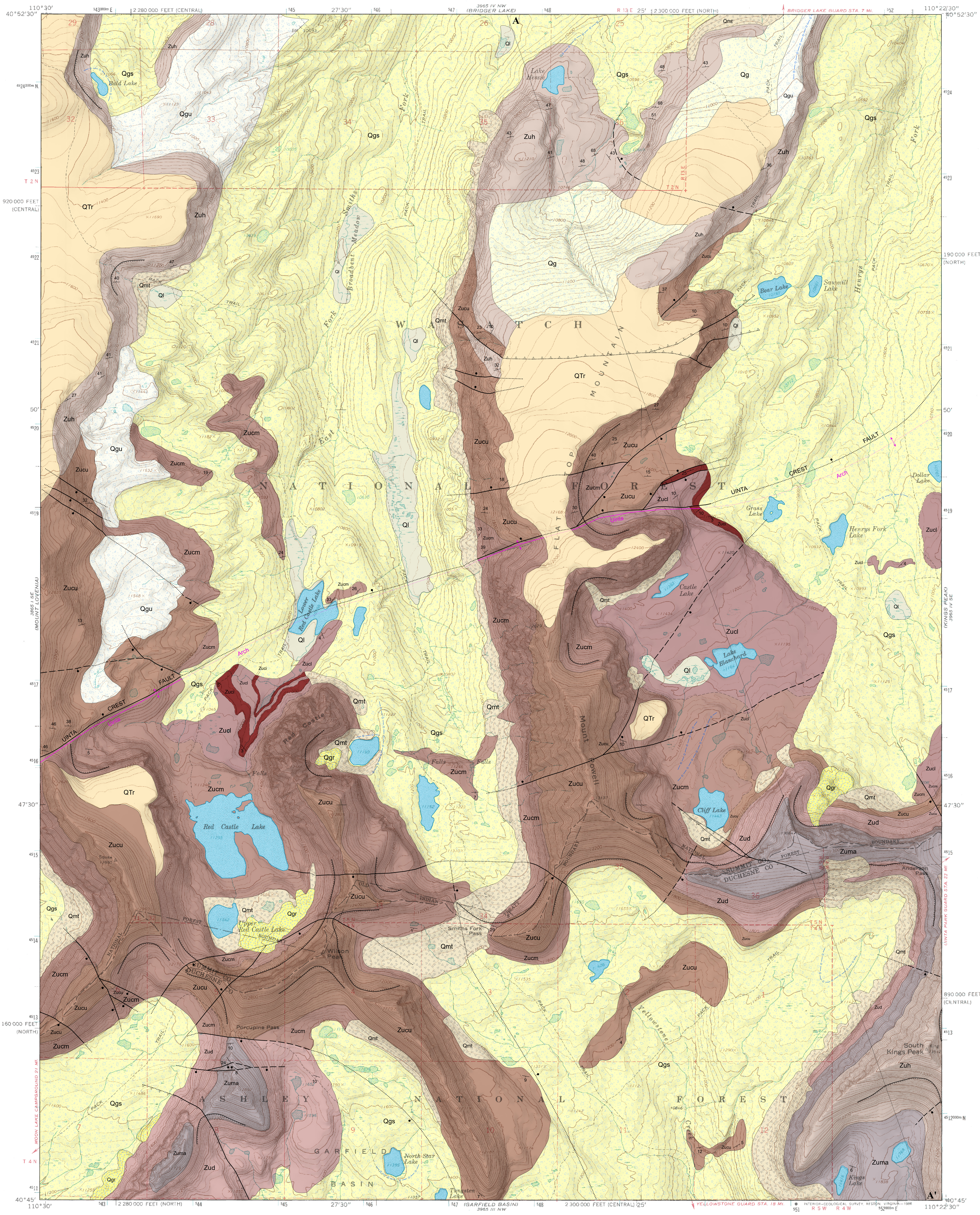
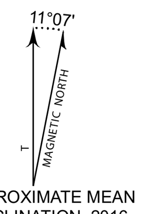
UTAH GEOLOGICAL SURVEY
a division of
Utah Department of Natural Resources



This geologic map was funded by the Utah Geological Survey, U.S. Geological Survey National Cooperative Geologic Mapping Program EDMAP award number G10AC00322, and National Science Foundation grant EAR-0819759.

The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

The Miscellaneous Publication series provides non-UGS authors with a high-quality format for documents concerning Utah geology. Although review comments have been incorporated, this publication does not necessarily conform to UGS technical, editorial, or policy standards. The Utah Department of Natural Resources, Utah Geological Survey, makes no warranty, expressed or implied, regarding the suitability of this product for a particular use. The Utah Department of Natural Resources, Utah Geological Survey, shall not be liable under any circumstances for any direct, indirect, special, incidental, or consequential damages with respect to claims by users of this product. For use at 1:24,000 scale.



