen et al., 2015). These channels have not been studied in detail, so we do not include them herein.

Channels associated with the Old River Bed delta are present on the DPG. Two types of channel systems were mapped—younger sand channels (Qasd) and older gravel channels (Qagd), described below. We mapped the main and some subsidiary channels that were directly related to the Old River Bed delta, and depicted unit Qasd solely as lines and unit Qagd as polygons. This channel mapping was simplified and modified somewhat from unpublished archeological survey reports prepared by the Desert Research Institute for the Directorate of Environmental Programs, U.S. Army DPG, and by Page (2008) and Madsen et al. (2015).

Qasd **Alluvial sand of Old River Bed delta** (Early Holocene to Late Pleistocene) – Sand and silt, locally with gravel, present in "exposed/eroded channels" (exposed due to deflation of mudflat surfaces) on mudflats north and west of Granite Peak, and in "buried/uneroded channels" (buried by eolian sand and silt) extending between the Old River Bed and the mudflats of the southern Great Salt Lake Desert; unit Qasd is represented by green-colored (exposed/eroded) and blue-colored (buried/uneroded) lines on Plate 1; finer-grained deposits associated with coarser-grained alluvial gravel of Old River Bed delta (unit Qagd); probably related to continued Sevier-basin overflow and groundwater discharge following the decline of Lake Bonneville (Figure 2); 8800 to 11,400 ^{14}C yr B.P. (about 10,000 to 13,000 cal yr B.P.) (Oviatt et al., 2003; Madsen et al., 2015); thickness to about 3 feet (1 m).

Qagd **Alluvial gravel of Old River Bed delta** (Late Pleistocene) – Coarse sand and gravel, dominated by volcanic clasts, present in topographically inverted "gravel channels" on mudflats north of Granite Peak; these "gravel channels" have a distinct morphology—straight to curved, digitate, and with abrupt bulbous ends; coarser-grained deposits associated with finer-grained alluvial sand of Old River Bed delta (unit Qasd); formed by a river delta that originated as overflow from the Sevier basin along the Old River Bed during the late regressive phases of Lake Bonneville (Figure 2), prior to 11,000 and after 12,500 ^{14}C yr B.P. (about 13,000 to 14,600 cal yr B.P.) (Oviatt et al., 2003; Madsen et al., 2015); thickness to about 12 feet (4 m).

Spring Deposits

Qsm **Spring and marsh deposits** (Holocene to Late Pleistocene) – Clay, silt, and sand that is locally organic-rich, calcareous, or saline; present in saturated (marshy) areas near springs along margins of Great Salt Lake Desert mudflats and in Deep Creek Valley; thickness uncertain, possibly less than 10 feet (3 m).

Eolian Deposits

Qes, Qes?

Eolian sand deposits (Holocene to Late Pleistocene) – Windblown sand and silt deposited as sheets and well-developed dunes and dune fields; dunes present as parabolic, linear, dome, lunette, and shrub-coppice types (see Dean, 1978); larger dune fields may include a fringe of unmapped sheet sand; mostly silty, well-sorted, fine-grained quartz and aggregates of clay, silt, and sand; generally with no distinct bedding; mapped over extensive areas of the quadrangles; also mapped in several stacked units, see descriptions below; up to 70 feet (20 m) thick.

Qei **Eolian silt** (Holocene to Late Pleistocene) – Mapped only in stacked units Qei/Qal, Qei/Qafy, Qei/QTa, Qei/Qlf, Qei/Qac, Qei/Ts?; see individual descriptions below.

Playa deposits

Qpm **Playa mud** (Holocene to Late Pleistocene) – Silt, mud, and calcareous mud present in a few low-lying areas near "Granite Mountain"; also mapped as upper part of the extensive mudflats as stacked unit Qpm/Ql, see stacked unit description below; thickness uncertain, probably up to 1 foot (0.3 m).

Lacustrine and Deltaic Deposits (Currey cycle and Bonneville lake cycle)

The map area lies in the western Bonneville basin. See Figure 2 for a hydrograph and chronology of Lake Bonneville and Great Salt Lake. Lake Bonneville shoreline elevations were reported by Crittenden (1963), Currey (1982), and Chen and Maloof (2017). See Oviatt (2015) and Oviatt and Pedone (2024) for a Lake Bonneville overview and chronology, while Oviatt and Shroder (2016) provided a recent scientific overview of Lake Bonneville. Oviatt et al. (2003) and Madsen et al. (2015) reported on the Old River Bed related to the regression of Lake Bonneville. Oviatt (2014) discussed the Gilbert-episode, which Oviatt et al. (2024) renamed the Currey cycle, of Great Salt Lake. Sediment core data from the map area are presented in Table 1.

Qdg **Deltaic gravel** (Late Pleistocene) – Well-sorted pebbly sand containing volcanic and sedimentary pebbles; sand and gravel deposited near the mouth of the Sevier River in the Old River Bed area during the Bonneville lake cycle; cross-bedded to very thick bedded; regressive deposits were locally reworked by waves into a thin sheet with delta ridge crests; to 50 feet (15 m) thick.

Qlu **Bonneville lacustrine deposits, undivided** (Late Pleistocene) – Undivided gravel, sand, silt, marl, and calcareous clay of Lake Bonneville that is interlayered and not readily mapped separately; thin to very thick bedded; may include ostracode- and gastropod-rich layers; locally can include thin eolian silt and sand deposits at surface, and small areas of pre-Lake Bonneville deposits and bedrock; very locally includes a thin veneer of shoreline gravel deposits that may be related to the Currey cycle at an elevation near 4255 feet (1297 m) (see Oviatt et al., 2024); unit Qlu is locally divided into coarse- and fine-grained deposits (units Qlg, Qls, and Qlf); thickness as much as 150 feet (45 m) or more.

Qlg, Qlg?

Lacustrine gravel (Late Pleistocene) – Sandy gravel to boulders deposited in shore zones of Lake Bonneville and Lake Currey; clasts are typically well rounded and sorted; Lake Bonneville shorelines are locally calcareous tufa-cemented and draped on bedrock (especially at the Provo shoreline); includes both Lake Bonneville transgressive and regressive phase gravels; unit may include small areas of lacustrine sand and fines, eolian silt and sand, and pre-Lake Bonneville alluvial deposits; thinner gravel deposits on bedrock are not mapped; thickness variable, about 100 feet (30 m) or more.

Qls, Qls?

Lacustrine sand (Late Pleistocene) – Sand and silt deposited in Lake Bonneville; only a few exposures near “Granite Mountain” and in Deep Creek Valley; thickness to 100 feet (30 m) or more.

Qlf, Qlf?

Lacustrine fine-grained deposits (Late Pleistocene) – Sand, silt, marl, and calcareous clay of Lake Bonneville; thin to very thick bedded; may include ostracode- and gastropod-rich layers; locally includes small areas of sand or sand and gravel; locally includes the white marl and yellow clay of Gilbert (1890); locally includes thin surficial eolian silt and sand deposits; thickness as much as 100 feet (30 m) or more.

Lacustrine deposits (Great Salt Lake, Lake Currey, Lake Bonneville, and pre-Lake Bonneville)

Ql **Lacustrine deposits, undivided** (Holocene to Early? Pleistocene) – Only mapped as lower part of stacked unit Qpm/Ql; see description below.

Mass-Movement Deposits

Qms **Landslide deposits** (Holocene to Middle Pleistocene?) – Poorly sorted clay- to boulder-size material; one small area of slide material derived from the Woodman Formation at the mouth of Christiansen Canyon, western Deep Creek Range; probably less than 100 feet (30 m) thick.

Qmct **Colluvial and talus deposits** (Holocene to Late Pleistocene) – Colluvium and blocks of talus locally present on steeper slopes and below cliffs; probably less than 20 feet (6 m) thick.

Mixed-Environment Deposits

Qla **Lacustrine and alluvial deposits** (Holocene to Late Pleistocene) – Sand, gravel, silt, and clay; consists of alluvial deposits reworked by Lake Bonneville, lacustrine deposits reworked by streams and covered by slopewash and alluvial fans, as well as alluvial and lacustrine deposits that cannot be readily differentiated at map scale; grades into other lacustrine and alluvial deposits; locally includes a thin cover of eolian deposits; thickness up to about 100 feet (30 m) or more.

Qac **Alluvial and colluvial deposits** (Holocene to Late Pleistocene) – Primarily gravel, with sand, silt, and clay; form aprons of small alluvial-fan and colluvial surfaces that spill out onto and grade into alluvial-fan deposits; also present within upland valleys; thickness generally less than 20 feet (6 m).

Qca **Colluvial and alluvial deposits** (Holocene to Late Pleistocene) – Primarily gravel, with sand, silt, and clay; forms dissected colluvial aprons around bedrock in the Pinyon Flat area west of Gold Hill; thickness generally less than 20 feet (6 m).

Qae **Alluvial and eolian deposits, undivided** (Holocene to Late Pleistocene) – Only mapped as stacked unit Qae/Qlf; see description below.

Qel **Eolian and lacustrine deposits, undivided** (Holocene to Late Pleistocene) – Only mapped as stacked unit Qel/ℙol; see description below.

Stacked-Unit Deposits

We map stacked-unit deposits that consist of a discontinuous veneer of the first unit (surficial deposits) overlying the second unit (surficial deposits or bedrock). Cover units primarily include eolian deposits (Qes and Qei) and lacustrine gravel of Lake Bonneville (Qlg). See each unit for more detailed descriptions. Thin unmapped cover materials may also be present on other geologic units throughout the map area.

Qal/Qlf **Alluvium over lacustrine fine-grained deposits** (Holocene over Late Pleistocene) – Sand, silt, clay, and some gravel in alluvial channels and sheets overlying lacustrine silt, clay, marl, and some sand; covers a large area between "Granite Mountain" and the Old River Bed; thickness of upper unit probably less than 6 feet (2 m).

QTa/Ts **Quaternary-Tertiary alluvium over Salt Lake Formation** (Middle Pleistocene?-Pliocene? over Miocene) – Mantle of gravel in a finer-grained matrix overlying unit Ts in Deep Creek Valley and Ibapah badlands areas; commonly rounded pebble- and cobble-size clasts with carbonate rinds; see unit Ts description; corresponds to unit QTs on the adjacent Georgetta Ranch 7.5' quadrangle (Nutt and Brooks, 1994) located southwest of the map area; cover unit thickness uncertain possibly as much as 6 feet (2 m) or more.

QTa/Tsc

Quaternary-Tertiary alluvium over Salt Lake Formation conglomerate (Middle Pleistocene?-Pliocene? over Miocene) – Upper part (QTa) of poorly sorted gravel, sand, silt, and clay; locally derived material similar in composition to unit Qafo, may be locally cemented with carbonate; clasts up to about 3 feet (1 m) of local sedimentary rock with carbonate rinds; forms flat-topped, high-level incised deposits located in two areas near North Pass Canyon, eastern Deep Creek Range; lower part of unit (Tsc) is very poorly exposed, light-pink cobble and pebble conglomerate with carbonate matrix; locally contains dolomite breccia blocks and pods (unit Tbx); cover unit thickness possibly as much as 300 feet (90 m), and poorly exposed Tsc up to about 200 feet (60 m).

Qes/unit (Qes/Qafy, Qes/Qlu, Qes/Qlg, Qes/Qlf, Qes/Qla, Qes/Tlw?, Qes/Psd, Qes/Pℙos)

Eolian sand over various units (Holocene to Late Pleistocene over Holocene through Late Pennsylvanian) – Windblown sand and some silt in sheets and dunes overlying various surficial-deposit and bedrock units; see individual unit descriptions for underlying units; thickness of upper unit probably less than 20 feet (6 m).

Qei/unit (Qei/Qal, Qei/Qafy, Qei/QTa, Qei/Qlf, Qei/Qac, Qei/Ts?)

