UTAH GEOLOGICAL SURVEY
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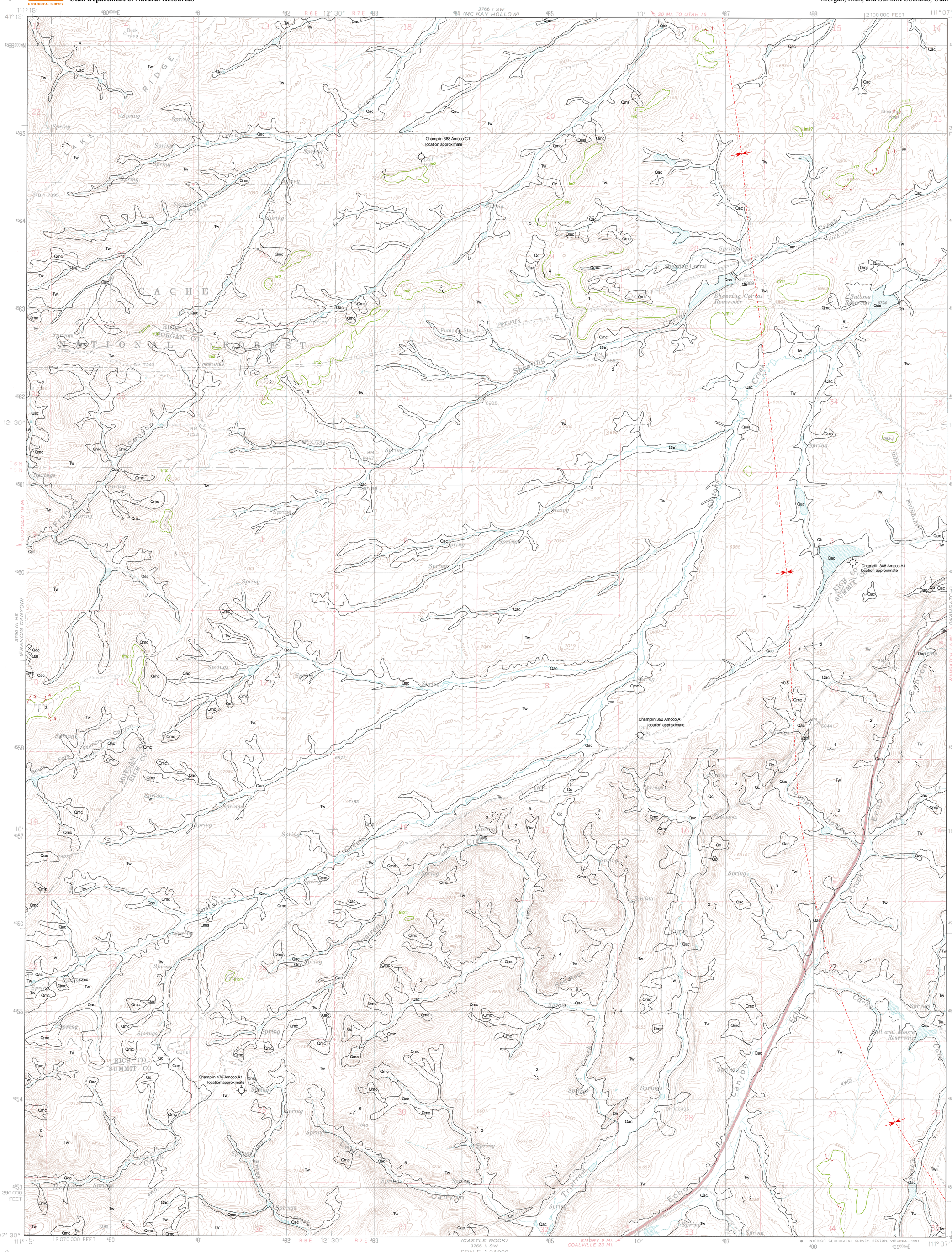

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INTERIM GEOLOGIC MAP OF THE SHEARING CORRAL QUADRANGLE, MORGAN, RICH AND SUMMIT COUNTIES, UTAH

by Jon K. King

2010

SHEARING CORRAL, UTAH
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OPEN-FILE REPORT 565
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SUMMARY

This map and report are part of work by the Utah Geological Survey to geologically map the Ogden 30- x 60-minute quadrangle. This open-file report was made to provide detail that can not be shown at the smaller scale of a 30- x 60-minute map (see Coogan and King, 2001) and because no detailed geologic mapping of the entire Shearing Corral quadrangle was available. Previous relatively detailed mapping of the southern fringe of the quadrangle was by Madsen (1959) for a graduate thesis at the University of Utah, but his map has a planimetric base and covers only a few square miles of the quadrangle.

