

# PROGRESS REPORT: GEOLOGIC MAP OF THE OGDEN 30' X 60' QUADRANGLE, UTAH AND WYOMING

YEAR 3 of 3

Original mapping by James C. Coogan and Jon K. King  
Compilation by Jon K. King



**OPEN-FILE REPORT 380**  
**UTAH GEOLOGICAL SURVEY**

*a division of*

**Utah Department of Natural Resources**  
*in cooperation with U.S. Geological Survey*  
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YEAR 3 of 3  
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2000

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This progress report makes the results of the third year of mapping on a three year project available to the public. This map consists of original mapping by Coogan and King, with previous mapping compiled from many sources by King. Because the report is subject to review and may not conform to UGS policy and editorial standards, it may be premature for an individual or group to take action based on the contents. This material will not be reproduced when the final product has been released.

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INDEX TO GEOLOGIC MAPPING, YEAR 3  
(Numbers refer to maps as shown on figure 1.)

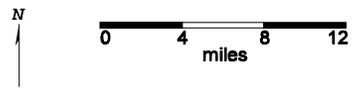
- 1 Bryant, Bruce, 1984, Reconnaissance geologic map of the Precambrian Farmington Canyon Complex and surrounding rocks in the Wasatch Mountains between Ogden and Bountiful, Utah: U.S. Geological Survey Miscellaneous Investigations Series Map I-1447, scale 1:50,000. [parts of **Kaysville**, **Peterson**, and **Snow Basin** quadrangles]
- 2 Coogan, J.C., 1998, Preliminary geologic maps of the **Meachum Ridge**, **Henefer**, and **Heiners Creek** quadrangles: Utah Geological Survey unpublished maps, scale 1:24,000 [minor revisions in 1999].
- 3 Coogan, J.C., 2000 (in review), Interim geologic maps of the **Peck Canyon**, **Lost Creek Dam**, and **Francis Canyon** quadrangles, Lost Creek drainage, Morgan, Rich, Summit, and Weber Counties, Utah: Utah Geological Survey Open-File Report, scale 1:24,000.
- 4 Coogan, J.C., 2000 (in review), Interim geologic maps of the **Dairy Ridge** and **Horse Ridge** quadrangles, leading margin of Willard thrust sheet, Cache, Morgan, Rich, and Weber Counties, Utah: Utah Geological Survey Open-File Report, scale 1:24,000.
- 5 Coogan, J.C., 1999, Preliminary geologic maps of the **James Peak**, **Sharp Mountain**, **Monte Cristo Peak**, and **Devils Slide** quadrangles: Utah Geological Survey unpublished maps, scale 1:24,000.
- 6 Coogan, J.C., and King, J.K., 1998, Preliminary geologic maps of the **Castle Rock**, **Wahsatch**, and **Porcupine Ridge** quadrangles: Utah Geological Survey unpublished maps, scale 1:24,000 [revised in 1999].
- 7 Coogan, J.C., and King, J.K., 1999, Preliminary geologic maps of the **Durst Mountain** and **Morgan** quadrangles: Utah Geological Survey unpublished maps, scale 1:24,000.
- 8 Crittenden, M.D., Jr., 1972, Geologic map of the **Browns Hole** quadrangle, Weber and Cache Counties, Utah: U.S. Geological Survey Geologic Quadrangle Series Map GQ-968, scale 1:24,000.
- 9 Crittenden, M.D., Jr., and Sorensen, M.L., 1985a, Geologic map of the **Mantua** quadrangle and part of the Willard quadrangle, Box Elder, Weber, and Cache Counties, Utah: U.S. Geological Survey Miscellaneous Investigations Series Map I-1605, scale 1:24,000; with revisions by J.C. Coogan, 1999, in eastern third of quadrangle.
- 10 Crittenden, M.D., Jr., and Sorensen, M.L., 1985b, Geologic map of the **North Ogden** quadrangle and part of the Ogden and Plain City quadrangles, Box Elder