Eolian silt over various units (Holocene to Late Pleistocene over Holocene through Miocene) – Windblown silt overlying various surficial-deposit and bedrock units; see individual unit descriptions for underlying units; Qei/Qlf surface locally contains distinctive vegetation stripes of uncertain origin (see Oviatt et al., 2003; West and Johnson, 2005); thickness of upper unit probably less than 6 feet (2 m).

Qpm/Ql **Playa mud over undivided lacustrine deposits** (Holocene over Late Pleistocene over Pleistocene) – A thin veneer of playa mud overlying lacustrine deposits of post-Bonneville, Lake Bonneville, and pre-Bonneville lakes; sediment types include gray-, light-brown-, and white-colored silt, mud, carbonate mud, marl, clay, and sand; playa deposits are locally saline or gypsiferous and locally cover post-Lake Bonneville alluvial channels (unit Qasd); follows recent mapping and studies in nearby areas of the Great Salt Lake Desert (Clark et al., 2020a, in prep.; Oviatt et al., 2020; Bernau et al., 2023, 2024); unit comprises the extensive mudflats of the Great Salt Lake Desert in the map area; unit

Qpm/Ql was previously mapped as eolian and alluvial deposits over lacustrine fines (Clark et al., 2016); limited data exists on the thickness of Qpm and Ql; playa mud may be only 1 to 2 inches (3–5 cm) thick, uncertain thickness of underlying lacustrine deposits (see Table 1 and references therein).

Qlg/unit (Qlg/Tlw, Qlg/Psl, Qlg/Pofc, Qlg/ℙolc, Qlg/rx)

Lacustrine gravel (Lake Bonneville) over unit (Late Pleistocene over Tertiary through Pennsylvanian?) – Sandy and pebbly gravel overlying various bedrock units; rx denotes undivided bedrock; see individual unit descriptions for underlying units; thickness of upper unit probably less than 20 feet (6 m).

Qlu/Jqm

Undivided Bonneville lacustrine deposits over Jurassic quartz monzonite of Gold Hill (Late Pleistocene over Late Jurassic) – Gravel, sand, silt, marl and calcareous clay of Lake Bonneville over bedrock unit (Jqm); cover thickness as much as 10 feet (3 m) or more.

Qae/Qlf **Alluvial and eolian deposits over lacustrine fine-grained deposits** (Holocene to Late Pleistocene over Late Pleistocene) – Sand, gravel, silt, and clay of younger fan alluvium with patchy eolian sand overlying lacustrine fines; present at "Granite Mountain," western Cedar Mountains, and Wig Mountain; cover unit thickness is probably 10 feet (3 m) or less.

Qel/ℙol **Eolian and lacustrine deposits over Oquirrh Group, limestone unit (Aragonite thrust sheet)** (Holocene to Late Pleistocene over Middle Pennsylvanian?) – Windblown sand and silt and Bonneville lacustrine gravel and sand overlying bedrock unit (ℙol); mapped in one area at northeast margin of map area; cover unit thickness is variable, but possibly as much as 10 feet (3 m).

NEOGENE-PALEOGENE (TERTIARY)

Volcanic, Plutonic, and Sedimentary Rocks of Western Area (Gold Hill district, Northern Deep Creek Range, Ferber Hills, Ibapah badlands)

Geochronologic data are summarized in Table 2.

Ts, Ts? **Salt Lake Formation, undivided** (Miocene) – Very pale orange sandstone and conglomerate, very light gray to white reworked tuff (clay-altered), tuffaceous siltstone and shale; conglomerate with clasts of the granitic rocks, Paleozoic carbonates, Paleozoic to Proterozoic quartzite, and Proterozoic schist (Nutt and Brooks, 1994); poorly indurated and exposed, forms slopes on low hills of the Deep Creek Valley and eastern Ibapah badlands areas; prior tephrochronology correlation ages of about 9.5 to 13 Ma (Perkins et al., 1998); Salt Lake Formation is correlative to the Humbolt Formation in Nevada; incomplete (exposed) thickness as much as about 100 feet (30 m); typically a few thousand feet thick in western Utah basins.

Tsc, Tsc?

Salt Lake Formation, conglomerate (Miocene) – Gray to grayish brown and locally moderate reddish orange to blood red pebble to boulder conglomerate with a sandy to silty matrix; local rhyolitic ash bed (near zircon geochronology sample); rounded clasts are locally derived from adjoining sedimentary rocks; well to poorly indurated; locally contains dolomite breccia blocks and pods (mapped separately as unit Tbx) that likely represent sedimentary breccia present in Salt Lake Formation exposures mapped elsewhere (see for example, Miller et al., 1999); crops out in Clifton quadrangle and adjacent area; U-Pb detrital zircon maximum depositional age of about 12 Ma (P. O'Sullivan, Geosep Services, unpublished data, 2024) that corresponds with tephrochronology correlation age range of Perkins et al. (1998); also mapped as part of stacked unit QTa/Tsc; Salt Lake Formation is equivalent to the Humboldt Formation in Nevada; exposed unit thickness up to about 200 feet (60 m).

Tbx **Dolomite breccia** (Miocene) – Gray-colored dolomite sedimentary breccia (and one area of recrystallized limestone) in blocks and pods located within units Tsc and QTa/Tsc; fragments in breccia are variable but typically 3 inches (8 cm) or less across of resistant sedimentary breccia of Paleozoic bedrock units (Mills et al., 2023); uncertain thickness.

Tsw **Quartz vein stockwork** (Miocene?) – Zones of stockwork quartz-carbonate-adularia veins in strongly oxidized, altered quartz monzonite (unit Jqm) [granodiorite] and an upper zone of less intense veining and alteration that composes the Kiewit disseminated gold deposit in Rodenhouse Wash-Clifton Hills, Gold Hill district (Robinson, 2016; Mills, in prep.); K-Ar age of 7.85 ± 0.8 Ma (recalculated age in USGS geochronology database, 2024) on adularia veining event from Climax shaft (Whelan, 1970); main stockwork zone about 35 to 165 feet (10–50 m) thick and roughly 1000 feet (300 m) across (Robinson, 2016).

Tib **Basaltic dikes** (Miocene?) – Dark-gray, weathering to dark-reddish-brown, aphanitic to fine-grained, potassic-trachybasalt dikes; composition similar to unit Tb; locally vesicular; olivine altered to iddingsite; crops out in a few small, typically bouldery exposures east of Overland Canyon, and also as an minor component (unmapped) of the Goshute Wash dike swarm; new geochemical data (Mills et al., 2023); no age control, but probably Miocene based on composition and field relation to 16 Ma rhyolite porphyry dike; thickness in Goshute Wash up to 6 inches (20 cm) and as much as 25 feet (8 m) east of Overland Canyon (Mills et al., 2023).

Tb **Basaltic lava flows** (Miocene?) – Dark gray weathering to reddish brown potassic trachybasalt; fine-grained with small phenocrysts of plagioclase, clinopyroxene and olivine (Robinson, 1993); forms weathered knobs in Gold Hill Wash (Gold Hill quadrangle) where it overlies unit Tlf; not in contact with Salt Lake Formation but likely of similar age; new geochemical data (this study); basalt likely too altered for reliable age dating, but regional ages are Miocene (Moore and McKee, 1983); thickness is up to 100 feet (30 m).

Tid **Igneous dikes, undivided** (Miocene to Eocene) – Dike swarm of variable composition cutting Jurassic pluton near Goshute Wash (Clifton quadrangle) and other intermediate and silicic dikes in map area (Burwell, 2018; Mills et al., 2023; Mills, in prep.; this study); U-Pb zircon age of 16.23 ± 0.26 Ma on rhyolite porphyry dike (Mills et al., 2023) and prior feldspar K-Ar age of 26.6 ± 1.2 Ma on similar composition dike nearby (Krahulec, 2017), but overall age extent uncertain; Burwell (2018) obtained U-Pb zircon ages on dikes cutting the Jurassic pluton including 17.45 ± 0.37 Ma (monzonite) and 39.95 ± 0.47 Ma (porphyritic granite); Burwell (2018) also reported undated aplite dikes and a granite dike; dikes mapped by Robinson (1993) were generally too small for our target scale or could not be located; other mapped dikes from this study are undated and this unit necessarily consists of multiple dike forming and intrusive events; dikes up to 100 feet (30 m) wide and approximately 2500 feet (750 m) in length.

Tst **Volcaniclastic sandstone and tuff** (Early Miocene) – Light brownish-gray to pale-red and dark-reddish-brown volcaniclastic sandstone and siltstone and rhyolitic tuff; rocks are water-lain locally with cross-beds, gritty and pebbly lenses of rock fragments and pumice fragments; tuff in Blood Canyon area is low density and reworked; laminated to medium bedded; poorly to well indurated forming slopes and ledges; exposures in Rodenhouse Wash and near Blood Canyon likely overlie unit Tlf (Mills et al., 2023); U-Pb detrital zircon maximum depositional age of about 19 Ma (P. O'Sullivan, Geosep Services, unpublished data, 2024); thickness up to 200 feet (60 m) (Mills et al., 2023).

Tlf, Tlf? **Intermediate lava flows** (Oligocene? or Eocene?) – Dark- to moderate-gray and reddish-gray, weathering to dark-reddish-brown and light-brown, porphyritic latite, trachyte and trachydacite lava flows; ~20 percent phenocrysts of plagioclase, potassium feldspar and hornblende; forms knobs and eroded slopes; exposed in Rodenhouse Wash, northeast of Kiewit mine, near Gold Hill Wash and Blood Canyon; new geochemical data (this study); overlies 39.2 Ma welded tuff northeast of Clifton Flat (Mills et al., 2023); unreliable $^{40}Ar/^{39}Ar$ age on plagioclase due to excess argon (K. Zanetti, NIGL, email to Clark, March 14, 2024); thickness up to about 100 feet (30 m) (Mills et al., 2023).

Tgg, Tgg?

Granite of Gold Hill (Eocene) – Light pinkish gray granite that is medium to coarsely crystalline, leucocratic to mesocratic; equigranular to locally porphyritic with alkali feldspar phenocrysts (commonly altered); biotite and hornblende (up to 20%) with accessory magnetite, apatite, titanite, and zircon (Robinson, 1993); contains xenoliths of diorite; a more mafic phase is unit Tdi, (diorite); forms knobs and slopes northwest of Gold Hill village; queried in exposures at Pinyon Flat pending geochemical and geochronologic data; contact with unit Jqm is not exposed along Gold Hill Wash and may cut unit Tvf at Pinyon Flat; new geochemical data (Mills, in prep.; this study); prior K-Ar ages 38 to 44 Ma (Armstrong, 1970; Stacey and Zartman, 1978; Moore and McKee, 1983); preferred emplacement ages from U-Pb zircon of 38.16 ± 0.45 Ma (King and Burwell, unpublished report, 2016), and U-Pb zircon and apatite of 38 ± 0.83 and 38.07 ± 6.79 Ma, respectively (White, 2023); roughly 5 square miles (14 km^2) in exposed extent.

The granite of Gold Hill has nearly identical age and compositional similarities to the granite of Ferber Flat (King and Burwell, unpublished report, 2016) that crops outside of the map area at the Ferber mining district, Nevada (see Krahulec, 2018); new geochemical data (this study); Coats (1987) mapped as Cretaceous granite?, but U-Pb zircon ages of 39.43 ± 0.56 Ma (King and Burwell, unpublished report, 2016) and about 39 Ma (P. O'Sullivan, Geosep Services, unpublished data, 2024 for this study) show it is also Eocene in age.

Tvf, Tvf?