The Shearing Corral quadrangle is located northeast of Salt Lake City, Utah and west of Evanston, Wyoming, near the Utah-Wyoming border, in the Bear River drainage in Rich County, Utah and Weber River drainage in Morgan and Summit Counties, Utah (figure 1). The major geographic feature in the quadrangle is upper Echo Canyon in the southeast portion of the map area. Echo Canyon and nearby lands are major railroad and interstate highway transportation corridors.

Geologically the map area is in the Cretaceous to Eocene "overthrust" belt of Utah, Idaho, and Wyoming (Coogan, 1992a, b; Royse, 1993), part of the Cordilleran fold-and-thrust belt of North America. In the Shearing Corral quadrangle, this complex geology, though exposed to the west and east (see Coogan and King, 2001), is obscured by a "sea" of younger rocks, the Wasatch Formation. The Eocene and uppermost Paleocene Wasatch Formation is the only bedrock exposed in the quadrangle. The Crawford thrust fault is present to the west beneath the Cretaceous Evanston Formation in the Francis Canyon and Lost Creek Dam quadrangles (Coogan, 2004a, b), and the older Willard thrust sheet is present farther to the west, also beneath extensive Wasatch Formation cover (Yonkee and others, 1997; Coogan, 2004a, 2006a, b). A roughly north-south-trending, broad syncline in the Wasatch Formation in this and adjacent quadrangles is likely due to emplacement of the Hogsback thrust, with a leading edge to the east in Wyoming (see Yonkee and others, 1997). The syncline may have developed syndepositionally with the Wasatch Formation because carbonate-rich beds in the Wasatch are most noticeable near the fold trace and imply a lacustrine setting; see Coogan (1992a) for a similar setting to the north on the Crawford thrust sheet near Bear Lake. Though no faults are mapped in this quadrangle, Quaternary normal fault scarps are present to the northwest along Saleratus Creek (see Coogan and King, 2001; Coogan, 2004b) in a fault zone previously mapped by Lamerson (1982, plate 1B). This normal faulting is due to post-thrust Cenozoic extension, in particular Miocene and younger Basin-and-Range extension, and may sole into the Crawford thrust fault (see for example West, 1993, 1994); some normal fault offset might be due to Oligocene relaxation (collapse) of the Cordilleran fold-and-thrust belt (see Constenius, 1996).

Interpretations of subsurface geology in the quadrangle have been made by Lamerson (1982, plate 11), and Yonkee and others (1997, figure 28, cross-section A-A'). Note that the Champlin 392-Amoco A well in this quadrangle (plate) is shown on both cross sections (as Amoco #1-392A and 392A). Another cross section with a slightly different subsurface

interpretation was constructed by Coogan (1992a, plate 2, cross-section a-a') to the north across the adjacent McKay Hollow quadrangle. Though mostly showing the subsurface geology to the northeast in the Murphy Ridge quadrangle, Lamerson (1982, plate 4) also used the Amoco 1-391 Champlin well (Champlin 391-Amoco A in syntax of this report) that Coogan (1992a,) did. These cross sections were constructed from seismic and well data and show the Shearing Corral quadrangle is on the west to northwest flank of an antiform above a ramp in the Absaroka thrust fault. Regionally, erosion removed the Upper Cretaceous Henefer and Frontier Formations and Lower Cretaceous Aspen, Kelvin, and Bear River Formations from this antiform before deposition of the Evanston Formation. The amount of strata removed by erosion is variable, as can be seen in the cross sections of Lamerson (1982), Coogan (1992a, plate 2, a-a'), and Yonkee and others (1997, figure 28). A cross section in Lamerson (1982, plate 11) implies all of the Henefer Formation and most of the Frontier Formation was eroded away in the Shearing Corral quadrangle, while to the east rocks as old as the Gannett Group (and Aptian portion of Kelvin Formation) were removed by erosion.