- and Weber Counties, Utah: U.S. Geological Survey Miscellaneous Investigations Series Map I-1606, scale 1:24,000.
- 11 Harty, K.M., and Lowe, Mike, 1993, Geologic map of the North Ogden landslide complex, Weber County, Utah, in Harty, K.M., Lowe, Mike, and Christenson, G.E., Hazard potential and paleoseismic implications of liquefaction-induced landslides along the Wasatch Front, Utah: Utah Geological Survey final technical report for U.S. Geological Survey contract 14-08-0001-G2058, plate 1, scale 1:24,000.[part of **North Ogden** quadrangle]
  - 12 King, J.K., 1998, Preliminary geologic maps of the **Neponset Reservoir NW, Neponset Reservoir NE, McKay Hollow, Shearing Corral, and Murphy Ridge** quadrangles: Utah Geological Survey unpublished maps, scale 1:24,000.
  - 13 King, J.K., 1999, Preliminary geologic map of the **Peterson** quadrangle: Utah Geological Survey unpublished map, scale 1:24,000.
  - 14 King, J.K., and Coogan, J.C., 1999, Preliminary geologic map of the **Bybee Knoll** quadrangle: Utah Geological Survey unpublished map, scale 1:24,000.
  - 15 King, J.K., Coogan, J.C., and Yonkee, W.A., 1999, Preliminary geologic map of the **Snow Basin** quadrangle: Utah Geological Survey unpublished map, scale 1:24,000.
  - 16 Lowe, Mike, 1992, unpublished surficial geologic mapping in parts of the **Kaysville, North Ogden, Mantua, Huntsville, and Browns Hole** quadrangles, scale 1:24,000.
  - 17 Mullens, T.E., 1969, Geologic map of the **Causey Dam** quadrangle, Weber County, Utah: U.S. Geological Survey Geologic Quadrangle Series Map GQ-790, scale 1:24,000. [Stratigraphy revised in Mullens, T.E., 1972, Revised correlation of some Carboniferous rock units in the **Causey Dam** quadrangle, Weber County, Utah: U.S. Geological Survey Professional Paper 750-D, p. D105-D107.][minor revisions by J.C. Coogan, 1998-9]
  - 18 Nelson, A.R., and Personius, S.F., 1993, Surficial geologic map of the Weber segment, Wasatch fault zone, Weber and Davis Counties, Utah: U.S. Geological Survey Miscellaneous Investigations Series Map I-2199, 22 p., scale 1:50,000.[parts of **North Ogden, Ogden, and Kaysville** 7.5' quadrangles]
  - 19 Personius, S.F., 1990, Surficial geologic map of the Brigham City segment and adjacent parts of the Weber and Collinston segments, Wasatch fault zone, Box Elder and Weber Counties, Utah: U.S. Geological Survey Miscellaneous Investigations Series Map I-1979, scale 1:50,000.[parts of **Mantua and North Ogden** quadrangles]

- 20 Solomon, B.J., 1999, Surficial geologic map of the West Cache fault zone and nearby faults, Box Elder and Cache Counties, Utah: Utah Geological Survey Map 172, scale 1:50,000. [part of **Mantua** quadrangle]
- 21 Sorensen, M.L., and Crittenden, M.D., Jr., 1979, Geologic map of the **Huntsville** quadrangle, Weber and Cache Counties, Utah: U.S. Geological Survey Geologic Quadrangle Series Map GQ-1503, scale 1:24,000; with revisions by J.C. Coogan, 1999, in northern sixth of quadrangle.
- 22 Sorensen, M.L., and Crittenden, M.D., Jr., 1972, Preliminary geologic map of the Wasatch Range near North Ogden, Utah: U.S. Geological Survey Miscellaneous Field Studies Map MF-428, scale 1:24,000 [parts of **North Ogden** and **Huntsville** quadrangles]
- 23 Yonkee, W.A., and Lowe, Mike, 1997, Interim geologic map of the **Ogden** 7.5' quadrangle, Davis and Weber Counties, Utah: Utah Geological Survey unpublished map, scale 1:24,000.