Volcanic rocks of Ferber Hills-Pinyon Flat (Eocene) – Interlayered gray- to red-colored lahars, lava flows, and tuffs of intermediate composition; forms knobs and slopes mapped between stocks of the granite of Gold Hill and granite of Ferber Flat in Nevada; new geochemical data (this study); prior ages on rocks that overlie and cut the White Sage Formation and unconformable on deformed Permian strata—K-Ar age on latite breccia of 39.2 ± 0.6 Ma (Moore and McKee, 1983) and ^{40}Ar/^{39}Ar ages on dacite flow of 39.6 ± 0.2 Ma and rhyolitic intrusion 39.58 ± 0.6 Ma (see Figure 2, Potter et al., 1995; Dubiel et al., 1996); a single exposure of welded tuff near Gold Hill Wash (Clifton quadrangle) yielded a ^{40}Ar/^{39}Ar age of 39.15 ± 0.09 Ma (K. Zanetti, NIGL, unpublished data, 2024); unit is unconformable on White Sage Formation; exposed thickness up to about 500 feet (150 m).

Tdi **Diorite** (Eocene) – Moderate gray diorite; fine to medium crystalline, mesocratic to melanocratic, equigranular; a more mafic phase of unit Tgg in two small exposures in and near Pool Canyon, Dutch Mountain; new geochemical data (this study); U-Pb zircon age of 40.08 ± 0.56 Ma (King and Burwell, unpublished report, 2016) indicates that unit Tgg is younger.

A similar diorite phase at Ferber Flat, Nevada (outside of map area) had a U-Pb zircon age of 39.41 ± 0.51 Ma (King and Burwell, unpublished report, 2016).

Tws **White Sage Formation** (Eocene, Wasatchian) – An upper sequence of carbonate rocks overlying a basal conglomerate (Nolan, 1935); Potter et al. (1995) and Dubiel et al. (1996) identified four lithofacies (descending): (1) white fine-grained dolomite, unbedded to thin and very thin bedded, chippy weathering, local black chert lenses and nodules, unfossiliferous; (2) carbonate mounds consisting of tan micritic limestone with locally abundant ostracodes and charophyte stem fragments, commonly developed on basal conglomerate and locally bedrock, elsewhere mounds are interbedded with the underlying carbonate lithofacies; (3) white to tan micritic limestone and carbonate mudstone, thin to thick bedded, with ostracodes, charophyte stems, and mollusks locally abundant, interbedded with gray calcareous claystone and dark gray organic sandy mudstone; (4) basal gray conglomerate with pebbles to boulders of Paleozoic carbonate clasts and minor siliciclastic pebbles, mostly clast supported, medium to thick beds, local thin interbeds of reddish orange sandstone and gray claystone, grades upward into conglomeratic limestone, lithofacies as much as 100 feet (30 m) thick; formation crops out as ledges, cliffs and slopes generally along Deep Creek west of Gold Hill; molluscan biostratigraphy indicated correspondence to the Wasatchian North American Land Mammal age ([Ypresian European age], see Woodburn, 1987; now ~ 48 to 56 Ma); deposited in marginal-lacustrine, lacustrine, freshwater-marsh, and minor terrestrial environments; unconformably overlain by unit Tvf but contact is generally not well exposed; thickness is up to 500 feet (150 m) (Dubiel et al., 1996).

Tj **Jasperoid** (Tertiary?) –Dark-red to dark-brown to black jasperoid composed of pervasive silica replacement and iron oxide alteration that obscures primary sedimentary strata; outcrops are resistant and locally brecciated and vuggy, and can contain clasts of unaltered rock in a siliceous matrix; forms cliffs, knobs, and ledges in Gold Hill district (Mills, in prep.); only larger exposures are mapped; commonly occurs along faults of various ages and orientations but actual ages are lacking; thickness highly variable.

Ta **Alteration at Rodenhouse Wash** (Tertiary?) – Zone of sericitic to argillic alteration with local stockwork to breccia within quartz monzonite of Gold Hill (unit Jqm), developed near Rodenhouse Wash of Gold Hill district (Mills, in prep.); uncertain thickness.

Volcanic and Sedimentary Rocks of Southeastern Area ("Granite Mountain," Sapphire Mountain, Northern Dugway Range)

Trs **Rhyolite of Sapphire Mountain** (Late Miocene) – Pale-red, weathering to dark-yellowish-brown and moderate-red, porphyritic rhyolite lava flow or flows; contains about 10% phenocrysts of quartz, sanidine, and minor biotite in an aphanitic groundmass; locally includes flow breccia; forms cliffy exposures at Sapphire Mountain; ^{40}Ar/^{39}Ar age of 8.20 ± 0.05 Ma on sanidine (UGS & NMGRL, 2007; Clark et al., 2009a); incomplete thickness is 450 feet (140 m).

Trd **Rhyolitic dikes of "Granite Mountain"** (Late Miocene) – Grayish-orange, weathering to dark-yellowish-brown, porphyritic rhyolite with phenocrysts of feldspar and biotite; cross-cuts granite (unit Jg), granodiorite (unit Jgd), and pegmatite dikes; mapped as red lines on Plate 1; prior K-Ar age of 13 Ma (Moore and McKee, 1983), ^{40}Ar/^{39}Ar age of 7.78 ± 0.05 Ma on sanidine (UGS & NMGRL, 2007; Clark et al., 2009a); dikes probably related to rhyolite of Sapphire Mountain; width up to 30 feet (10 m).

Tt **Trachyte flows of northern Dugway Range** (Oligocene? to Eocene?) – Gray to reddish-brown aphanitic to porphyritic trachyte and tephriphonolite lava flows (rhyodacite of Staatz, 1972); locally with phenocrysts of quartz, plagioclase, biotite, and amphibole; locally vesicular, highly oxidized and devitrified; exposures present along Buckhorn detachment fault; also includes small areas of flow breccia and associated tuffs (see Staatz and Carr, 1964; Staatz, 1972; Kelley et al., 1987; Kelley and Yambrick, 1988; Klatt, 2006); age estimate of 36? Ma (Lindsey, 1979); UGS obtained unreliable ^{40}Ar/^{39}Ar radiometric age (Lisa Peters, New Mexico Geochronology Research Laboratory, written communication, 2008); incomplete thickness up to 400 feet (120 m).

Tbb **Breccia body** (Tertiary?) – Heterogeneous jumbled bedrock blocks and fragments in a reddish, clayey, calcareous matrix (possible breccia pipe) in one northern Dugway Range exposure; blocks are primarily limestone and siltstone of the Woodman Formation (Mw), but in places include fragments of limestone from the Ochre Mountain Limestone (Mo) and Joana Limestone (Mj) (Staatz, 1972); cuts unit Mj; age unknown, assumed Tertiary; Staatz (1972) mapped as intrusive breccia; circular exposure is about 500 feet (150 m) in diameter.

Volcanic and Sedimentary Rocks of Northeastern Area (Wildcat Mountain and Southern Cedar Mountains)

Tlw, Tlw?

Latitic rocks of Wildcat Mountain (Oligocene? to Eocene?) – Dark- to moderate-gray and pale-red latite lava flows and dark-gray trachydacite intrusions associated with local vents; exposed on west side of Wildcat Mountain; rocks are porphyritic to aphanitic and locally vesicular; blocky exposures commonly draped with lacustrine gravel and eolian sand; geochemical data, but no age data obtained (Clark et al., 2016); mostly mapped as stacked units Qlg/Tlw and Qes/Tlw?, and queried in exposures that were not directly inspected; incomplete exposed thickness up to 120 feet (40 m).

Tls **Tertiary limestone** (Pliocene? to Eocene?) – Light grayish-brown lacustrine limestone and travertine; locally cherty or silicified; poorly bedded; mapped in two areas in northeast part of map area; also present to north in adjacent Bonneville Salt Flats 30' x 60' (Clark et al., 2020a, in prep.); previously mapped as lacustrine tufa (Clark et al., 2016); no direct age data, could correlate with part of Salt Lake Formation or older Tertiary rocks; thickness as much as 20 feet (6 m).

Tac **Andesitic and dacitic rocks of southern Cedar Mountains** (Eocene) – Dark- to light-gray and pale-red lava flows interlayered with lahars and less common tuffs; lava flows are porphyritic to aphanitic; phenocrysts include feldspar, quartz, and biotite; lahars contain clasts of intermediate volcanic rocks up to 4 feet (1.2 m) across; variously welded ash-flow tuffs contain phenocrysts of feldspar, hornblende, and biotite; calc-alkaline affinities are similar to those of Oligocene-Eocene rocks in the region (Clark, 2015; Clark et al., 2016); forms slopes to cliffs; erupted from local vents mapped as unit Tiac; ^{40}Ar/^{39}Ar ages of 38.17 ± 0.47 and 40.66 ± 0.45 (groundmass) and 41.73 ± 0.24 Ma (hornblende) (UGS & NMGRL, 2009b; Clark et al., 2016); exposed thickness to 1000 feet (305 m).

Tiac **Andesitic intrusions of southern Cedar Mountains** (Eocene) – Dark-gray porphyritic to aphanitic andesitic intrusions associated with local vents for extrusive calc-alkaline volcanic rocks (unit Tac); locally contains phenocrysts of feldspar, hornblende, and lesser biotite; noteworthy columnar jointing of exposures common—particularly at Devils Postpile (subvertical) and for Six Horse Pass (horizontal); Devils Postpile was previously called Moronis Postpile (Maurer, 1970); ^{40}Ar/^{39}Ar ages of 39.55 ± 0.22 Ma (groundmass) from Devils Postpile and 40.61 ± 0.78 Ma (groundmass) from Tabbys Peak just east of map area (UGS & NMGRL, 2009b; Clark et al., 2016); exposures to 1600 feet (490 m) across.

JURASSIC TO NEOPROTEROZOIC ROCK UNITS OF THE WESTERN AND SOUTHEASTERN AREA (Gold Hill district, Northern Deep Creek Range, Ferber Hills, "Granite Mountain," Sapphire Mountain, Northern Dugway Range, Wig Mountain)

JURASSIC

Jqm, Jqm?

Quartz monzonite of Gold Hill (Late Jurassic) – Pluton of light-gray, weathering to white and reddish brown, biotite-hornblende quartz monzonite and locally including a pyroxene-rich phase; rock is equigranular to locally porphyritic, medium- to coarsely crystalline, mesocratic to melanocratic, commonly with distinctive pink and violet to light purple alkali feldspars (20%-25%); other larger grains include plagioclase (40%-50%), quartz (10%-15%), hornblende (5%-10%) and biotite (5%-10%); locally with dark gray mafic enclaves from several centimeters to meters wide (Robinson, 1993; Burwell, 2018); crops out from the Clifton Hills to the Gold Hill area, forms cliffs and slopes; geochemically it is quartz monzonite (Mills et al., 2023; Mills, in prep.) in agreement with data from Burwell (2018); average biotite K-Ar age of 155 Ma (Stacy and Zartman, 1978; revised using new decay constants); younger K-Ar ages at Gold Hill village of about 40 Ma (Armstrong, 1970; Moore and McKee, 1983) likely due to resetting of biotite; U-Pb zircon ages of 156.10 ± 1.8 (main phase) and 155.40 ± 1.8 Ma (pyroxene-rich phase) (Burwell, 2018), and U-Pb zircon and apatite ages of 152.29 ± 1.4 and 152.66 ± 7.83 Ma, respectively (White, 2023); intrusive contact with upper Paleozoic sedimentary units is surrounded by a broad alteration zone about 30 to 300 feet (10–100 m) wide (see Mills, in prep.); the pluton is cut by the Goshute Wash dike swarm (unit Tid) near Goshute Wash in Clifton Hills (Mills et al., 2023) and other granite and aplite dikes (Burwell, 2018); roughly 33 square miles (86 km^2) in exposed extent.

Jgu, Jgu?

Granite and foliated granodiorite of "Granite Mountain," undivided (Late Jurassic) – A few areas of foliated granodiorite (unit Jgd) with sills and dikes of granite (unit Jg) exposed in the central and western part of "granite mountain"; see descriptions for Jgd and Jg below.