Descriptions of Cretaceous strata are included in this report as subsurface units because these framework cross sections and borehole data are available, and the Cretaceous units are relatively unique, making them identifiable in cuttings. Three other oil and gas exploration holes, in addition to the Champlin 392-Amoco A well, have been drilled in the Shearing Corral quadrangle (see plate). The deepest well (Champlin 388-Amoco C) reportedly penetrated the Cretaceous Frontier, Aspen, and Bear River Formations, and entered the lower Cretaceous Gannett Group (Utah Department of Oil, Gas and Mining [DOGM] well file) after possibly going through the Evanston Formation. These identifications are suspect because the well file for the Champlin 392-Amoco A well (Utah DOGM) disagrees with what Lamerson (1982, plate 11) showed, and Lamerson had access to all well data.

MAP UNIT DESCRIPTIONS

QUATERNARY

Qal Stream and floodplain alluvium (Holocene) - Sand, silt, clay, and gravel in channels and floodplains; composition depends on source area; 0 to 20 feet (0-6 m) thick. Only mapped adjacent to Francis Canyon quadrangle to west.

Qac Alluvium and colluvium (Holocene and Pleistocene) - Includes stream and fan alluvium, colluvium, and, locally, mass-movement deposits; 0 to 20 feet (0-6 m) thick. Note that most valleys in Echo Canyon drainage are "choked" by sediment.

Qc Colluvium (Holocene and Pleistocene) - Includes slopewash and soil creep; composition depends on local bedrock; generally less than 20 feet (6 m) thick.

Qmc Landslide and colluvial deposits, undivided (Holocene and Pleistocene) - Mapped where

landslides are difficult to distinguish from colluvium (slopewash and soil creep) and where mapping separate, small, intermingled areas of landslides and colluvial deposits is not possible at map scale; typically mapped where landslides are thin ("shallow") and include slumps and flows; also mapped where the blocky or rumpled morphology that is characteristic of landslides has been diminished ("smoothed") by slopewash and soil creep; composition depends on local sources; 0 to 40 feet (0-12 m) thick.

Qms Landslide deposits (Holocene and Pleistocene) - Poorly sorted clay- to boulder-sized material; includes slumps and locally flow deposits; generally characterized by hummocky topography and main scarps; composition depends on local sources; morphology becomes more subdued with time; thickness highly variable.

Qh Human disturbance (Historical) - Obscures original deposits or rock; only larger disturbances are shown; includes right-of-way removal along Interstate Highway 80 and fill along Union Pacific Railroad; also includes low earthen dams on Corral and Suttons Creeks.

TERTIARY

Tw Wasatch Formation (Eocene and uppermost Paleocene) - Typically red sandstone, siltstone, mudstone, and conglomerate with minor gray limestone and marlstone locally; marker beds in this quadrangle are light-colored, resistant limestone and marlstone; lighter shades of red, yellow/tan, and light gray more common in uppermost part; subsurface thickness in quadrangle estimated as 1000 feet (300 m) from penetration shown for Champlin 392-Amoco A well by Lamerson (1982, plate 11); to east thickens to 2000 feet (600 m), including 500 feet (150 m) of basal conglomerate, from penetration shown in Wahsatch quadrangle by Lamerson (1982, figure 26); from variations in exposed thicknesses to the west (Coogan, 2004a-c, 2006a, b), thickness likely varies locally due to considerable relief on subsurface basal erosional surface.

SUBSURFACE UNIT DESCRIPTIONS

TERTIARY AND CRETACEOUS

Evanston Formation (Paleocene and Upper Cretaceous, Maastrichtian/Campanian) - Not exposed in Shearing Corral quadrangle, but should be present in subsurface and Lamerson (1982, plate 11) shows about 1000 feet (300 m) penetrated by the Champlin 392-Amoco A well. Closest exposures are to east near Evanston in Wyoming and to southwest in Heiners Creek quadrangle. To west upper (Paleocene) part is absent or not recognized. To east upper part is variegated red, tan, light-gray, and light-green sandstone, siltstone, and mudstone and minor quartzite-pebble conglomerate, carbonaceous shale, and coal that is entirely (mostly?) Paleocene in age. To west, lower part, Cretaceous Hams Fork Member, is light-gray, brownish-gray, and tan sandstone, conglomeratic sandstone, and