Brigham City	Mount Pisgah	Paradise	Porcupine Reservoir	Hardware Ranch	Curtis Ridge	Birch Creek Reservoirs	Woodruff	Woodruff Narrows	Sawtooth Mountain	
Willard	Mantua	James Peak	Sharp Mountain	Monte Cristo Peak	Dairy Ridge	Meachum Ridge	Neponset Reservoir NW	Neponset Reservoir NE	Three Forks	41°30'N
	9, 16, 19, 20	5	5	5	4	2	12	12		
Plain City	North Ogden	Huntsville	Browns Hole	Causey Dam	Horse Ridge	Peck Canyon	McKay Hollow	Murphy Ridge	Evanston	
	10, 11, 16, 18, 19, 22	16, 21, 22	8, 16	17	4	3	12	12		41°15'N
Roy	Ogden	Snow Basin	Durst Mountain	Bybee Knoll	Lost Creek Dam	Francis Canyon	Shearing Corral	Wahsatch	Millis	
	18, 23	1, 15	7	14	3	3	12	6		
Clearfield	Kaysville	Peterson	Morgan	Devils Slide	Henefer	Heiners Creek	Castle Rock	Porcupine Ridge	Myers Reservoir	
	1, 16, 18	1, 13	7	5	2	2	6	6		41°00'N
Saltair NE	Farmington	Bountiful Peak	Porterville	East Canyon Reservoir	Coalville	Turner Hollow	Upton	Red Hole	Seven Tree Flat	
	112°00'W	111°45'W		111°30'W		111°15'W		UTAH	WYOMING	111°00'W

Figure 1. Index to geologic mapping, year 3.



## OGDEN 30' x 60' PRELIMINARY MAP UNITS

QUATERNARY (number suffixes show local levels/relative age, with "1" the youngest; other common suffixes are: o = older and y = younger; see correlation chart for unit suffixes)

Qa1, Qa2, Qa[p], Qab, Qay, Qao

Stream and fan alluvium -- Sand, silt, clay, and gravel. Alluvium labeled Qa[p] and Qab are graded to the Provo (and slightly lower) and Bonneville shorelines of late Pleistocene Lake Bonneville, respectively. Near former Lake Bonneville, units labeled 1 and 2 are younger than Lake Bonneville; elsewhere relative-age numbers only apply to local drainages.

Qal1, Qal2

Stream alluvium, Holocene -- Sand, silt, clay, and gravel in channels and floodplains; composition depends on source area; suffixes 1 and 2 indicate ages where they can be separated in the area of former Lake Bonneville, with 2 including low terraces.

Qat2, Qat3, Qatp, Qaty, Qato, Qat4-7

Stream-terrace deposits -- Sand, silt, clay, and gravel in terraces above floodplains. Terraces labeled Qatp are graded to the Provo and slightly lower shorelines of late Pleistocene Lake Bonneville and are only present in Morgan and Mantua Valleys. Near former Lake Bonneville, units with suffixes 2 and 3 are younger than Lake Bonneville; elsewhere relative-age numbers only apply to local drainages and the lowest terraces are labeled 2.

Qaf1, Qaf2, Qafy, Qafp, Qafb, Qaf3, Qafo

Alluvial-fan deposits -- Mostly sand, silt, and gravel that is poorly bedded and poorly sorted. Fans labeled Qafp and Qafb are graded to the Provo (and slightly lower) and Bonneville shorelines of late Pleistocene Lake Bonneville, respectively; unit Qaf3 is used where these fans can't be separated. Near former Lake Bonneville, units with suffixes 1 and 2 are younger than Lake Bonneville and are shown as Qafy where they can't be separated; here, unit Qafo is older than Lake Bonneville. Elsewhere relative-age numbers and letters only apply to local drainages.

QafO Lower and middle Pleistocene alluvial-fan deposits – Fans located above pre-Lake Bonneville older alluvial-fan deposits (Qafo) near Mountain Green; contain mostly sand, silt, and gravel that is poorly bedded and poorly sorted.

Qap Pediment-mantle deposits (also labeled as Qs = erosion surface with uncertain mantle thickness) -- Gravel, sand, silt, and clay alluvium and colluvium capping erosional surfaces.