Jgd **Foliated granodiorite of "Granite Mountain"** (Late Jurassic) − Medium-light-gray to medium-gray granodiorite with variable chemical composition (decreasing silica) to quartz monzonite, monzonite, diorite, and monzodiorite; primary minerals (decreasing abundance) include plagioclase, quartz, alkali-feldspar, biotite, amphibole, and muscovite (Fowkes, 1964; Christiansen et al., 2007; Jensen et al., 2007); rock is weakly to strongly foliated, contains uncommon dark xenoliths and local large feldspar crystals; cut by numerous unmapped, white, beryl-bearing pegmatite dikes in various forms (Fowkes, 1964; Clark et al., 2009a) with K-Ar age of 30.9 ± 0.2 (Whelan, 1970), dikes as much as 100 feet (30 m) thick; also cut by uncommon rhyolite dikes (unit Trd), dacite and latite dikes (unmapped and undated), as well as aplite dikes and quartz veins; geochemical data reported by Clark (2015) and Clark et al. (2009, 2016); Jensen et al. (2007) and Clark et al. (2009) provided isotopic data on granodiorite; granodiorite is believed to be altered upper part of granite intrusion (unit Jg) (Clark and Christiansen, 2006; Christiansen et al., 2007; Jensen et al., 2007); forms rounded to blocky exposures in central part of mountain; some fault and fracture zones in granodiorite and associated granite (unit Jg) are mineralized with hematite and lesser amounts of base metal-bearing minerals; U-Pb zircon age of 149.8 ± 1.3 Ma (Clark and Christiansen, 2006; Christiansen et al., 2007; Jensen et al., 2007; Christiansen and Vervoort, 2009); ^{40}Ar/^{39}Ar thermochronological cooling ages of 15.97 ± 0.04 Ma on biotite and 27.13 ± 0.05 Ma on K-feldspar constrain the exhumation history (Clark et al., 2009a; UGS & NMGRL, 2009a); roughly 10 square miles (25 km^2) in exposed extent.

Jg **Granite of "Granite Mountain"** (Late Jurassic) − White (leucocratic) granite that weathers to pale-orange and moderate- yellowish-brown; primary minerals (decreasing abundance) include quartz, plagioclase, alkali-feldspar, muscovite, and biotite (Fowkes, 1964; Christiansen et al., 2007; Jensen et al., 2007); locally includes dark schistose xenoliths and large potassium feldspar crystals; generally weakly foliated, except in northeastern exposures where strong flow foliation exists in upper part near contact with foliated granodiorite; cut by a few pegmatite dikes, other dikes (rhyolite [Trd] and unmapped/undated dacite and latite dikes), and aplite dikes and quartz veins; forms rounded to blocky exposures at the north end of "Granite Mountain"; K-Ar age of 14.2 ± 0.6 Ma (Moore and McKee, 1983) is presumably reset; U-Pb zircon age of 148.8 ± 1.3 Ma (Clark and Christiansen, 2006; Christiansen et al., 2007; Jensen et al., 2007; Christiansen and Vervoort, 2009; Clark et al., 2009a); ^{40}Ar/^{39}Ar thermochronological cooling ages of 13.69 ± 0.12 Ma on muscovite and 19.14 ± 0.08 Ma K-feldspar constrain the exhumation history (Clark et al., 2009a; UGS & NMGRL, 2009a); roughly 11 square miles (28 km^2) in exposed extent.

PERMIAN

Pge **Gerster Formation** (Middle Permian) – Brownish gray weathering to yellowish-brown or pink interbedded limestone and dolomitic limestone; limestone is generally sandy, argillaceous, cherty, and bioclastic; thin to medium bedded; forms ledges in Ferber Hills from Gerster Gulch to Ferber Wash; fossiliferous with microfossils (conodont, foraminifera, bryozoa) and megafossils of brachiopods with spirifer varieties that indicate a Wordian age (Nolan, 1935; Bissell, 1962; Marcantel, 1975; Wardlaw et al., 1979; Wardlaw, 2015); the Gerster and underlying units through the Grandeur (former Kaibab) have been included in the Park City Group (Hose and Repenning, 1959; Wardlaw et al., 1979; Wardlaw, 2015), but UGS does not use this group terminology; thickness is 425 to 600 feet (130–180 m) (Nolan, 1935; Hodgkinson, 1961; Bissell, 1962).

Ppy **Plympton Formation** (Middle to Early? Permian) – Gray-colored dolomite and cherty dolomite; dolomite is finely to coarsely crystalline, while chert occurs as layers, lenses, and masses; unit includes an unmapped tongue of the Gerster Formation (see Hodgkinson, 1961; Bissell, 1962; Browning, 1973; Marcantel, 1975); fossils indicate a Wordian to Roadian age (Wardlaw et al., 1979; Wardlaw, 2015); thin slope (< 40 feet, 12 m) at base of unit may represent the Meade Peak Tongue of the Phosphoria Formation (see Wardlaw et al., 1979; Maughan, 1979), but poor exposures preclude definitive assignment; formations underlying the Gerster were included by Nolan (1935) in the Oquirrh Formation which is now subdivided as several units from the Plympton Formation through Ely Limestone (see Bissell, 1962; this study); thickness is 1200 feet (365 m) (this study), although lesser thicknesses are reported (Hodgkinson, 1961; Browning, 1973).

Pgr, Pgr?

Grandeur Formation (Early Permian) – Light- to moderate-gray cherty limestone and dolomite; limestone is finely crystalline to bioclastic, dolomite is finely to coarsely crystalline; light gray to brown-colored chert in thin layers and blebs and nodules; thick to very thick bedded (Bissell, 1962); forms a cliffy interval above the less resistant Arcturus in exposures east and west of Deep Creek; fossils indicate a Leonardian/Kungurian age (Baird, 1975; Wardlaw, 2015); may be unconformable on underlying Arcturus; unit has been called Kaibab Formation/Limestone in older studies of eastern Nevada and western Utah, but we use Grandeur Formation terminology considering lithology, extent, and age issues; thickness near 245 feet (75 m) (Hodgkinson, 1961; Bissell, 1962; Baird, 1975).

Pa **Arcturus Formation** (Early Permian) – Repetitively interbedded gray-colored dolomite and limestone that is locally sandy, cherty, and bioclastic, and yellow- to orange- to brown-colored calcareous sandstone; bedding is typically thin to medium, forms ledges and slopes; the upper part is thinner bedded and less resistant than underlying parts; Hodgkinson (1961) and Bissell (1962) reported a medial interval of white-weathering alabaster-like gypsum and fine-grained orthoquartzite at Ferber Wash, but this has not been observed in incomplete sections; fusulinid microfossils are locally common and indicate a Leonardian age (Hodgkinson, 1961; Bissell, 1962; Stevens, 1979; Stevens et al., 1979); we use the formation name Arcturus, but a multitude of names have been applied to this interval here, and Silberling and Nichols (2002) correctly stated the need for modern regional stratigraphic studies; incomplete thickness up to about 2500 feet (760 m); Hodgkinson (1961) and Bissell (1962) reported about 2225 feet (680 m) from probable faulted section in Ferber Hills; Berge (1960) noted 682 feet (208 m) of incomplete Pequop Formation with no overlying Loray Formation (correlative units) at Ferguson Mountain, Nevada; Nutt and Thorman (1994) gave about 2490 feet (760 m) in the Weaver Canyon quadrangle Nevada-Utah area; minimum thickness of 1395 feet (425 m) in the Kinsley Mountains, Nevada (Muntean et al., 2017); near 3000 feet (915 m) thick in the Confusion Range, Utah (Hose and Repenning, 1959).

Pℙfs, Pℙfs?

Ferguson Mountain Formation and Strathearn Formation, undivided (Early Permian to Late Pennsylvanian?) – Combined unit composed of Ferguson Mountain Formation with a thin basal Strathearn; ***Ferguson Mountain*** is light to moderate gray limestone and dolomite cyclicly interbedded with dark-gray, weathering to light brown, reddish brown and pale red calcareous siltstone and sandstone; some sections have more siltstone and sandstone and less carbonate; limestone and dolomite can be fossiliferous and cherty; bedding is laminated to thick; ***Strathearn*** is light gray weathering to light- and dark-brown calcareous sandstone that locally displays cross beds and wavey laminae, and at Blood Mountain is tan, and gray cherty and sandy dolomite; thin bedded; forming low ledges that are locally exposed; combined unit forms ledges, cliffs and slopes in sections that are commonly structurally deformed in the hanging wall of the Ferguson detachment; unconformably overlies the Ely Limestone in the Gold Hill and Wendover areas (Bissell, 1964; Schneyer, 1990); unit previously included in the Oquirrh Formation of Nolan (1935); the basal Strathearn is from 6 to 13 feet (2–4 m thick); accurate thickness of Ferguson Mountain Formation is difficult to determine due to structural complications, probably near 3000 feet (915 m); 1715 feet (525 m) reported at Twin Peaks (Hodgkinson, 1961, with uncertain details); complete thicknesses of 2200 to 3095 feet (670–945 m) measured at type sections in Nevada where lower contact is uncertain (see Steele, 1959, 1960; Berge, 1960; Hodgkinson, 1961; Slade, 1961; Bissell, 1962; Zabriske, 1970).

Prior fusulinid fossil studies near Gold Hill indicated the Ferguson Mountain Formation is Late Wolfcampian to Virgilian at Twin Peaks (Hodgkinson, 1961; Zabriske, 1970) and the lower part is Wolfcampian at the Owl Hills No. 1 exploration well in Nevada (Bissell, 1964); at Ferguson Mountain Nevada the formation appears to span from the early Leonardian to Missourian?, but the lower contact is uncertain (Steele, 1959; 1960; Berge, 1960; Slade, 1961; Bissell, 1962; Stevens et al., 1979); recently collected samples from the lower Ferguson Mountain Formation at Blood Mountain were devoid of conodonts (S.M. Ritter, BYU, emails to Clark, 2023-24); the Strathearn is not well dated but possibly Late Pennsylvanian as the underlying upper Ely is DesMoinesian (Bissell, 1964; Schneyer, 1990; Clark et al., 2020a).

PENNSYLVANIAN-MISSISSIPPIAN

ℙe, ℙe?

Ely Limestone (Middle-Early Pennsylvanian to Late Mississippian) – Moderate-gray to blue-gray limestone and dolomite with lesser sandy limestone, and interbedded light-brown-weathering dark-gray calcareous siltstone and sandstone; locally thin light-brown sandstone interbeds and wispy sand laminae; locally cherty (gray and black) and fossiliferous; bedding is thin to very thick; cyclic character that forms cliffs, ledges, slopes; locally can be difficult to differentiate from the Ochre Mountain Limestone, particularly in structurally complex areas; Robinson (1993) reported that Ely exposures to the north have a greater percentage of sandstone than the carbonate rocks; macrofossils (brachiopods, bryozoa, echinoderms, corals), fusulinids, and conodonts are reported in the Gold Hill district (Nolan, 1935; Harris in Robinson, 1993); Middle-Early Pennsylvanian fusulinids are reported from equivalent strata nearby in Nevada (Slade, 1961; Bissell, 1964) and lower age extent from Sadlick (1965); recently collected samples from the upper Ely at Blood Mountain were barren of conodonts (S. Ritter, Brigham Young University, emails to Clark, 2023–2024); in part corresponds to Nolan's (1935) Oquirrh Formation, but subsequent studies revised the age and nomenclature, yet we do not use the terminology of Bissell (1964) that has not been widely accepted; contact with underlying Chainman Shale is locally faulted; uncertain thickness, up to about 1400 feet (425 m) exposed in map area (Robinson, 1993; this study).