lesser quartzite- and chert-pebble conglomerate, with variegated gray, greenish-gray, and red mudstone in upper part; dark-gray, carbonaceous shale and coal locally in lower part; member coarsens downward and westward into basal conglomerate; may be as much as 1600 feet (500 m) thick near Thirtyfive Canyon, Heiners Creek quadrangle, but dip of beds uncertain; unconformably truncated and locally absent beneath Wasatch Formation. Cretaceous part originally named Hams Fork Conglomerate Member by Oriel and Tracey (1970), but conglomerate in name is dropped in Ogden 30x60-minute quadrangle because sandstone and mudstone are far more abundant in the unit than conglomerate (see Coogan and King, 2001).

CRETACEOUS

Due to a lack of verifiable borehole data, and folding and extensive erosion (potential paleotopography) prior to deposition of the Evanston Formation, I am not certain which Cretaceous units are present and where they are located in subsurface in the Shearing Corral quadrangle. The following geologic units may be present.

Henefer Formation (Upper Cretaceous-Coniacian/Turonian?) - May not be present in subsurface in this quadrangle; if present would be on the west side of the quadrangle. Nearest exposures are to southwest in upper Echo Canyon, Heiners Creek quadrangle.

In exposures west of map area contains tan and gray, coarse-grained to conglomeratic sandstone, cyclically interbedded with gray mudstone, shale, and carbonaceous mudstone; coarsens upward and westward; dominantly massive, yellow-weathering, bioturbated sandstone in upper Echo Canyon; reportedly about 2500 feet (760 m) thick to west near Coalville (Hale, 1960, 1962, 1976; Trexler, 1966), but top not exposed in the areas of these reports. Eardley (1944) named unit, but had a huge thickness for it because he included the Kelvin and Frontier Formations in his Henefer unit; the Wanship Formation as described by Madsen (1959) is actually the upper Frontier Formation.

Frontier Formation (Upper Cretaceous-Coniacian/Turonian/Cenomanian) - Likely partially eroded from Absaroka-thrust-ramp antiform in this quadrangle prior to deposition of the Evanston Formation (see Lamerson, 1982, plate 11); note also subsurface paleo-cuesta shown by Lamerson (1982, plate 5), though east of map area, suggests a paleo-cuesta of Oyster Ridge Sandstone Member may be present in subsurface in the Shearing Corral quadrangle.

Exposed to south and west in Castle Rock and Henefer quadrangles, respectively. From these exposures, Frontier is typically gray shale, mudstone, and siltstone, light-gray to tan to brown sandstone and conglomeratic sandstone, and carbonaceous shale; marine and non-marine; to west, about 4500 feet (0-1370 m) thickness exposed near Coalville, Utah (Trexler, 1966), and 0 to 8000 feet (2440 m) thick in subsurface (Hale, 1962); about 2850 feet (870 m) exposed to south in Castle Rock quadrangle, with an additional 3600 feet (1100 m) likely present in subsurface; where possible divided into members

following Hale (1960, 1962). Following descriptions from Huff Creek area, Castle Rock quadrangle provided because members are distinct enough that they can be identified in geophysical logs and cuttings.

Upton Sandstone Member - Gray to yellowish-gray, calcareous, fine-grained sandstone; 221 feet (67 m) thick. Age is Coniacian (molluscan fossil zone 27) near Coalville (Molenaar and Wilson, 1990).

Judd Shale Member - Gray, calcareous shale; poorly exposed; about 225 feet (70 m) thick.

Meadow Creek Sandstone Member - Light-yellowish-gray, calcareous, fine-grained, cross-bedded sandstone; about 285 feet (87 m) thick.

Grass Creek Member - Gray calcareous shale; poorly exposed; about 235 feet (72 m) thick.

Dry Hollow Member - Light-yellowish-gray, fine-grained, calcareous sandstone in upper 70 feet (21 m); gray-brown and tan, calcareous siltstone and shale in middle part of member and interbedded lenses of light-gray, coarse-grained sandstone and chert- and quartzite-pebble conglomerate in basal 100 feet (30 m) of member; total thickness about 550 feet (168 m). Age of capping sandstone is Coniacian (molluscan fossil zone 27) near Coalville (Molenaar and Wilson, 1990).