- Qac Alluvium and colluvium -- Includes stream and fan alluvium, colluvium, and, locally, mass-movement deposits.
- Qc Colluvium -- Includes slopewash and soil creep; composition depends on local bedrock.
- Qcg Colluvial and residual gravel deposits – Includes Quaternary gravel-armored surfaces that don't resemble pediments; previously included in Huntsville fanglomerate.
- Qmc Colluvium and mass-movement deposits, undivided – Includes landslide, slump, slopewash, and soil creep with subdued morphology on steep slopes.
- Qm, Qmo  
Mass-movement deposits, undivided – Includes slides, slumps, and flows, as well as colluvium, talus, and alluvial fans that are mostly debris flows; composition depends on local sources. Qmo locally used where younger mass-movements (including landslides and slumps) are mapped.
- Qms, Qms1, Qms2, Qms3, Qmsy, Qms4, Qmso  
Landslide and slump deposits (locally, unit involved is shown in parentheses) – Poorly sorted clay to boulder-sized material; locally includes flow deposits. Near former Lake Bonneville units with relative-age number suffixes were: 1) emplaced in the last 80 to 100 years; 2) are post Lake Bonneville in age; 3) were emplaced during or shortly after Lake Bonneville regression; and 4) were emplaced before Lake Bonneville transgression; extensive deposits in Lake Bonneville sediments in North Ogden and Kaysville quadrangles include earthquake liquefaction features. Suffixes y (as well as 1&2) and o (as well as 3&4) indicate probable Holocene and Pleistocene ages, respectively.
- Qmt Talus, and lesser colluvium -- Angular debris at the base of and on steep slopes. Includes rock glaciers that form lobate mounds in cirques in the Wasatch Range; probably inactive.
- Qg, Qgw  
Glacial till and outwash -- Mostly Pinedale (~15,000 to 30,000 yrs old) but probably includes Little Ice Age (1500 to 1800 A.D.) and may include Bull Lake (~130,000 to 150,000 yrs old) deposits; locally includes rock glaciers. Unit Qgw is outwash and, possibly, alluvially reworked outwash that obscures older deposits and bedrock.
- Qly Lacustrine deposits other than those in Lake Bonneville – Fine-grained material and locally marsh deposits in lakes outside the Great Salt Lake basin; typically younger than Lake Bonneville deposits.

- Qla Lake Bonneville deposits; and post- and pre-Lake Bonneville alluvial-fan deposits, undivided -- Mostly poorly sorted and poorly bedded sand, silt, and gravel.
- Ql Lake Bonneville deposits, undivided.
- Qlf Fine-grained lacustrine deposits -- Mostly clay, silt, and fine sand deposited offshore in Lake Bonneville. In the Kaysville quadrangle, deposits below the Gilbert shoreline are the same age as the shoreline, while deposits below the historic-highstand shoreline (4,213 feet [1,284.5 m]) of Great Salt Lake are recent.
- Qls Lake Bonneville sand -- Mostly sand with some silt and gravel deposited nearshore; grades downslope into unit Qlf with decreasing sand content. Typically sand in the Ogden and Morgan Valleys.
- Qlg Lake Bonneville gravel -- Mostly interbedded gravel and sand deposited along beaches and slightly offshore.
- Qdl, Qdlb  
Deltaic and lacustrine deposits in Lake Bonneville -- Mapped in Morgan and Ogden Valleys. Unit Qdlb is sand deposited at the mouth of Weber Canyon during the Bonneville highstand.
- Qdf Fan-delta deposits in Lake Bonneville -- Alluvial fans that were deposited above (subaerially) and in Lake Bonneville (subaqueous).
- Qd, Qdp, Qdb  
Deltaic deposits in Lake Bonneville -- Mostly sand, silty sand, and gravelly sand; suffixes p and b are for deltas at the Provo and slightly lower shorelines, and Bonneville shoreline, respectively.
- Qsm Spring deposits -- Marshy areas in Kaysville quadrangle, and spring travertine downstream from Causey Spring in the Causey Dam quadrangle.
- Qh Human disturbance -- Obscures original deposits by cover or removal.
- Qx/Qy Thin Quaternary unit x overlying Quaternary unit y -- For example Qaf2/Qms2 in southwest corner of map.

#### QUATERNARY AND TERTIARY

- QTaf Quaternary and/or Tertiary alluvial-fan deposits -- Poorly sorted sand, silt, and gravel in fan east of Weber Canyon; fan surface is much higher than other alluvial and pediment-mantle deposits, yet retains fan shape.

QTng Quaternary and/or Tertiary gravel-armored deposits (Pleistocene and/or Pliocene) -- Often called pediment gravel; caps Fowkes Formation near Porcupine Ridge. On the west side of Durst Mountain, includes underlying alluvial-fan deposits mapped next to normal faults; previously included in Huntsville fanglomerate.

QTa Quaternary and/or Tertiary high-level alluvium -- Gravel, sand, silt, and clay above numbered stream terraces, alluvium, and pediment-mantle deposits; locally gravel-armored; locally may be younger than other Quaternary-Tertiary units.

#### TERTIARY

Ty Pliocene(?) conglomerate -- Only present next to normal faults on west side of Durst Mountain; unconformably overlies Norwood Tuff; previously included in Huntsville fanglomerate.