MISSISSIPPIAN

Mc **Chainman Shale** (Late Mississippian) – Black to gray fissile shale with interbedded gray to brown fine-grained sandstone, and dark-gray to black micritic limestone; weathered surfaces are commonly stained light reddish brown, dark red, and black; bedding is laminated to medium; forms slopes and occasional ledges; considered Chesterian in age from macrofossils at Gold Hill and regionally (Nolan, 1935; Sadlick, 1965); this mechanically weak formation is a zone of decollement and detachment (Nolan, 1935; Welsh, 1984, 1994; Robinson, 1993; Ketner et al., 1998; Silberling and Nichols, 2002); contact with underlying Ochre Mountain Formation may be conformable or faulted; incomplete exposed thickness as much as 450 feet (140 m) near the Midas mine, Clifton Hills; possibly thicker west of Gold Hill village (Nolan, 1935).

Mo, Mo?

Ochre Mountain Limestone (Late to Middle Mississippian) – Dark-blue and dark-gray to blue-gray limestone that is locally cherty and fossiliferous; includes minor interbeds of fine-grained quartz arenite; locally includes an unmapped dark gray shale interval(s) (see Harmala, 1982); limestone with common and locally abundant stringers and nodules of light-gray and black chert; thin to very thick bedded forming cliffs and ledges; outcrops are locally highly fractured and riddled with calcite veins, contain intraformational breccias (probably of tectonic origin), and locally altered (Robinson, 1993); formation can be very difficult to differentiate from the Ely Limestone, particularly in structurally complex areas (Mills et al., 2023); Chamberlain (1981) and Harmala (1982) conducted biostratigraphic studies (macro and microfossils) in the Gold Hill quadrangle that indicate the formation is incomplete, and a section in the extreme southwest corner of the quadrangle yielded Chesterian-Meramecian fossils (Chamberlain, 1981); Robinson (1993) reports the lower formation contact is commonly a sub-horizontal fault, either the Ochre Mountain thrust or a low-angle normal fault;

thickness affected by structural complications, but Harmala (1982) reported about 1050 feet (320 m) at Ochre Mountain and Robinson (1993) reported an uncertain 1475 feet (450 m) in the Gold Hill quadrangle; incomplete thicknesses of 700 feet (200 m) at northern Dugway Range (Staatz, 1972), and 650 feet (200 m) at Wig Mountain (this study).

Mw **Woodman Formation** (Middle Mississippian) – Light-brown to light-gray, platy, calcareous siltstone and sandstone, and gray sandy to silty, micritic limestone that can be cherty and fossiliferous; unmapped basal Delle Phosphatic Member is phosphatic organic-rich siltstone, shale, and phosphorite with lenticular limestone (Harmala, 1982; Sandberg and Gutschick, 1984; Poole and Sandberg, 1991; Robinson, 1993); bedding is typically laminated to thin; forms chippy slopes and some ledges; fossils indicate age is Meramacian and Osagean in the northern Deep Creek Mountains and Dugway Range; Woodman correlated to the Humbug Formation (part) and Deseret Limestone of north-central Utah (Poole and Sandberg, 1991); Robinson (1993) reported a low-angle fault at the base, but the base is regionally an unconformity; Delle Member thicknesses of 33 to 58 feet (10–18 m) (Harmala, 1982; Poole and Sandberg, 1991); incomplete, exposed formation thickness is uncertain, but Nolan (1935) estimated <1500 feet (455 m); incomplete estimated thicknesses of 1000 (300 m) and 1180 feet (360 m) in Deep Creek-Gold Hill area (Rodgers, 1989; Robinson, 1993), 785 feet (240 m) at northern Dugway Range (Staatz, 1972), and 1000 feet (300 m) at Wig Mountain.

Mj, Mj? **Joana Limestone** (Early to Middle Mississippian) – Moderate-gray limestone and fossiliferous limestone that is fine grained, locally with some chert; thin to very thick bedded and forms ledges; age is Osagean to Kinderhookian (Poole and Sandberg, 1991); Staatz (1972) mapped as Madison Limestone equivalent in northern Dugway Range; overlies Guilmette Formation in unconformity or fault contact; no intervening Pilot Shale is reported in the White Horse Pass area, Nevada (Harmala, 1982; Silberling and Nichols, 2002); potentially complete thickness of 315 feet (95 m) at northern Dugway Range (Staatz, 1972), and 200 feet (60 m) in attenuated exposures at Wig Mountain (this study); thickness (unfaulted or faulted) is 370 to 395 feet (115–120 m) in the Gold Hill-northern Deep Creek Range area (Harmala, 1982; Poole and Sandberg, 1991; Robinson, 1993); Sandberg (in Harmala, 1982, p. 24) reported that the Joana is mapped with the Guilmette Formation at Guilmette Gulch, northern Deep Creek Range, but we did not field check.

DEVONIAN

Dg, Dg?

Guilmette Formation (Late to Middle Devonian) – Light- to dark-gray weathering to brown, irregularly dolomitized limestone; uncommon laminations near base of unit; minor brown fine-grained sandstone; thick to very thick bedded; forms ledges, slopes, and cliffs (Nolan, 1935; Rodgers, 1989); gray to white dolomitic marble where altered by the Eocene granite stock at Pool Canyon, Dutch Mountain (Harmala, 1982; Robinson, 1993); in the northern Dugway Range upper and lower parts have a greater percentage of interbedded sandstone, and *Amphipora* (stromatoporoid) fossils common in some dolomite beds of middle part (Staatz, 1972); local formation names of Staatz (1972) not used on this map; Wig Mountain exposures are primarily dolomite with some sandstone beds near top; Sandberg and Morrow (2009) and Sandberg (in Hintze and Kowallis, 2021, p. 37) reported the presence of the Fox Mountain Formation (basal breccia member of Guilmette Formation in western Utah), but these lithofacies have not been recognized to date in the map area and further evaluation is needed; 890 to 1400 (270–425 m) thick in northern Deep Creek Range (Nolan, 1935; Rodgers, 1989) and 2180 feet (660 m) thick at northern Dugway Range (Staatz, 1972); incomplete thicknesses of 220 feet (67 m) at Pool Canyon, Dutch Mountain (Harmala, 1982; Robinson, 1993), and about 200 to 800 feet (60–250 m) at Wig Mountain (this study).

Dsi, Dsi?

Simonson Dolomite (Middle Devonian) – Dark-gray to light brown, evenly laminated dolomite that is finely crystalline; typically medium to very thick bedded, forms resistant ledges (Nolan, 1935; Staatz, 1972; Rodgers, 1989; this study); local name of Staatz (1972) not used on this map; unconformably overlies the Sevy Dolomite; complete thickness near 1000 feet (305 m) in northern Deep Creek Range (Nolan, 1935; Rodgers, 1987); incomplete thickness of 1080 feet (330 m) at northern Dugway Range (Staatz, 1972), and attenuated at Wig Mountain where 350 feet (105 m) thick (this study).

Dsy **Sevy Dolomite** (Early Devonian) – Moderate gray, weathering light gray dolomite with distinctive laminated surface texture; thin to medium bedded forming ledges and slopes; unconformably overlies the Laketown Dolomite; complete thickness is 450 to 650 feet (135–200 m) in northern Deep Creek Range (Nolan, 1935; Rodgers, 1989), and incomplete, attenuated thickness of 350 feet (105 m) at Wig Mountain (this study).

SILURIAN-ORDOVICIAN

SOle **Laketown Dolomite and Ely Springs Dolomite, undivided** (Silurian to Late Ordovician) – Combined unit of gray dolomite that is sugary textured, and locally cherty, mottled, and laminated, forms cliffs and ledges (Nolan, 1935; Rodgers, 1989); ***Laketown*** upper part consists of moderate to dark gray dolomite locally mottled with chert nodules and lenses; middle part is light to medium gray dolomite, coarsely crystalline, that is thick to very thick bedded; lower part is medium to dark gray dolomite, commonly mottled and laminated, thin to thick bedded; unconformity at base of unit; underlying ***Ely Springs*** is 250 feet (75 m) of dark and moderate gray dolomite, mottled, with local white rods, minor chert, and is medium to thick bedded; coral and brachiopod fauna; undivided unit in the northern Deep Creek Range (Rodgers, 1989) and Dutch Mountain (Nolan, 1935; Robinson, 1993) replacing Fish Haven with Ely Springs terminology; major unconformity below related to the Tooele arch (Hintze, 1959) with unit SOle overlying the lower Pogonip Group; complete thickness is 1100 to 1235 feet (335–375 m) in northern Deep Creek Range (Nolan, 1935; Rodgers, 1989), and faulted sections in Dutch Mountain (Nolan, 1935; Robinson, 1993).

SILURIAN

Sl, Sl? **Laketown Dolomite** (Silurian) – Unit mapped separately in Wig Mountain and small queried exposures in northern Deep Creek Range near North Pass Canyon; at Wig Mountain unit is light- to dark-gray, weathering to brownish gray dolomite, commonly with vugs, locally with black chert, mottled and laminated; bedding is poor and very thick, forming cliffs; queried in faulted exposures of light-moderate-gray to light-bluish-gray dolomite that is medium to thick bedded and forms resistant knobs and cliffs; incomplete thicknesses as much as 1200 feet (365 m) at Wig Mountain (this study) and 570 feet (175 m) near North Pass Canyon (Mills et al., 2023).

ORDOVICIAN

Oes **Ely Springs Dolomite** (Late Ordovician) – Unit mapped separately in Wig Mountain and two small exposures at Dutch Mountain where not mapped with unit SOle; at Wig Mountain, light to dark gray dolomite; locally mottled with vugs; medium to thin bedded, forming ledges that are less resistant between enclosing formations; unconformably overlies the Notch Peak Formation (Tooele arch, Hintze, 1959); complete thickness of 300 feet (90 m) at Wig Mountain (this study).

ORDOVICIAN-CAMBRIAN

Early Ordovician and Cambrian rock units are exposed in the west-dipping structural block of the northern Deep Creek Range. Nolan (1935), Bick (1966), Kepper (1969), and Thomson (1973) used Cambrian stratigraphic nomenclature that has been superseded by that of McCollum and McCollum (1984) which better meshes with regional nomenclature (see for example, Hintze and Robison, 1975; McCollum and Miller, 1991; Hintze and Davis, 2003).

O€pn **Lower Pogonip Group and Notch Peak Formation, undivided** (Early Ordovician to Late Cambrian) – Dolomite that is commonly altered (bleached) to off-white and light gray colors and the two units cannot be readily separated; variable bedding and resistance; probably includes an upper part of lower Pogonip Group strata (Wah Wah, Fillmore? and House Formations), and a lower part of Notch Peak Formation; Eureka Quartzite and upper Pogonip Group were removed by erosion on the Tooele arch (Hintze, 1959); formerly the Chokecherry Dolomite of older maps (Nolan, 1935; Rodgers, 1989), but here follows regional nomenclature; thickness is 850 to 1050 feet (260–320 m) at the northern Deep Creek Mountains (Nolan, 1935; Rodgers, 1989).

O€n **Notch Peak Formation** (Early Ordovician? to Late Cambrian) – Light to moderate brownish gray dolomite where mapped separately at Wig Mountain; locally laminated and mottled and with vugs and calcite blebs; dolomitized to a brown palor; bedding is medium to thick forming cliffs; lower part of Rodgers (1989) Chokecherry Dolomite in northern Deep Creek Range; upper part of formation removed by erosion on the Tooele arch (Hintze, 1959); thickness is 420 feet (130 m) (this study).

CAMBRIAN

€ol **Orr Formation and Lamb Dolomite, undivided** (Late to Middle? Cambrian) – Light-gray to blue-gray to dark-gray dolomite that is thick bedded, locally pisolitic and cherty; at Pool Canyon includes some interbedded micritic limestone and sandy shale (Robinson, 1993); forms ledges and cliffs; combined unit mapped at Dutch Mountain (Nolan, 1935; Robinson, 1993); incomplete thickness is 1590 feet (485 m) (Robinson, 1993).