Oyster Ridge Sandstone Member - Light-yellow- to orange-gray, fine-grained, calcareous sandstone with local pebble layers and disarticulated pelecypod shells; about 80 feet (25 m) thick. Age is Turonian (molluscan fossil zone 19) near Coalville (Molenaar and Wilson, 1990). Not shown by Lamerson (1982, plate 11), likely because the unit is thin.

Allen Hollow Member - Gray calcareous shale; poorly exposed; about 780 feet (240 m) thick, though base not exposed. Age is Turonian (molluscan fossil zone 19) near Coalville (Molenaar and Wilson, 1990).

Coalville Member - Yellow-gray calcareous sandstone with interbedded carbonaceous shale and coal; about 225 feet (70 m) thick, though neither top nor base exposed. Age is Turonian (molluscan fossil zone 18) near Coalville (Molenaar and Wilson, 1990).

Chalk Creek Member - Gray to red, coarse-grained, medium-bedded sandstone with discontinuous chert- and quartzite-pebble conglomerate lenses; interbedded with red, tan, and gray mudstone and siltstone; base not exposed along Huff Creek, nor is top; 3150 feet (960 m) thick to southwest at Coalville (Hale, 1960).

Lower member - Gray to red, coarse-grained, medium-bedded sandstone with discontinuous chert- and quartzite-pebble conglomerate beds; interbedded with red, tan, and gray mudstone and siltstone; some yellowish-gray, fine-grained, calcareous sandstone and gray, calcareous siltstone in lower part; equivalent to lower Chalk Creek, Spring Canyon, and Longwall Sandstone Members of the Coalville area; about 850 feet (260 m) thick to west near Henefer. Likely included in the Chalk Creek Member unit shown by Lamerson (1982, plate 11) in the map area.

Aspen Shale (lower Cenomanian/Albian) - May or may not be present in subsurface in map area, because this shale pinches out to west and is not present in Henefer area. Shown by Lamerson (1982, plate 11) in subsurface in Shearing Corral quadrangle, penetrated to northeast in Murphy Ridge quadrangle (Lamerson, 1982, plate 4), and is exposed to southeast in Porcupine Ridge quadrangle (Coogan and King, 2001).

Dark-gray, fissile, siliceous shale and silty shale with teleost fish scales; about 300 feet (90 m) thick where exposed on southeast flank of Porcupine Ridge, Porcupine Ridge quadrangle; Coogan (1992a, plate 2, a-a') shows the Aspen as excessively thick. Age is lower Cenomanian (molluscan fossil zone 2) near Coalville (Molenaar and Wilson, 1990).

Bear River Formation (Albian) - Though shown by Lamerson (1982, plate 11), this unit may not be present in subsurface in this quadrangle because Albian (and older Cretaceous) lithologies change to the west from marine to non-marine such that a different unit, the Kelvin Formation, is mapped near Henefer (and the older Gannett Group is also not mapped). Further, the Kelvin, with its characteristic lithologies (see below), is also mapped to the southeast on Porcupine Ridge (Coogan and King, 2001).

The Bear River Formation, as exposed east of the Bear River in Wyoming, is typically gray, medium- to coarse-grained, calcareous sandstone; black, fossiliferous, carbonaceous shale; and gray to gray-brown, gastropod and pelecypod, limestone coquina; bedding thickness is regular; extent is uncertain but appears limited (see Rubey, 1973) and is less than that shown by Fursich and Kauffman (1984); south of Rubey's (1973) studies, Bear River Formation lithologies may not extend far west of Utah-Wyoming border, again western extent less than that shown by Fursich and Kauffman (1984); likely deposited in brackish to fresh water of a restricted bay (see Fursich and Kauffman, 1984) or in an estuary such that coals reported in the Bear River Formation are misidentifications of black marine(?) shales and not recognizing that the non-marine Cokeville Formation is the encompassing unit. The Bear River Formation in subsurface in Anschutz Ranch East area, east of Porcupine Ridge, is about 1200 to 1300 feet (370-400 m) thick (Lelek, 1982, figure 2; West and Lewis, 1982, figure 2), or possibly 1600 feet (490 m) thick (Lamerson, 1982, plate11).