Tsn Salt Lake Formation and/or Norwood Tuff, undivided

Tsnc Conglomerate of Salt Lake Formation and/or Norwood Tuff, undivided

Tsl Salt Lake Formation (as mapped Pliocene and Miocene, and possibly Oligocene) -- Tuff, tuffaceous siltstone and sandstone, altered tuff/claystone, and conglomerate; estimated thickness 0-500 feet (0-150 m) in James Peak quadrangle.

Thv Fanglomerate of Huntsville area -- Age uncertain, but unconformably overlies Norwood Tuff, and part may interfinger with Norwood Tuff; mapped in the Durst Mountain area; deposits included in this map unit have several ages, so where possible divided into included units Qcg, QTg, and Ty.

Tn Norwood Tuff (lower Oligocene and upper Eocene) -- Typically light-gray to light-brown tuff, tuffaceous siltstone and sandstone, altered tuff/claystone, and conglomerate; generally considered younger than the Fowkes, but not well dated; up to about 5,000 feet (1,525 m) thick, thickest between Morgan and Huntsville.

Tf Fowkes Formation (middle(?) Eocene) -- Typically green to gray tuff, tuffaceous siltstone and sandstone, altered tuff/claystone, and conglomerate; could be older than or the lateral equivalent of at least part of the Norwood; as mapped Bulldog Member (altered green tuff) is at base, because lowermost Fowkes(?) mostly looks like uppermost Wasatch Formation; 0 to about 500 feet (0-150 m) exposed, up to at least 2,000 feet (610 m) thick in subsurface, thickest near Utah-Wyoming state line.

Tw Wasatch Formation (Eocene and uppermost Paleocene) -- Typically red sandstone, siltstone, mudstone, and conglomerate with minor gray limestone

and marlstone locally; marker beds (labeled cm and rm, nearly equivalent at map scale) shown in upper part in northeast part of map area; lighter shades of red, yellow/tan, and light gray more common in uppermost part; total thickness up to 4,500 feet (1,370 m), thickest south of Henefer; thickness varies locally, due to considerable relief on basal erosional surface in Lost Creek drainage and along leading edge of Willard thrust.

**Twl** Limestone – Gray, oncolitic limestone and light-gray to white marlstone; discontinuous, grades laterally into Tw; mapped in Monte Cristo Peak and Sharp Mountain quadrangles; 0 to 300 feet thick (0-90 m).

**Twc** Basal conglomerate -- Red-orange- and tan-weathering, cobble conglomerate, mainly containing Proterozoic and Cambrian quartzite clasts; mapped along western tributaries of Lost Creek and in Porcupine Ridge and Wahsatch quadrangles; 0 to 400 feet (0-120 m) thick.

**Td** Igneous dikes (Tertiary?) -- Strongly chloritically altered mafic dikes in Ogden 7.5' quadrangle.

#### TERTIARY AND CRETACEOUS

Evanston Formation (Paleocene and Upper Cretaceous-Maastrichtian/Campanian)

**TKe** Upper member(?) -- Variegated red, tan, light-gray, and light-green sandstone, siltstone, and mudstone and minor quartzite-pebble conglomerate, carbonaceous shale, and coal; about 1,000 feet (305 m) thick where exposed east of the Bear River.

**Keh** Hams Fork Member (Upper Cretaceous) -- Light-gray, brownish-gray, and tan sandstone, conglomeratic sandstone, and quartzite- and chert-pebble conglomerate, variegated gray, greenish-gray, and red mudstone, and dark-gray, carbonaceous shale and coal in upper part; member coarsens downward and northwestward; thickens westward from 50 to 100 feet (15-30 m) near Evanston to 300 feet (90 m) at Echo Canyon, and northward to 1,200 feet (365 m) near Lost Creek Dam; unconformably truncated and locally absent beneath Wasatch Formation in hanging wall of the East Canyon thrust in Henefer quadrangle; thins to truncation northward above basal unconformity from Lost Creek Dam to Woodruff Creek area.

**Kehc** Basal conglomerate of Hams Fork Member (Upper Cretaceous) --Tan and gray, cobble to boulder conglomerate with minor interbedded gray, carbonaceous mudstone; conglomerate contains >80% Proterozoic and Cambrian quartzite clasts, but locally contains clasts of Triassic and Jurassic sandstone and rare Precambrian crystalline basement clasts; 0 to 300 feet (0-90 m) thick; conglomerate is truncated along a basal angular unconformity north of Lost Creek Dam.