Ꞓo **Orr Formation** (Late Cambrian) – Light-gray, oolitic, shaley, thin-bedded limestone, irregularly dolomitized, and light gray very thick bedded dolomite, with shale beds present near the top in northern Deep Creek Range (Rodgers, 1989); at Wig Mountain carbonate rocks are dolomitized; Nolan (1935) previously called Hicks Formation; Nolan (1935) reported a variable thickness from 590 to 1200 feet (180–365 m) but an upper thickness of 890 feet (270 m) seems more appropriate; Kepper (1969) measured 736 feet (225 m) in Dry Canyon, northern Deep Creek Range; 600 feet (180 m) thick at Wig Mountain (this study).

Ꞓl, Ꞓl? **Lamb Dolomite** (Late to Middle? Cambrian) – Typically gray-colored dolomite and limestone; upper part (150 feet [45 m]) is thin bedded, silty dolomite and limestone with about 40 feet (12 m) of reddish-weathering fine-grained sandstone at the top; middle part is light to medium gray dolomite with darker mottling, contains white rods of dolomite and calcite, medium to thick bedded; lower part is light-gray dolomite that is oolitic and pisolitic and very thick bedded; forms cliffs, ledges and slopes; locally queried near the Christiansen Canyon fault where altered and incomplete; trilobites from the upper part are *Crepicephalus* (Bick, 1966; McCollum and McCollum, 1984); complete thickness in northern Deep Creek Range is 800 to 1080 feet (245–330 m) (Nolan, 1935; Kepper, 1969; McCollum and McCollum, 1984); Bick (1966) measured 1162 feet (354 m) to the south; incomplete thickness at Wig Mountain is 750 feet (230 m) (this study).

Ꞓtl **Trippe Limestone** (Middle Cambrian) – Gray to light-brown limestone and dolomite that is locally oolitic with intraformational conglomerate; bedding is typically thin; shaley upper part (187 feet [57 m]) containing *Eldoradia* trilobites corresponds to the Fish Springs Member (Hintze and Robison, unpublished data, 1974; McCollum and McCollum, 1984), not mapped separately; forms cliffs, ledges and slopes; complete thickness in northern Deep Creek Range is 660 to 765 feet (180–235 m) (Nolan, 1935, Kepper, 1969; McCollum and McCollum, 1984); Bick (1966) reported 795 feet (242 m) to the south.

Ꞓpy, Ꞓpy?

“Pierson Cove” Formation, Young Peak dolomite member (Middle Cambrian) – Dark gray dolomite with white dolomite rods that is thin to thick bedded; locally oolitic and mottled; forms cliffs and ledges; distinctive dolomite unit that is mapped separately from the carbonate-shale sequence above and below; McCollum and McCollum (1984) include it as a dolomitic lithosome within the limestone of the upper “Pierson Cove” Formation (quotes denote tentative assignment), but say it is a local unit with no regional value; previously mapped as the Young Peak dolomite by Nolan (1935) and Bick (1966); lower contact climbs and interfingers with Pierson Cove limestone northward; contains *Bolaspidella* trilobite fauna (McCollum and McCollum, 1984); complete thickness in northern Deep Creek Range up to about 600 feet (180 m) (Nolan, 1935; Kepper, 1969; McCollum and McCollum, 1984); Bick (1966) measured about 350 feet (105 m) to the south.

Ꞓph, Ꞓph?

“Pierson Cove,” Wheeler Shale, Swasey Limestone, Whirlwind Formation, Dome Limestone, Chisholm Shale, and Howell Formation, undivided (Middle Cambrian) – Combined unit in northern Deep Creek Range after McCollum and McCollum (1984), formerly the Abercrombie Formation of Nolan (1935); typically gray to brown silty limestone and interbedded shale, limestone locally dolomitized; bedding is laminated to thick; forms ledges, slopes and cliffs; mapped where formations are difficult to separate due to similar lithologies, local exposure, vegetation, and faulting; several types of diagnostic trilobites are reported from this section (see McCollum and McCollum, 1984); complete thickness is about 2500 to 2700 feet (760–825 m) (Nolan, 1935; Kepper, 1969 [2148 feet, 655 m]; Hintze and Robison, 1974 unpublished; McCollum and McCollum, 1984); Bick (1966) measured 1765 feet (540 m) in Goshute Canyon to the south; unit also mapped on Dutch Mountain, and previously as undifferentiated Middle Cambrian strata (Trippe through Abercrombie Formations, Nolan, 1935) and the Abercrombie Formation (Robinson, 1993), with incomplete faulted thickness of about 1675 to 1870 feet (510–570 m).

Ꞓpib **Pioche Formation, Busby Quartzite Member** (Early Cambrian) – Brown quartzite and sandstone with lesser shale beds (similar to the Cabin Member) and minor dolomite; thin to thick bedded; forms cliffs, ledges and slopes; thickness in northern Deep Creek Range from about 410 to 450 feet (125–135 m) (Nolan, 1935; Bick, 1966; Rodgers, 1989).

Ꞓpic **Pioche Formation, Cabin Shale Member** (Early Cambrian) – Dark-brown, green and red shale and siltstone that is micaceous and becomes sandy near top of unit; bedding is laminated; typically forms slopes; contains *Olenellus* (trilobite) (McCollum and McCollum, 1984); thickness in northern Deep Creek Range is about 500 feet (150 m) (Nolan, 1935, Rodgers, 1989).

CAMBRIAN-NEOPROTEROZOIC?

ꞒZpm, ꞒZpm?

Prospect Mountain Quartzite (Early Cambrian to Neoproterozoic?) – Light-brown and white to brown quartzitic sandstone that is medium to very thick bedded; commonly cross-bedded with local quartz pebble conglomerate lenses; contains a few thin micaceous shaley beds; forms resistant cliffs and ledges (Nolan, 1935; Rodgers, 1989); Nolan's lower shale members now considered unit Zmu at Dutch Mountain (this study); formation unconformably overlies the McCoy Creek Group; incomplete thicknesses of 450 to 800 feet (140–245 m) at northern Deep Creek Range (Mills et al., 2023) and northern Dugway Range (Staatz, 1972); incomplete estimate of 2800 feet (855 m) at Dutch Mountain with faulting and deformation (this study); Bick (1966) reported 2950 feet (900 m) in Goshute Canyon to the south, and Bick considers the upper 2500 feet (760 m) Prospect Mountain in Nolan's rough section at Big Canyon to the south.

NEOPROTEROZOIC

Zmu **McCoy Creek Group, undivided** (Neoproterozoic) – Dark grayish-blue or greenish-blue and locally brownish-green slaty shale and dark-colored quartzite (Nolan, 1935); typically laminated to thin bedded forming slopes and ledges; only upper part of McCoy Creek Group (may correspond to upper unit(s) of Misch and Hazzard, 1962) that underlies the Prospect Mountain on the far east side of Dutch Mountain; Nolan (1935) included as shale members of Prospect Mountain and Robinson (1993) as Pioche and Prospect Mountain; Bick (1966) reported these units are part of his Goshute Canyon Formation and noted a similarity with the McCoy Creek Group (see Misch and Hazzard, 1962), which they are now considered (Rodgers, 1989); a different unit scheme for the McCoy Creek Group is used in the Snake Range, Nevada (see for example, Miller and Gans, 1999); incomplete thickness up to 1350 feet (410 m) (this study).

Zmt **McCoy Creek Group and Trout Creek sequence, undivided** (Neoproterozoic) – Unit mapped at the south end of "Granite Mountain" where three fault-bounded packages of metasedimentary rocks are composed of schist with quartzite, and marble with schist intruded by granodiorite (unit Jgd) and leucogranite (unit Jg) sills and dikes; approximately 40%-80% metasedimentary rocks and 20%-60% intrusions; forms ledges to cliffs (Clark et al., 2009a, 2016); lithologies suggest possible connection to the McCoy Creek Group and/or Trout Creek sequence of the Deep Creek Range (Rodgers, 1984, 1987, 1989; D.M. Miller, USGS, verbal communication, May 29, 2007; Yonkee et al., 2014) but there is little stratigraphic context; the marbles could also represent Cambrian units; locally cut by pegmatite and aplite dikes and quartz veins; in fault contact with granodiorite (unit Jgd); incomplete total thickness of 2300 feet (700 m) (Clark et al., 2009a, 2016).

PERMIAN TO MISSISSIPPIAN ROCK UNITS OF THE NORTHEASTERN AREA (Wildcat and "Kittycat" Mountains, Unnamed hills, Southern Cedar Mountains)

Wildcat and "Kittycat" Mountains

PIPo? **Oquirrh Group, undivided?** (Early Permian? to Middle Pennsylvanian?) – Possible Oquirrh Group rocks at Wildcat Mountain and adjacent "Kittycat Mountain" (see Stokes, 1963; Moore and Sorenson, 1979; Clark et al., 2016); correlation to other Oquirrh Group strata in the vicinity uncertain; no access to this part of UTTR-South for the current mapping project and very limited access for the Clark et al. (2016) mapping; incomplete thickness up to 1500 feet (460 m).

Unnamed hills (Aragonite thrust sheet)

Ppy **Plympton Formation** (Middle to Early Permian) – Only present in structurally deformed knoll on northeastern map border; light-olive-gray to yellowish-gray fossiliferous limestone and locally cherty limestone with medium to dark-gray and brown chert nodules; locally some minor bedded chert; fossil brachiopods typically abundant; lower part of formation (20 to 30 feet, 6–10 m) is dark grayish brown bedded and nodular chert with lesser medium dark brown dolomitic limestone; bedding is thin to thick, forming ledges and some cliffs (Clark et al., 2020a, in prep.); formation is Guadalupian age (Wordian and Roadian) (Wardlaw, 2015), but nearby extends into the Early Permian where Meade Peak Member of the Phosphoria Formation is not present (Clark et al., 2020a, in prep.); incomplete thickness less than about 100 feet (30 m).

Pgr **Grandeur Formation** (Early Permian) – One small exposure in knoll at northeastern map border; light-gray-weathering dolomite, dolomitic limestone, and sandy limestone; light-gray to white chert is common as nodules, blebs, and sporadic thin beds; forms cliffy outcrops; regional age is Leonardian (Kungurian) (Wardlaw, 2015); incomplete thickness less than about 50 feet (15 m); Clark et al. (2020a, in prep.) report 700 to 850 feet (215–260 m) nearby.

Psd **Permian sandstone, dolomite, and limestone** (Early Permian, Leonardian) – Two exposures at unnamed hills near northeastern map border where mapped as unit Qes/Psd; interbedded sandstone, dolomite, dolomitic limestone, and limestone; sandstone is orange-tan and light tan, fine grained, and locally cross-bedded; carbonate rocks are medium to dark gray and commonly contain chert; medium to very thick bedded; forms ledges, cliffs and slopes; the Leonardian (Artinskian-Kungurian) age is from bracketing strata and fusulinids in the Cedar Mountains (Clark et al., 2016); incomplete thickness about 900 feet (275 m) (Clark et al., 2020a, in prep.; this study).

Pℙos **Oquirrh Group, sandstone and limestone unit** (Early Permian, Leonardian?-Wolfcampian to Late Pennsylvanian, late Virgilian) – Light- to dark-brown sandstone, gray calcareous sandstone that weathers to light and dark brown, and light- to dark-gray limestone and fossiliferous limestone that is locally siliceous; local intraformational conglomerate beds; medium to thick bedded, forms slopes and ledges; fossil fusulinids and conodonts helped constrain the unit age, and readjustment of the upper contact indicates that upper Oquirrh beds may be Leonardian (Artinskian) considering sample D-74 (*Parafusulina* sp.) in Clark et al. (2016); one exposure at unnamed hills near northeastern map border where mapped solely as unit Qes/Pℙos; underlying Oquirrh Group, sandstone and siltstone unit (ℙosi on adjacent map) is not exposed; incomplete thickness is 1350 feet (410 m) (this study); see Clark et al. (2020a, in prep.) for other nearby thicknesses.