APPROXIMATE MEAN DECLINATION, 2016

SCALE 1:24,000
1 0.5 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0.5 0 1 KILOMETER
CONTOUR INTERVAL 40 FEET

GEOLOGIC MAP OF THE MOUNT POWELL QUADRANGLE, DUCHESNE AND SUMMIT COUNTIES, UTAH

by

Shannon L. Osterhout[1], Paul K. Link[2], Carol M. Dehler[3], and Esther M. Kingsbury-Stewart[4]

2016

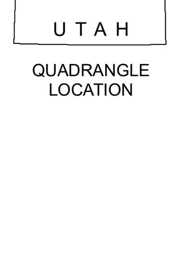
[1]Pioneer Natural Resources Company, 1401 17th Street, Suite 1200, Denver CO, 80202, shannon.osterhout@pxd.com
[2] Idaho State University, Department of Geosciences, Campus Box 8072, Pocatello, ID 83209
[3] Utah State University, Department of Geology, 4505 Old Main Hill, Logan, UT 84322-4505
[4]Wisconsin Geologic and Natural History Survey, 3817 Mineral Point Road, Madison, Wisconsin 53705-5100

Base from USGS Mount Powell Quadrangle (1967)
Projection: UTM Zone 12
Datum: NAD 1927
Spheroid: Clarke 1866

Project Manager: Douglas A. Sprinkel
GIS and Cartography: Zachary W. Anderson, Lori J. Steadman, and J. Buck Ehler

Utah Geological Survey
1594 West North Temple, Suite 3110
P.O. Box 146100, Salt Lake City, UT 84114-6100
(801) 537-3300
geology.utah.gov

This map was created from geographic information system (GIS) data.



QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1.Lyman Lake
2.Bridger Lake
3.Gilbert Peak NE
4.Mount Lovenia
5.Kings Peak
6.Oweep Creek
7.Garfield Basin
8.Mount Emmons

ADJOINING 7.5' QUADRANGLE NAMES

SUMMARY

The Mount Powell quadrangle is located along the crest of the Uinta arch in the High Uintas Wilderness Area. The quadrangle's namesake, Mount Powell, is the seventh highest point in Utah at 4010 meters (13,159 feet as shown on topographic base map). It was named for Major John Wesley Powell, a pioneering geologist who was the first to explore the Green and Colorado Rivers as part of the Geographical and Geological Survey of the Rocky Mountain Region during the late nineteenth century. The Mount Powell quadrangle was previously mapped by various workers (Crittenden and others, 1967; Wallace and Crittenden, 1969; Wallace, 1972; Bryant, 1992; Munroe and Laabs, 2009; Osterhout, 2011). The quadrangle is dominated by unconsolidated surficial deposits of mostly glacial origin and the middle part of the Uinta Mountain Group (UMG), a succession of middle Neoproterozoic (ca 750 to 740 Ma) sedimentary rocks several kilometers thick (Dehler and others, 2010).

Bedrock units are exposed in the high peaks and steep cliffs and include (from stratigraphic lowest to highest) the Red Castle Formation, Dead Horse Pass Formation, Mount Agassiz Formation, and the informal formation of Hades Pass. The middle UMG strata exposed in the quadrangle indicate a paleogeography characterized by offshore, shoreface, nearshore marine, deltaic, and fluvial facies and stratal architecture. The sedimentary bedrock units are interpreted to have been deposited in fluvial and shallow marine environments within an epicontinental sea at least 150 million years before the latest Proterozoic inception of the Laurentian western passive margin.

Glacial till of Smiths Fork age covers the basin floors and related well-defined headwall cirques cut into bedrock at the heads of the basins. The flanks of the basins are somewhat covered by talus or rock glaciers and much of the high tablelands are covered by thin regolith that likely resulted from periglacial processes.

The axis of the Laramide-age Uinta arch strikes through the quadrangle, gently folding the UMG bedrock units with generally shallow north and south dips (3 to 20 degrees). The Uinta Crest fault parallels the axis of the Uinta arch through the quadrangle. Regionally, the Uinta Crest fault is described as a down-to-the-north fault zone that extends from Hayden Peak, about 30 kilometers west-southwest of the Mount Powell quadrangle, to near North Burro Peak, about 15 kilometers northeast of the quadrangle (Crittenden and others, 1967; Bryant, 1992). The UMG strata are also cut by minor (several meters of offset) to moderate (several tens of meters of offset) normal and reverse faults.

DESCRIPTION OF MAP UNITS

QUATERNARY-TERTIARY UNITS

Ql — **Lacustrine and marsh deposits (Holocene)** – Unconsolidated, laminated fine sand, silt and clay, and fine colluvium with buried organic layers common; deposits infill closed ovoid depressions dammed by end moraines, till ridges, and hummocks; associated with meadows, marshes, and small lakes; generally less than 10 meters (30 ft) thick but may locally exceed 10 meters (30 ft).