Kelvin Formation (Lower Cretaceous, Albian/Aptian) - Nearest exposures located to southeast on Porcupine Ridge in Castle Rock, Porcupine Ridge and Wahsatch quadrangles, and to west in Henefer quadrangle. As exposed, upper half is brown, gray, and minor reddish-gray, coarse-grained sandstone and pebbly sandstone, interbedded with gray, green, and tan mudstone; partly time equivalent to Bear River Formation. Lower half is red and reddish-gray, pebble to cobble conglomerate with interbedded red mudstone and tan-gray sandstone; top is marked by a distinctive 10-foot (3-m)-thick zone of limestone-pebble conglomerate with sutured clast boundaries. Total exposed thickness of ~3000 feet (920 m), but base not exposed. Lithologically similar to Gannett Group and shown as Gannett Group on Porcupine Ridge by Constenius (1996, figure 8), see below.

Gannett Group (Cretaceous and(?) Jurassic) - Nearest exposures to Shearing Corral quadrangle are 20 miles (32 km) to northeast in Wyoming. Near Woodruff Narrows Reservoir, in Neponset Reservoir NE quadrangle, upper part is gray mudstone with brownish-weathering sandstone, and underlies Bear River Formation; lower part is red, pink, and green mudstone with brownish-weathering sandstone; 400 to 500 feet (120-150 m)

exposed thickness and base covered. Near Anschutz Ranch, in Porcupine Ridge quadrangle, the subsurface basal conglomerate shown by Lelek (1982, JKg on figure 2) and West and Lewis (1982, JKg on figure 2) implies these strata are Kelvin Formation like those noted above.

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MAP SYMBOLS

Contact, dotted where concealed by human disturbance

lm — Marker bed in upper Wasatch Formation, seem to be two limestone or limey beds (lm1 and lm2)

Broad syncline hinge-zone trace, dashed because very approximately located, dotted where concealed