ℙol **Oquirrh Group, limestone unit** (Middle to Early? Pennsylvanian, Desmoinesian-Atokan?-Morrowan?) – Medium-gray limestone and cherty limestone with minor interbedded light-brown sandstone and calcareous sandstone; typically thick bedded, forming cliffs and ledges; age from fossil fusulinids and conodonts (Clark et al., 2020a, in prep.); one exposure at unnamed hills near northeastern map border where mapped solely as unit Qel/ℙol; incomplete thickness is estimated at 1300 feet (395 m) (this study); see Clark et al. (2020a, in prep.) for other thicknesses nearby.

Southern Cedar Mountains (Cedar thrust sheet)

ℙolc **Oquirrh Group, limestone unit, Cedar thrust sheet** (Middle Pennsylvanian?) – Medium- to dark-gray limestone and cherty limestone and lesser medium to dark-gray, weathering to yellowish-gray, calcareous sandstone and siltstone; medium to thick bedded; forms cliffs and ledges; lowermost Oquirrh unit of the Cedar thrust sheet; no fossil data for biostratigraphic control; locally mantled by lacustrine gravel; incomplete thickness uncertain, estimated 1900 feet (580 m).

Mmc **Manning Canyon Formation** (Early Pennsylvanian? to Late Mississippian) – Gray to black, fissile, slope-forming shale with lesser light-brown and multicolored sandstone and uncommon brownish-gray, carbonaceous limestone; typically forms dark shaley slopes littered with quartzite fragments; crops out in three small exposures near leading edge of Cedar thrust sheet; interval of regional decollement and detachment; incomplete thickness is up to 450 feet (135 m) (this study), and probably 1500 to 2000 feet (450–600 m) thick in southern Cedar Mountains (Maurer, 1970), but base not exposed.

Southern Cedar Mountains (Cedar thrust sheet footwall)

Psl **Permian sandstone, limestone, and dolomite** (Early Permian, Leonardian) – Light-brown to pale-red sandstone that weathers to dark brown, interbedded with moderate-gray cherty limestone and dolomite that weathers to light gray, and some calcareous sandstone in lower part; bedding is thin to thick to indistinct, forming ledgy and cliffy outcrops; sandstone is slightly calcareous with fine- to medium-grained sand and tabular cross-bedding; limestone and lesser dolomite are finely crystalline and locally bioclastic, with black chert in nodules and thin beds; contains *Parafusulina* sp. (fusulinid) fossils near base that indicated a Leonardian (Artinskian-Kungurian) age; incomplete thickness is about 2000 feet (600 m) in map area (Clark et al., 2016; this study); Maurer (1970) reported a complete measurement of 3953 feet (1205 m) of this interval to the north in the Cedar Mountains.

Pofc **Oquirrh Group, Freeman Peak and Curry Peak Formations, undivided** (Early Permian, Wolfcampian) – Medium- to dark-gray, weathering to yellowish-gray, calcareous, fine-grained sandstone and siltstone with uncommon very pale orange, medium-gray and pale-red orthoquartzite and sandy limestone; laminated to thick-bedded unit breaks into chips and plates forming rounded hills and slopes with occasional ledges; “worm trail” markings common on bedding planes in lower part of unit; also contains *Schwagerina* sp. and *Triticites* cf. *T. meeki* (fusulinids) that indicate a middle to early Wolfcampian (Sakmarian-Asselian) age; uncertain thickness in map area, but 3500 feet (1065 m) thick at southern Cedar Mountains (Clark et al., 2016).

IPobm, IPobm?

Oquirrh Group, Bingham Mine Formation (Late Pennsylvanian, Virgilian-Missourian) – Very pale orange to pale-red calcareous sandstone with lesser medium-gray sandy limestone; thin to medium bedded, forming ledges and slopes; two exposures on eastern map border; fossils include brachiopods, bryozoans, and fusulinids (*Triticites, Triticites cullomensis, Pseudofusulinella*); fusulinids indicate a Virgilian to Missourian (Gzhelian-Kasimovian) age (Clark et al., 2016); incomplete thickness in map area of about 1800 feet (550 m) (this study), and complete at 2700 feet (825 m) thick at southern Cedar Mountains (Clark et al., 2016).

IPobp **Oquirrh Group, Butterfield Peaks Formation** (Middle to Early Pennsylvanian, Desmoinesian-Morrowan) – Medium- to dark-gray, sandy limestone, cherty limestone, and fossiliferous limestone interbedded with light-brown calcareous sandstone and quartzite; thin to very thick bedded, forming ledges, cliffs, and slopes of a cyclic character; lower part forms ledgy escarpment; limestone is finely crystalline to bioclastic; gray, yellow-brown, and black chert occurs as spherical nodules and semi-bedded masses; contains sandy laminae and horizontally flattened concretionary structures; overall clastic percentages increase upsection; fossils include *Chaetetes* and *Syringopora* (colonial corals), rugose corals, brachiopods, bryozoans, and fusulinids (*Fusulina, Fusulinella, Beedeina, Millerella*), fusulinids indicate a Desmoinesian to Atokan (Moscovian) age (Maurer, 1970; Clark et al., 2016); single small exposure on eastern map border; only uppermost part in map area of about 300 feet (90 m) thick (this study), and complete at 4150 feet (1265 m) thick at southern Cedar Mountains (Clark et al., 2016).

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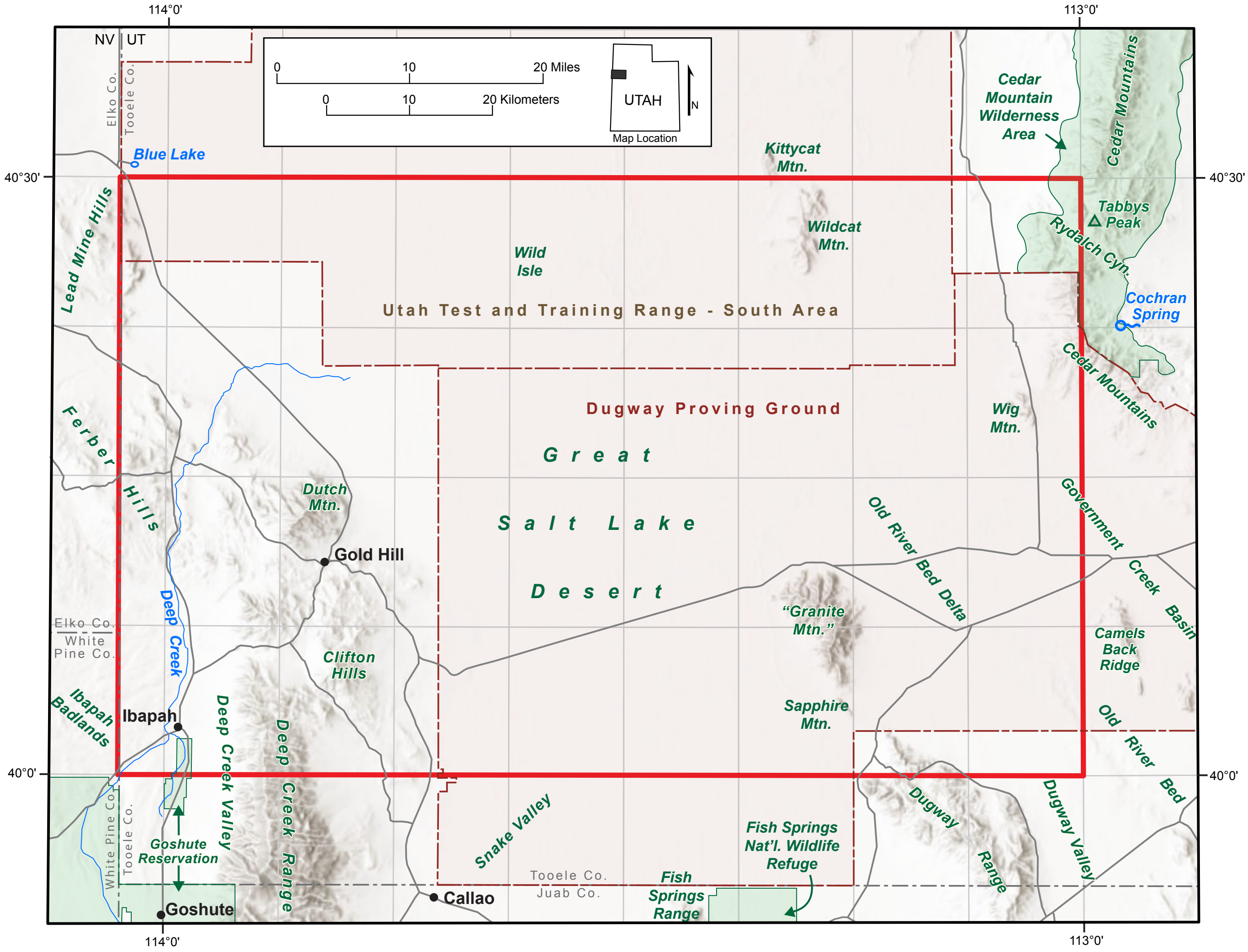

Figure 1. *Location of primary geographic features in the Wildcat Mountain and east part of the Currie 30' x 60' quadrangles (red rectangle). See Mapping Sources on Plate 2 for the progress of geologic mapping.*