Qmt — **Talus (Holocene and upper Pleistocene[?])** – Unconsolidated, poorly sorted, mostly angular boulders located at the base of cirque headwalls along north-facing cliff walls and along glacial valley sides; extremely coarse with most fines having been removed by meltwater; accumulations of fine colluvium are common down slope from many talus deposits, especially where cliffs contain a large component of shale; include small avalanche cones, protalus ramparts, and sheet-like deposits that blanket and skirt cliff faces; rock falls are common, especially following precipitation, and indicate many talus deposits remain active; 1 to 50 meters (3–165 ft) thick.

Qgr — **Rock glacier (Holocene and upper Pleistocene[?])** – Unconsolidated, poorly sorted, angular boulders and fine-grained materials; fine-grained materials are more common in these deposits than in talus; lichen-covered boulders typify more stabilized rock glaciers; characterized by steep-sloped lobate bulges that protrude out into basins and on the floor of high-altitude cirque basins; characteristic surface morphology of transverse ridges and furrows results from slow, imperceptible flow by deformation and mobilization of interstitial ice; rock glaciers in the Mount Powell quadrangle are present on north-facing slopes near Cliff Lake and Red Castle Lake; surface meltwater pond emanates from a rock glacier west of Trail Rider Pass; as much as 30 meters (100 ft) thick.

Qg — **Glacial till, undivided (Holocene[?] and upper Pleistocene)** – Unconsolidated, poorly sorted diamicton of uncertain age that is similar to Smiths Fork till; mapped on Flat Top Mountain in the northern part of the quadrangle; forms steep hummocky topographic relief and exhibits linear patterned ground suggesting the deposit was modified by periglacial processes; thickness uncertain but generally forms thin veneer over bedrock.

Qgs — **Smiths Fork Till (upper Pleistocene)** – Unconsolidated, matrix-supported, poorly sorted diamicton that consists of pebbles, cobbles, and boulders of Uinta Mountain Group lithologies; sandstone and quartzite boulders at the surface are abundant; clasts are commonly angular to subangular, especially the larger boulders; striated clasts are locally abundant; forms broad deposits on basin floors that are topographically variable, ranging from smooth to hummocky with small ridges or knolls and kettles; deposited during the last glaciation (ca. 32,000 to 14,000 years ago) and considered correlative with the Pinedale Glaciation elsewhere in the Rocky Mountains (Phillips and others, 1997); samples collected for cosmogenic 10Be surface-exposure dating reveal that terminal moraines were abandoned by retreating glaciers before 16,000 years ago (Munroe and others, 2006; Laabs and others, 2007; Refsnider and others, 2007; Munroe and Laabs, 2009); till in the basin centers is generally quite stable due to low surface slopes but lateral moraines and till deposits on steeper bedrock slopes are prone to mass wasting, especially when water-saturated (Munroe and Laabs, 2009); includes post-glacial (Holocene) stream alluvium deposited along creeks, local colluvium, and small lacustrine/marsh deposits; thickness varies from 1 to 10 meters (3–30 ft) in middle of Painter Basin, but may be as much as 50 meters (165 ft) thick in the moraines.

Qgu — **Pre-Smiths Fork Till, Undivided (upper or middle Pleistocene)** – Glacial diamicton of Munroe and Laabs (2009); they described it as having similar physical properties and composition to Smiths Fork Till, but located beyond the Smiths Fork glacial limit in a position where it is not possible to determine whether these sediments were deposited during the Blacks Fork or an earlier glaciation; displays a greater degree of soil development than Smiths Fork Till; includes post-glacial (Holocene) stream alluvium deposited along creeks, local colluvium, and small lacustrine/marsh deposits; as much as 50 m (165 feet) thick.

QTr — **Residual deposits (Holocene[?] to Tertiary[?])** – Unconsolidated, poorly sorted, angular boulders to silt developed mostly on the 34 million-year-old Gilbert Peak erosion surface (Hansen, 1986; Kowallis and others, 2005); characterized by planar, grass-covered slopes; boulders are commonly concentrated in linear and anastomosing patterns suggesting deposits may be modified by periglacial processes; boulders are typically lichen-covered; may be similar to older piedmont gravel deposits mapped by Sprinkel (2006), which included deposits modified by periglacial processes; unit thinly covers bedrock in some areas and is generally less than 1 meter (3 ft) thick, but may be locally as much as 3 meters (10 ft) thick.