## WILLARD THRUST SHEET (Outer Shelf Sequence)

### PERMIAN

Pp Park City and Phosphoria Formations, undivided (Permian) -- Includes (in descending order): Franson Member of Park City Formation and several thin members of both formations (Permian) - Limestone and dolomite, cherty; about 400+ feet (120+ m) thick near Causey Dam. Meade Peak Phosphatic Shale Member of Phosphoria Formation (Lower Permian) - Phosphatic limestone, dolomite, siltstone, and shale; 230 to 260 feet (70-80 m) thick near Causey Dam. Grandeur Member of Park City Formation (Lower Permian) - Limestone and dolomite; 250 to 280 feet (75-85 m) thick near Causey Dam.

### PERMIAN AND PENNSYLVANIAN

PIPw Wells Formation (Lower Permian and Pennsylvanian) (at least partly equivalent to Weber Quartzite to south) – Light-gray to white, thick-bedded sandstone in upper part with interbedded, dark-gray, thick-bedded limestone and minor dolomite in lower part; about 400 feet (120 m) thick at Causey Dam.

### MISSISSIPPIAN

Mmc Monroe Canyon Limestone (Mississippian-Chesterian and Meramecian) (roughly equivalent to upper Humbug interval, and possibly Doughnut elsewhere in map area) – Includes upper dolomite and limestone, and underlying limestone and minor siltstone; about 700 to 1,000 feet (210-300 m) thick in James Peak quadrangle; about 500 feet (150 m) thick at Causey Dam, but this doesn't include lower Monroe Canyon (Mml) noted below.

Mml Lower Monroe Canyon Limestone(?) - Dolomite and limestone and lesser sandstone; only mapped separately in Causey Dam quadrangle; 500 to 700 feet (150-215 m) thick; actual contact between Monroe Canyon and Little Flat Formations may be in this unit.

Mlf Little Flat Formation (Mississippian-Meramecian and Osagean)(roughly equivalent to lower Humbug and Deseret interval elsewhere in map area) – Gray, tan and reddish-tan, calcareous sandstone, and sandy limestone and dolomite, with phosphatic shale at base; about 800 to 1,100 feet (245-335 m) thick.

MI Lodgepole Limestone (Mississippian-Osagean and Kinderhookian) (rough equivalent of Gardison interval in Ogden Canyon) -- Dark-gray, thin-bedded, lime micrite to wackestone, locally cherty; top not exposed in Horse Ridge and Dairy Ridge quadrangles; structurally thickened in Horse Ridge quadrangle; about 750 to 900 feet (230-275 m) thick.

### DEVONIAN

Dle Leatham Formation (Upper Devonian-Famennian) -- Only present in the James Peak quadrangle; poorly exposed, dark-colored siltstone and limestone; less

than 30 feet (9 m) thick and truncated at unconformity. Map unit likely includes Cottonwood Canyon member of Lodgepole Limestone of Mississippian (Kinderhookian) age.

- Db Beirdneau Sandstone (Upper Devonian) – Tan, reddish-tan, and yellowish-gray sandstone, siltstone, and sandy dolomite and limestone; contact ledge “limestone” at top; thickens southward from Monte Cristo Peak to Causey Dam, from about 245 to 500 feet (77-150 m); structurally thickened in Horse Ridge quadrangle; thins to west over Stansbury uplift and not present in Mantua, James Peak, and Sharp Mountain quadrangles.
- Dhw Hyrum and Water Canyon Formations  
Dh Hyrum Dolomite (Upper and Middle Devonian) – Dark-gray to medium-brownish-gray, coarsely crystalline dolostone; weathers distinctive, chocolate-brown color; exposed in Causey Dam, James Peak, and Monte Cristo Peak quadrangles, and possibly exposed in Sharp Mountain quadrangle; 400 to 675 feet (120-205 m) thick; 50 to 165 feet (15-50 m) of Hyrum(?) in Mantua quadrangle and not present to north in Wellsville Mountains; thins to west over Stansbury uplift.
- Dwc Water Canyon Formation (Lower Devonian) -- Thin- to medium-bedded, reddish-tan and gray siltstone and light-gray to light-tannish-gray, very light-gray- to white-weathering, very thick-bedded to thinly laminated, finely crystalline dolostone; thins southward from about 400 feet (120 m) thick near Sharp Mountain to 200 feet (60 m) thick at Causey Dam; possibly 50 to 165 feet (15-50 m) of Water Canyon(?) in Mantua quadrangle, but faulted; probably thins over Tooele arch or Stansbury uplift.