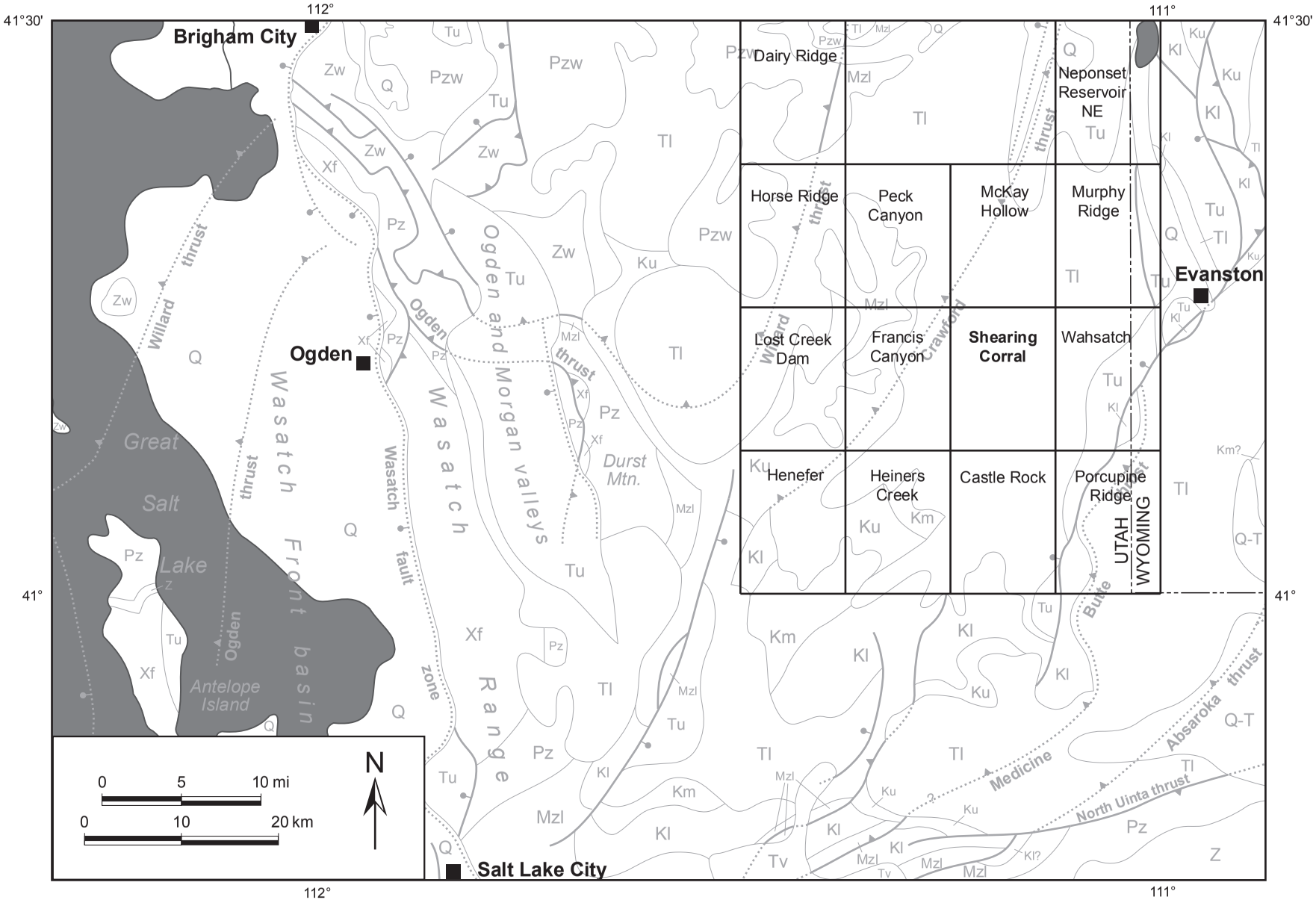
Strike and dip of bedding

2 — Upright, located in northwest corner of map area

3 — Determined by photogrammetry (upright)

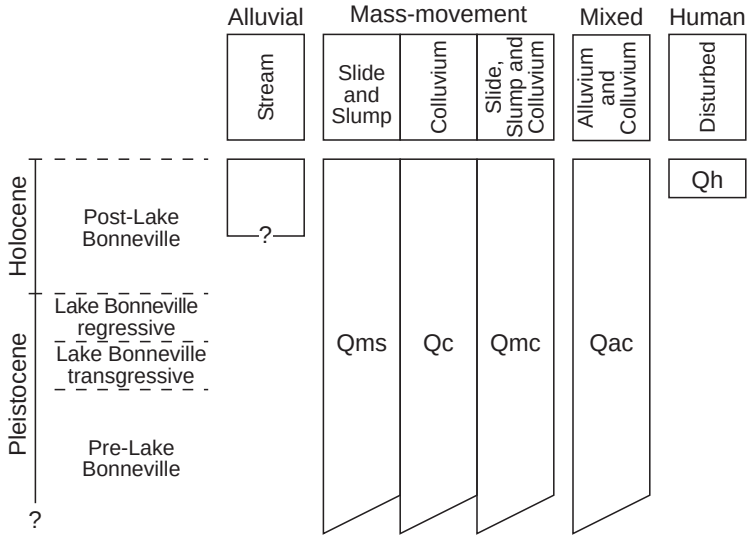
2 — Determined digitally by 3-point solution along photogrammetrically drawn contact or marker bed (upright)

Oil and gas exploration drill hole



Q	Quaternary deposits	Kl	Cretaceous, lower
QT	Quaternary and Tertiary, undivided	Mzl	Mesozoic, lower
Tu	Tertiary, upper	Pz	Paleozoic
Tl	Tertiary, lower	Pzw	Paleozoic, Willard thrust sheet
Tv	Tertiary volcanics	Zw	Late Proterozoic, Willard thrust sheet
Ku	Cretaceous, upper	Z	Late Proterozoic
Km	Cretaceous, middle	Xf	Farmington Canyon Complex

Figure 1. Generalized geologic map (modified from Yonkee and others, 1997), showing Shearing Corral quadrangle (in bold), as well as adjacent 7.5' quadrangles and quadrangles noted in text.

Quaternary correlation chart - Shearing Corral quadrangle

Ages relative to Lake Bonneville are based on regional correlations in the Ogden 30’ x 60’ quadrangle.