NEOPROTEROZOIC

Zuh — **Formation of Hades Pass (Neoproterozoic, Cryogenian)** – Reddish-brown, medium- to very coarse grained quartz to feldspathic arenite with minor meter-scale interbeds of very light gray to purplish-brown, fine- to medium-grained quartz arenite; bed geometry is characterized by laterally aggrading, amalgamated channels and sparse interbedded siltstone greater than 10 cm thick; rare channel-form, white arenite and siltstone (greater than 10 meters [30 ft] thick) occur in high cliff wall exposures at the top of the section exposed in the quadrangle; has soft-sediment deformation (slump folds), planar and trough cross-bedding, and abundant secondary alteration including Liesegang banding; although no paleocurrent measurements were taken in formation of Hades Pass within this quadrangle, 18 measurements in the adjoining Kings Peak 7.5-minute quadrangle yielded an average paleoflow direction of 127° (Kingsbury-Stewart and others, 2013); primarily braided fluvial depositional environment; lower contact with the upper member of the Red Castle Formation north of the Uinta arch and the Mount Agassiz Formation south of the Uinta arch is regionally mappable, sharp, and erosive and represents a stratal discontinuity (composite sequence boundary); upper contact with the overlying Red Pine Shale is not exposed in the quadrangle; informal formation name first used by Wallace (1972); at least 1500 meters (4920 ft) thick, estimated from mapped exposure within the Kings Peak quadrangle (Kingsbury-Stewart and others, 2015).

Zuma — **Mount Agassiz Formation (Neoproterozoic, Cryogenian)** – Very light gray to light-purple-gray, fine- to coarse-grained quartz arenite and pink sub-feldspathic arenite with centimeters to tens-of-meters thick interbeds of reddish-brown feldspathic siltstone and gray claystone to shale; soft-sediment deformation (slump folds and flame structures), planar cross-beds, bi-directional planar cross-beds (0.5 cm to 1.5 cm [about 0.2–0.5 in] thick), mud chips, parting lineations, and interference ripples; although no paleocurrent measurements were taken in the Mount Agassiz Formation within this quadrangle, 80 measurements in the adjoining Kings Peak 7.5-minute quadrangle yielded a broad span of directions with an average paleoflow direction of 224° (Kingsbury-Stewart and others, 2015); offshore to nearshore marine depositional environment; although not mapped, the formation can be divided into four fine-grained subunits and three coarse-grained subunits, all meters to tens-of-meters thick; coarse-grained subunits on the east-facing wall of Kings Peak have large-scale (several meters high) prograding foresets (Kingsbury-Stewart and others, 2013); fine- and coarse-grained subunits stack in upward-coarsening cycles interpreted as depositional sequences that consist of retrogradational and aggradational-progradational systems tracts (after Neal and Abreu, 2009), which in the traditional terminology of Mitchum and Van Wagoner (1991) are transgressive and highstand systems tracts; lower contact is a stratal discontinuity interpreted as a sequence boundary with the underlying Dead Horse Pass Formation (see Kingsbury-Stewart and others, 2013, for details on internal lithologic descriptions and sequence stratigraphy); the Mount Agassiz Formation is distinguished from the underlying Dead Horse Pass Formation by thicker interbeds of gray shale and light-brown sandstone, which gives the formation a comparatively lighter color; grades laterally to the west into the upper part of the upper member of the Red Castle Formation (see correlation chart and stratigraphic column); informal formation name first used by Wallace (1972) but has been formalized by Kingsbury-Stewart and others (2013); ~130 to 300 meters (425–985 ft) thick.

Zud — **Dead Horse Pass Formation (Neoproterozoic, Cryogenian)** – Reddish-brown to very light gray quartz arenite and feldspathic arenite with interbedded green-gray to gray claystone and shale and maroon siltstone; planar cross-beds, flaser bedding, ripple marks, and hummocky to swaley cross-stratification; paleocurrent measurements (11 measurements) yield an average paleoflow direction of 282°; offshore to nearshore marine depositional environment; although not mapped, the formation can be divided into three fine-grained subunits (fine-grained sandstone, siltstone, and shale) and two coarse-grained subunits (mostly coarse-grained sandstone), up to a few tens of meters thick; fine- and coarse-grained subunits stack in upward-coarsening cycles that are interpreted as retrogradational and aggradational-progradational systems tracts (afterNeal and Abreu, 2009), which in the traditional terminology of Mitchum and Van Wagoner (1991) are transgressive and highstand systems tracts; see Kingsbury-Stewart and others (2013) for details on internal lithologic descriptions and sequence stratigraphy; the upper contact with the overlying Mount Agassiz Formation is sharp; the contact with the underlying Red Castle Formation is a sharp or erosive surface interpreted as a composite transgressive surface (Kingsbury-Stewart and others, 2013); Dead Horse Pass Formation is distinguished from the underlying middle member of the Red Castle Formation by its greater textural and compositional maturity and bed geometry characterized by stratal terminations (onlap, downlap, and truncation); grades laterally westward to the lower part of the upper member of the Red Castle Formation (see correlation chart and stratigraphic column); informal formation name first used by Wallace (1972) but has been formalized by Kingsbury-Stewart and others (2013); 150 to 235 meters (495–770 ft) thick.