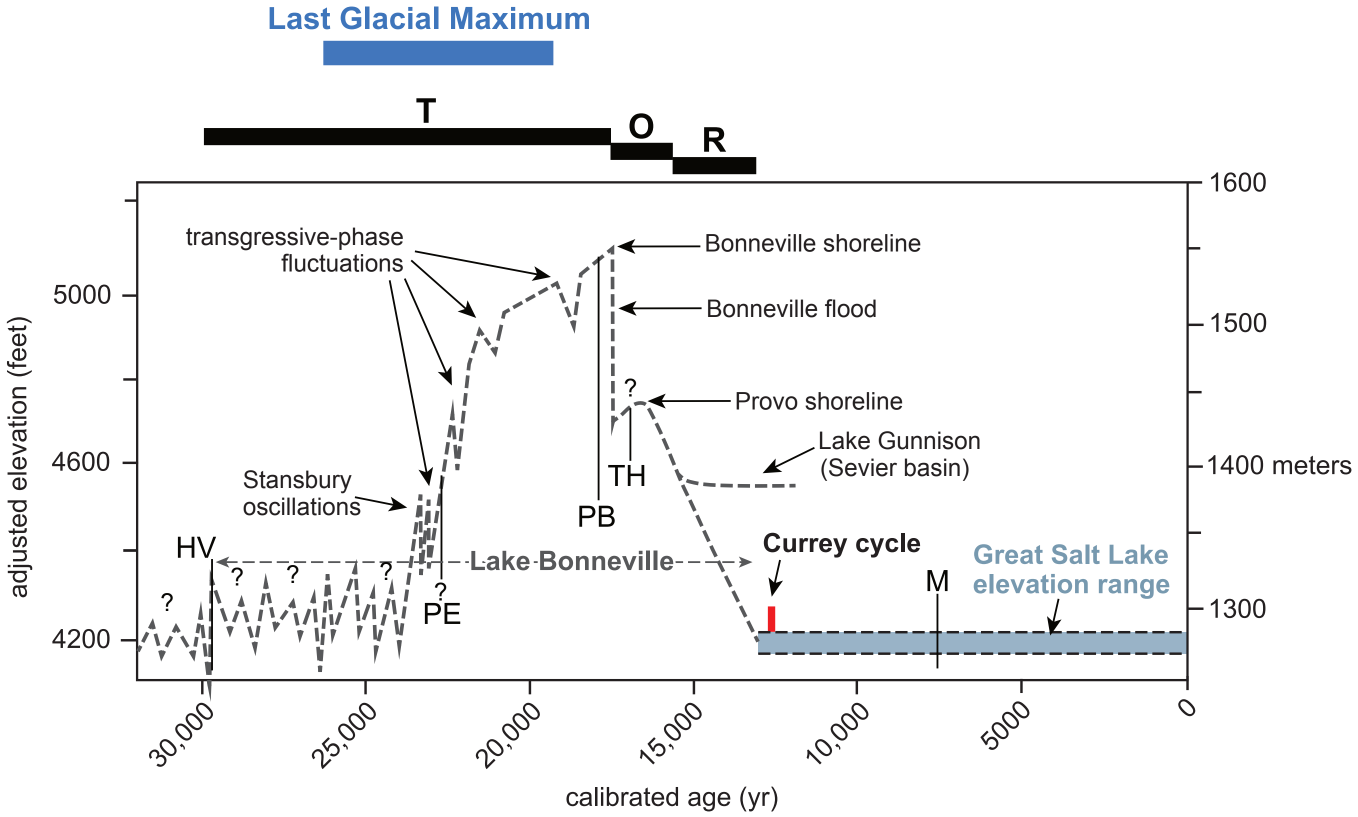

Figure 2. *Chronology of Lake Bonneville and Great Salt Lake; based on Figure 2B of Oviatt and Pedone (2024). Estimated lake-level curve (hydrograph) shown by dashed gray line. All post-Bonneville fluctuations of Great Salt Lake have occurred within the gray rectangle, except for Currey cycle. Basaltic volcanic ashes in Bonneville sequence: HV = Hansel Valley; PE = Pony Express; PB = Pahvant Butte; TH = Tabernacle Hill. One silicic volcanic ash (Mazama; M), in Great Salt Lake sediment. Transgressive (T), overflowing (O), and regressive (R) phases of Lake Bonneville are shown at the top of diagram. The Last Glacial Maximum after Clark et al. (2009b). Vertical scale isostatically adjusted using Currey equation (Oviatt, 2015).*

Table 1. *Summary of sediment core and stratigraphic data from the map area.*

Map ID	Core ID	Year	General Location	Latitude N	Longitude W	Datum	UTM83-12 E	UTM83-12 N	Stratigraphic Summary	References
SC1	WB-19A	2019	SW of Wildcat Mtn	40.36411	113.43901	WGS84	292908	4471026	alluvial sediment of post-Currey cycle age (depth to 12 cm [12 cm thick]); Currey cycle sediment (depth to ~114 cm [~102 cm thick]), Lake Bonneville marl (depth to 171 cm [57 cm thick]), base of Bonneville not present	Brunelle et al., in preparation; C.G. Oviatt, unpublished data
SC1	WB-19B	2019	SW of Wildcat Mtn	40.36411	113.43901	WGS84	292908	4471026	alluvial sediment of post-Currey cycle age (depth to 13 cm [13 cm thick]); Currey cycle sediment (depth to 126 cm [113 cm thick]), Lake Bonneville marl (depth to 227 cm [101 cm thick]), base of Bonneville not present	Hart et al., 2022; Brunelle et al., in preparation; C.G. Oviatt, unpublished data
SC2	GG-19A	2019	SW of Wildcat Mtn	40.35329	113.39184	WGS84	296881	4469716	sediments of Currey Cycle age (depth to 100 cm [100 cm thick]), Lake Bonneville marl (depth to 185 cm [85 cm thick]), pre-Bonneville sediments (depth to 227 cm [42 cm thick]); base of pre-Bonneville not present	Brunelle et al., in preparation; C.G. Oviatt, unpublished data
SC3	DPGNW-4	1998	NNE of Granite Mtn	40.245	113.235	NAD83	309897	4457347	top of Lake Bonneville marl probably truncated; Lake Bonneville marl (depth to 174 cm [174 cm thick]); pre-Bonneville sediment (depth to 245 cm [71 cm thick]); base of pre-Bonneville not present	C.G. Oviatt and D. Madsen, unpublished data
	composite section	2003	Government Creek Basin composite section (Carr area of DPG)	40.2	112.9	WGS84	339000	4448000	about 1 m of post-Lake Bonneville eolian silt and sand; Lake Bonneville sediment (possibly to depth ~30 feet [~9 m]), pre-Bonneville deposits (uncertain to depth of at least 300 ft, 91 m)	Fitzmayer et al., 2004, Figure 4, p. 165; C.G Oviatt unpublished data

Notes:
Map ID refers to the core locations on Plate 1.
DPG is Dugway Proving Ground.

Table 2. *Summary of geochronology data from the map area.*

Map ID	Sample ID	Map Unit	Sample Type	7.5' Quadrangle	Location Data UTM83-12 E	Location Data UTM83-12 N	Approximate Location	Age (Ma)	Error (Ma)	Mineral	Method	Notes	References
1	GP081605-6c (Trd1)	Trd	Rhyolite dike	Granite Peak	305284	4445167		7.78	0.05	Sanidine	Ar/Ar		Clark and others, 2016
2	nd	Tsw	Quartz-adularia vein	Gold Hill	262301	4446537	yes	7.85	0.8	Adularia	K-Ar	revised age	Whelan, 1970 (Climax mineshaft)
3	SM071405-11 (Trs1)	Trs	Rhyolite lava flow	Granite Peak	306186	4437483		8.20	0.05	Sanidine	Ar/Ar		Clark and others, 2016
4	WC9	Ts	Tuffaceous sandstone and conglomerate	Goshute Wash	266065	4434623		~12		Zircon	U-Pb	MDA not calculated yet	This study
	nd	Trd	Rhyolite dike	Granite Peak	nd	nd		13		Whole rock	K-Ar	suspect	Moore and McKee, 1983
	74-KA-18	Jg	Muscovite granite	Granite Peak	nd	nd		14.2	0.6	Muscovite	K-Ar	suspect, reset age	Moore and McKee, 1983
5	GHC22-010	Tid	Felsic dike	Clifton	263556	4442284		16.23	0.26	Zircon	U-Pb		Mills and others, 2023
6	GXJ256085	Tid	Monzonite dike	Gold Hill	263675	4446959		17.14	0.4	Zircon	U-Pb		Burwell, 2018
7	WC1	Tst	Volcaniclastic sandstone	Clifton	260871	4444959		~19		Zircon	U-Pb	MDA not calculated yet	This study
8	unknown	Tid	Quartz-feldspar porphyry dike	Clifton	262750	4442540	yes	26.6	1.2	Feldspar	K-Ar	corrected age	Krahulec, 2017 (Amax)
	WC39	Ts	Tuffaceous siltstone	Ferber Peak SE	243933	4435665		~30		Zircon	U-Pb	No Miocene grains	This study
	nd		Pegmatite dike	Granite Peak SE	s. 26, T.13W., R8S.		yes	30.9	2	Muscovite		suspect?	Whelan, 1970
9	NV21-007GLD	Tgg	Granite	Gold Hill	257899	4451280		38	0.83	Zircon	U-Pb		White, 2023
9	NV21-007GLD	Tgg	Granite	Gold Hill	257899	4451280		38.07	6.79	Apatite	U-Pb		White, 2023
10	GH-002	Tgg	Granite	Gold Hill	257986	4451361		38.16	0.45	Zircon	U-Pb		King and Burwell, 2016
11	70-2	Tgg	Granite	Ochre Mountain	254752	4452634	yes	38.23	1.3	Biotite	K-Ar	revised age	Stacey and Zartman, 1978
	FI1		Granite	Ferber Peak	239601	4458603		~39		Zircon	U-Pb	Ferber intrusion, age not calculated yet	This study
12	GHC22-001A	Tvf	Trachyte welded tuff	Clifton	257655	4445195		39.15	0.09	Plagioclase	Ar/Ar		This study
13	74-KA-15	Tvf	Latite breccia	Ochre Mountain	247401	4453710	yes	39.2	0.6	Biotite	K-Ar		Moore and McKee, 1983
14	D-6 (Tiac1)	Tiac	Andesitic intrusion	Wig Mountain	327630	4466826		39.55	0.22	Groundmass concentrate	Ar/Ar		Clark and others, 2016
15	WSF North	Tid	Rhyolitic intrusion	Ochre Mountain	247342	4453791	yes	39.58	0.10	Biotite	Ar/Ar		Potter and others, 1995; Dubiel and others, 1996
16	WSF South	Tvf	Dacite	Ochre Mountain	246990	4453012	yes	39.6	0.2	Hornblende	Ar/Ar		Potter and others, 1995; Dubiel and others, 1996
17	GXJ256081	Tid	Granite porphyry dike	Gold Hill	261612	4447769		39.95	0.47	Zircon	U-Pb		Burwell, 2018
18	GH-001	Tid	Mafic dike	Gold Hill	257972	4451168		40.08	0.56	Zircon	U-Pb	Suspect age as dike cuts Tgg	King and Burwell, 2016
19	GH-006	Tdi	Diorite	Gold Hill	256815	4454054		40.08	0.56	Zircon	U-Pb		King and Burwell, 2016
20	6	Tg	Granite	Gold Hill	257448	4452547	yes	40.62	1.4	Biotite	K-Ar	revised age	Stacey and Zartman, 1978
21	D-42 (Tac5)	Tac	Andesite	Wig Mountain NE	327554	4479539		40.66	0.45	Groundmass concentrate	Ar/Ar		Clark and others, 2016
22	D-7 (Tac1)	Tac	Andesite	Wig Mountain	330013	4469687		41.73	0.24	Hornblende	Ar/Ar		Clark and others, 2016
	74-KA-16	Jqm	nd	Gold Hill	259359	4450078	yes	43.9	0.8	Biotite	K-Ar	suspect, reset age	Moore and McKee, 1983
	8	Jqm	Granite	Gold Hill	259122	4450086	yes	44.2	0.8	Biotite-hornblende	K-Ar	suspect, reset age	Armstrong, 1970
	75-KA-9	Jqm	Quartz monzonite	Gold Hill	260227	4447581	yes	134.9	4	Hornblende	K-Ar	suspect	Moore and McKee, 1983
23	GP081605-9 (Jg1)	Jg	Granite porphyry	Granite Peak	303416	4444484		148.8	1.3	Zircon	U-Pb		Clark and others, 2016
24	GP102605-3 (Jgd1)	Jgd	Granodiorite	Granite Peak SE	305601	4439991		149.8	1.3	Zircon	U-Pb		Clark and others, 2016
25	NV21-006GLD	Jqm	Quartz monzonite	Gold Hill	259121	4449485		152.29	1.4	Zircon	U-Pb		White, 2023
25	NV21-006GLD	Jqm	Quartz monzonite	Gold Hill	259121	4449485		152.66	7.83	Zircon	U-Pb		White, 2023
26	15A	Jqm	Granite	Clifton	259035	4439902	yes	154.32	5	Biotite	K-Ar	revised age	Stacey and Zartman, 1978
27	GXJ256076	Jqm	Quartz monzonite (pyroxene-rich)	Gold Hill	260301	4447703		155.40	1.8	Zircon	U-Pb		Burwell, 2018
28	GXJ256084	Jqm	Quartz monzonite	Gold Hill	263686	4447042		156.10	1.8	Zircon	U-Pb		Burwell, 2018
29	18	Jqm	Granite	Clifton	259727	4443769	yes	156.46	5	Biotite	K-Ar	revised age	Stacey and Zartman, 1978
	C23-4	Tlf	Trachyte lava flow	Clifton	260838	4444832		233		Plagioclase	Ar/Ar	suspect, excess Argon	This study

Notes:
Map ID (gray highlight) corresponds to plate 1.
nd is no data.
Approximate locations for older samples.
K-Ar revised ages and errors reported in the USGS geochronology database (2023). Revised using new decay constants (see for example, Dalrymple, 1992).