Zucu — **Upper member of Red Castle Formation (Neoproterozoic, Cryogenian)** – Reddish-brown silty mudstone to medium-grained quartz arenite, and intervals of coarse-grained to pebbly arkosic arenite; intervals of silty shale are dark reddish gray to green gray (~5 meters [15 ft] thick); sandstone is thin bedded (0.1 to 0.5 meter [0.3–1.5 ft] thick) with planar lamination, trough cross-bedding, mud rip-up clasts, lag deposits, scours, hummocky cross-stratification, and herringbone cross-bedding; laterally continuous beds are 0.1 to 10 meters (0.3–30 ft) thick; sparse coarse-grained to granule quartz arenite is present in intervals less than 1 meter (3 ft) thick with abundant mud rip-up clasts and lag deposits; beds 0.5 to 6 meters (1.5–20 ft) thick; 10 paleocurrent measurements in the arkosic arenite yielded an average paleoflow direction of 182° whereas 11 measurements in the quartz arenite facies yielded an average paleoflow direction of 302°; lower contact with the middle member of the Red Castle Formation is sharp to erosive (base of green-gray shale of upper member overlying reddish-brown arkosic sandstone or red siltstone of middle member); offshore marine and deltaic depositional environment; the formation can be divided into three, tens-of-meter-scale, upward coarsening, silty sandstone or mudstone to quartz or arkosic arenite; fine- and coarse-grained subunits stack in upward-coarsening cycles that are interpreted as retrogradational and aggradational-progradational systems tracts (after Neal and Abreu, 2009); the arkosic arenite beds are much thicker in the north and west but become richer in quartz arenite as they grade laterally to the Mount Agassiz and Dead Horse Pass Formations in the Gunsight Pass area of the Kings Peak quadrangle (Kingsbury-Stewart and others, 2015) and south along Tungsten Ridge; erosional upper contact; less than 30 meters thick (100 ft) in the Kings Peak quadrangle, but ~170 meters (565 ft) thick in the Henrys Fork drainage to ~335 meters (1100 ft) thick in the Smiths Fork drainage of this quadrangle.

Zucm — **Middle member of Red Castle Formation (Neoproterozoic, Cryogenian)** – Reddish-brown, medium-grained to granular, submature arkosic arenite; laterally continuous cyclic beds of sandstone-siltstone couples that fine upward; abundant trough and planar cross-beds overlain by thin beds of reddish-brown, very fine grained sandstone interbedded with silty mudstone; bedding thickness is tens of centimeters to meter scale; horizontal to gently dipping (less than ~ 30°) tabular, meter-scale beds; contains preserved bed forms on the tops of bed sets (ripples and dunes centimeter to meter scale), mud rip-up clasts (as much as 4 cm [1.5 in]), and rare channel forms; 285 paleocurrent measurements in the arkosic arenite yielded an average paleoflow direction of 185°; tidal flat to tidal-influenced braided delta depositional environment; lower contact with the lower member of the Red Castle Formation is sharp to gradational and is placed where lenticular bedding of the lower member becomes tabular; member coarsens to the west from the Henrys Fork to the Smiths Fork drainages within this quadrangle and loses much of the interbedded fines; Kingsbury-Stewart and others (2015) could not separate the middle and lower members with certainty throughout the adjoining Kings Peak quadrangle, in which they combined it as a single map unit (Zucml); unit Zucml is shown on the stratigraphic column and correlation of map units (on plate 2 of this publication) for correlation purposes; member (Zucm) is extensively exposed south of the Uinta arch around the Red Castle Lakes, the Red Castle, Castle Peak, Smiths Fork Pass above the Smiths Fork drainage, and south in the Henrys Fork drainage; middle member also has limited exposure at the head of the Yellowstone drainage; the exposure north of the Uinta arch is limited to the Smiths Fork drainage, mainly on the west side of the basin; middle member crops out in great, striking red cliffs and when the sun is on it, it is clear how the Red Castle got its name; thickens northward from about 95 to 300 meters (~310–985 ft) thick.

Zucl — **Lower member of the Red Castle Formation (Neoproterozoic, Cryogenian)** – Reddish-brown to reddish-purple, channelized, immature to sub-mature, medium-grained arkosic arenite to pebble conglomerate and sparse, discontinuous beds of red silty shale and fine sandstone; channelized sandstone beds have well- and sub-rounded quartz grains up to 1 cm (0.4 in) and subrounded to subangular feldspar grains up to 2 cm (0.8 in); rip-up clasts up to 5 cm (2 in) in diameter are common; bedding consists of sub-meter-scale amalgamated channel forms that are laterally continuous on a 1- to 10-meters (3- to 33-ft) scale; within the channel forms are cosets of trough or planar cross-beds and (or) moderately dipping (~20° to 35°) lateral accretion macroforms with internal cross-bedding; contains abundant trough cross-beds that are commonly normally graded (centimeters to tens of centimeters) with pebble- to coarse sand-sized grains at the base and fining up to mixed coarse- to fine-grained sand; the size of the cross-beds generally decreases up section within the unit and sometimes within a single coset; reddish-brown silty to very fine grained sandstone forms beds 2 to 5 cm (0.8–2 in) thick with occasional mud cracks; contains lenticular feldspathic arenite facies; 159 paleocurrent measurements yielded an average paleoflow direction of 162°; lower member includes interbedded quartzite of the informal Island Lake tongues (Zuci); basal contact of each tongue is sharp and interpreted as a flooding surface; braided fluvial depositional environment with interbedded marine quartzite (Island Lake tongues); basal contact not exposed; Kingsbury-Stewart and others (2015) could not separate the middle and lower members with certainty throughout the adjoining Kings Peak quadrangle, in which they combined it as a single map unit (Zucml); unit Zucml is shown on the stratigraphic column and correlation of map units (on plate 2 of this publication) for correlation purposes; excellent exposures of Zucl are on the west side of the Red Castle near the head of Smiths Fork drainage (south limb of the Uinta arch) and on both limbs of the Uinta arch in the Henrys Fork drainage, especially near Island Lake (mislabeled as Grass Lake on topographic base) on the south limb; at least 230 meters (755 ft) thick.

Zuci — **Island Lake tongues (Neoproterozoic, Cryogenian)** – Medium- to very coarse grained quartz arenite; dark purple to white on fresh surfaces; weathers to gray purple; sparse pebbles of polycrystalline quartz, red jasper, and black chert; submature, normally graded beds and lenticular to tabular, medium (0.3 to 2 m [1–6.5 feet]), structureless beds; rare scoured beds with sharp contacts, sparse mud chips, mud cracks, slump features, and trough cross-bedding; interbedded with micaceous silty shale, siltstone and very fine grained quartz arenite; greenish gray on fresh surfaces, weathers green and orange, contains sand-starved ripples, asymmetrical ripples, mud-draped symmetrical ripples, quartz lenses less than 1 cm thick to less than 1 m (less than 3 feet) long that are often mud draped; 0.5 cm to 3 cm (0.2–1.2 in) pinch and swell beds are in the shale and 1 cm (0.4 in) siltstone and 3 to 10 cm (1.2–4 in) of quartzite are interbedded; 9 paleocurrent measurements in the quartz arenite facies show multidirectional flow but an average paleoflow direction of 311°; tongues of marine deposits that repeatedly flooded across a braided fluvial depositional system; in Henrys Fork drainage, two tongues are exposed (approximately greater than 25 m and 32 m [80 and 105 feet] thick); basal contact not exposed; in Smiths Fork drainage, three tongues (approximately 2 m, 11 m, and 22 m [6, 36, and 72 feet] thick) are interbedded within the lower member of the Red Castle Formation (the lowest tongue is not mappable at map scale); contains quartz arenite, silty sandstone, and silty mudstone facies; exposed in small cliffs and slopes at the crest of the Uinta arch; all three tongues are exposed to the west of The Red Castle in the Smiths Fork drainage and two are exposed near Island Lake in the Henrys Fork drainage; in the Henrys Fork drainage the base of the lowest tongue is not exposed; lower contacts with the lower member of the Red Castle Formation are sharp and upper contacts are sharp to erosional.

Older Uinta Mountain Group and Red Creek Quartzite (Neoproterozoic and Paleoproterozoic) – Shown on cross section only.

ACKNOWLEDGMENTS

We thank Ashley National Forest for providing field assistance, the hospitality of George Gehrels and University of Arizona Laserchron Lab for detrital zircon analysis, and Mark Schmitz at Boise State University for help with zircon separations. We thank Grant Willis and Mike Hylland (Utah Geological Survey) for their reviews and editing the geologic map, manuscript, and supporting materials. We also thank Buck Ehler (formerly Utah Geological Survey) for his GIS work on earlier versions of the geologic map and Zach Anderson (Utah Geological Survey) for his GIS work on the final version.

REFERENCES

Bryant, B., 1992, Geologic and structure maps of the Salt Lake City 1° x 2° quadrangle, Utah and Wyoming: U.S. Geological Survey Miscellaneous Investigations Series Map I-1997, 2 plates, scale 1:125,000.

Cohen, K.M., Finney, S.C., Gibbard, P.L., and Fan, J., 2013, The ICS international chronostratigraphic chart: Episodes, v. 36, no. 3, p. 199–204.

Crittenden, M.D., Jr., Wallace, C.A., and Sheridan, M.J., 1967, Mineral resources of High Uintas primitive area, Utah: U.S. Geological Survey Bulletin 1230-I, p. 27, 1 plate, scale 1:125,000.

Dehler, C.M., Fanning, C.M., Link, P.K., Kingsbury, E.M., and Rybczynski, D., 2010, Maximum depositional age and provenance of the Uinta Mountain Group and Big Cottonwood Formation, northern Utah—paleogeography of rifting western Laurentia: Geological Society of America Bulletin, v. 122, no. 9/10, p. 1686–1699.

Hansen, W.R., 1986, Neogene tectonics and geomorphology of the eastern Uinta Mountains in Utah, Colorado, and Wyoming: U.S. Geological Survey Professional Paper 1356, 78 p.

Kingsbury-Stewart, E.M., Link, P.K., Dehler, C.M., and Osterhout, S.L., 2015, Geologic map of the Kings Peak 7.5-minute quadrangle, Duchesne and Summit Counties, Utah: Utah Geological Survey Miscellaneous Publication 15-3DM, 2 plates, scale 1:24,000.

Kingsbury-Stewart, E.M., Osterhout, S.L., Link, P.K., and Dehler, C.M., 2013, Sequence stratigraphy of the Neoproterozoic middle Uinta Mountain Group, central Uinta Mountains, Utah—a closer look at the western Laurentian seaway at ca. 750 Ma: Precambrian Research, v. 236, p. 65–84.

Kowallis, B.J., Christiansen, E.H., Balls, E., Heizler, M.T., and Sprinkel, D.A., 2005, The Bishop Conglomerate ash beds, south flank of the Uinta Mountains—are they pyroclastic fall beds from the Oligocene ignimbrites of western Utah and eastern Nevada?, *in* Dehler, C.M., Pederson, J.L., Sprinkel, D.A., and Kowallis, B.J., editors, Uinta Mountain geology: Utah Geological Association Publication 33, p. 131–145.

Laabs, B.J.C., Munroe, J.S., Rosenbaum, J.G., Refsnider, K.A., and Mickelson, D.M., 2007, Chronology of the last glacial maximum in the upper Bear River basin, Utah: Arctic, Antarctic, and Alpine Research, v. 39, no. 4, p. 537–548.

Mitchum, R.M., Jr., and Van Wagoner, J.C., 1991, High-frequency sequences and their stacking patterns-sequence-stratigraphic evidence of high-frequency eustatic cycles: Sedimentary Geology, v. 70, no. 2-4, p. 131–160.

Munroe, J.S., and Laabs, B.J.C., 2009, Glacial geologic map of the Uinta Mountains area, Utah and Wyoming: Utah Geological Survey Miscellaneous Publication 09-4DM, 1 plate, scale 1:100,000.

Munroe, J.S., Laabs, B.J.C., Shakun, J.D., Singer, B.S., Mickelson, D.M., Refsnider, K.A., and Caffee, M.W., 2006, Latest Pleistocene advance of alpine glaciers in southwestern Uinta Mountains, Utah, USA—evidence for the influence of local moisture sources: Geology, v. 34, no. 10, p. 841–844.

Neal, J., and Abreu, V., 2009, Sequence stratigraphy hierarchy and the accommodation succession method: Geology, v. 37, no. 9, p. 779–782.

Osterhout, S.L., 2011, Geologic mapping, lithostratigraphic and sequence stratigraphic analysis of the Neoproterozoic Uinta Mountain Group, Mount Powell 7.5' quadrangle, Duchesne and Summit Counties, Utah: Idaho State University, M.S. thesis, 127 p., 1 plate, scale 1:24,000.

Phillips, F.M., Zreda, M.G., Gosse, J.C., Klein, J., Evenson, E.B., Hall, R.D., Chadwick, O.A., and Sharma, P., 1997, Cosmogenic 36Cl and 10Be ages of Quaternary glacial and fluvial deposits of the Wind River Range, Wyoming: Geological Society of America Bulletin, v. 109, no. 11, p. 1453–1463.

Refsnider, K.A., Laabs, B.J.C., and Mickelson, D.M., 2007, Glacial geology and equilibrium line altitude reconstruction for the Provo River drainage, Uinta Mountains, Utah, U.S.A.: Arctic, Antarctic, and Alpine Research, v. 39, no. 4, p. 529–536.

Sprinkel, D.A., 2006, Interim geologic map of the Dutch John 30' x 60' quadrangle, Daggett and Uintah Counties, Utah, Moffat County, Colorado, and Sweetwater County, Wyoming: Utah Geological Survey Open-File Report 491DM, compact disc, GIS data, 3 plates, scale 1:100,000.

Wallace, C.A., 1972, A basin analysis of the upper Precambrian Uinta Mountain Group, Utah: Santa Barbara, University of California-Santa Barbara, Ph.D. dissertation, 412 p.

Wallace, C.A., and Crittenden, M.D., Jr., 1969, The stratigraphy, depositional environment, and correlation of the Precambrian Uinta Mountain Group, western Uinta Mountains, Utah, *in* Lindsay, J.B., editor, Geologic guidebook of the Uinta Mountains—Utah's maverick range: Intermountain Association of Geologists and Utah Geological Survey 16th Annual Field Conference, p. 127–141.

MAP SYMBOLS

Contact – Solid where well located; dashed where approximately located on map; dashed and queried (?) where approximately located on cross section

Normal fault – Dashed where approximately located; dotted where concealed; queried where existence is uncertain; bar and ball on downthrown side where offset is known

Reverse fault – Solid where well located; dashed where approximately located; dotted where concealed

Anticline (upright) – Solid where well located; dotted where concealed

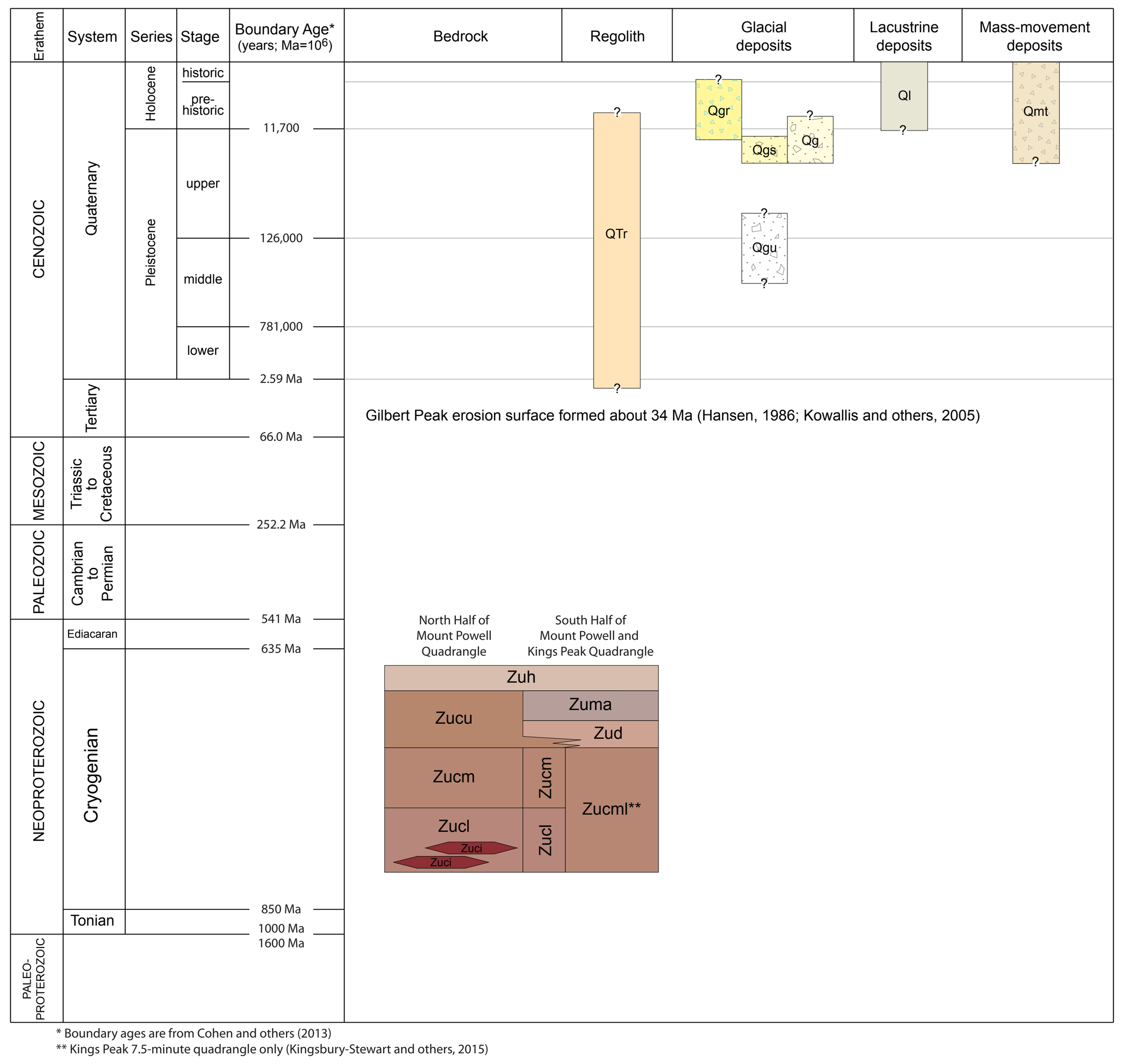
Cirque headwall, well located

Moraine crest – Crests of prominent end moraines and lateral moraines; moraines of Smiths Fork age are most topographically prominent due to their relatively young age; moraines of pre-Smiths Fork age are more topographically subdued due to their longer period of weathering and possibly by more intense periglacial processes during the Smiths Fork Glaciation.

Strike and dip of bedding (inclined)

Cross section, A-A'

CORRELATION OF UNITS



* Boundary ages are from Cohen and others (2013)
** Kings Peak 7.5-minute quadrangle only (Kingsbury-Stewart and others, 2015)

KINGS PEAK AND MOUNT POWELL 7.5-MINUTE QUADRANGLES - STRATIGRAPHIC SECTIONS