#### SILURIAN AND ORDOVICIAN

- SOlf Laketown and Fish Haven Dolomites -- Dark- to light-gray, cherty dolostone; about 500 to 1,400 feet (150-425 m) thick, thins to south, probably over Tooele arch.
- SI Laketown Dolomite (as mapped Silurian and Ordovician) -- Dark- to light-gray, thick- to very thick-bedded, cherty dolostone; about 500 to 1,500 feet (150-460 m) thick, thins to south, probably over Tooele arch; mapped separately from Fish Haven Dolomite where Swan Peak Formation is present.

#### ORDOVICIAN

- Ofs Fish Haven Dolomite and Swan Peak Formation  
Fish Haven Dolomite (Ordovician) -- Dark-gray, thick- to very thick-bedded dolostone with white chert as small nodules; commonly with dull-medium-gray to light-gray mottling on weathered surfaces; forms resistant ridge where distinguishable from more recessive dolostones at the base of the overlying Laketown Dolomite; 0 to at least 165 feet (0-50 m) thick, possibly up to 380 feet

(115 m) thick; thins to south and missing over Tooele arch.

Swan Peak Formation (Ordovician) -- Mostly tan to pale-reddish quartzite with lower part containing similar quartzite, dark shale, and some limestone beds; 0 to about 250 feet (0-75 m) thick, thickest in northwest and north; present from Sharp Mountain westward; missing to south over Tooele arch and missing on leading edge of thrust sheet.

- Ogc Garden City Formation (Ordovician) -- Dark-gray to gray, thin- to medium-bedded, silty limestone; intraformational, flat-pebble conglomerate common in lower half; weathers light bluish-gray with yellow/tan-weathering, wavy, siltstone layers; forms resistant ridges; commonly structurally thickened on leading margin of thrust sheet; usually about 400 to 1,200 feet (120-365 m) thick, thins to south and missing over Tooele arch.

#### ORDOVICIAN AND CAMBRIAN

i sn St. Charles and Nounan Formations

- i sc St. Charles Formation (Ordovician and Upper Cambrian) -- Dark-gray, medium- to thick-bedded dolostone, weathers very dark gray with medium-gray, crude laminae and mottling; contains subordinate medium-gray, very thick- to thick-bedded dolostone; light-gray, tannish-gray weathering, thin-bedded, silty limestone present above and interbedded with basal quartzite; basal unit also contains tannish-gray, medium-bedded, cross-bedded Worm Creek quartzite (Upper Cambrian) and light-tannish-gray, silty shale; quartzite about 0 to 75 feet (0-25 m) thick; total thickness about 500 to 970 feet (150-295 m).

#### CAMBRIAN

- i n Nounan Formation (Middle and Upper Cambrian) -- Medium-gray, very thick- to thick-bedded dolostone; with subordinate dark-gray, medium- to thick-bedded dolostone that weathers very dark gray with medium-gray, crude laminae and mottling; about 500 to 1,150 feet (150-350 m) thick, thins to south and possibly to east.
- i bo Bloomington Formation (Middle Cambrian) -- Olive to tan shale and gray, nodular limestone; about 500 to 900 feet (150-275 m) thick; divided into members (descending), except in Mantua quadrangle:
- i bc Calls Fort Shale Member -- Olive-gray to tan-gray, thin bedded, micaceous shale and argillite with minor, thin-bedded, dark-gray, silty limestone; 75 to 125 feet (35 to 40 m) thick on leading edge of thrust sheet.
- i bm Middle limestone member -- Dark gray, thick- to thin-bedded limestone with tan-, yellow-, and red-weathering, wavy, silt layers; contains subordinate olive-gray and tan-gray, thin-bedded, micaceous shale and argillite; thickens southward from 425 to 850 feet (130-260 m) on leading

edge of thrust sheet.

- i bh Hodges Shale Member -- Olive-gray to tan-gray, thin-bedded, micaceous shale and argillite and thin- to thick-bedded, dark-gray limestone with tan-, yellow-, and red-weathering, wavy, silt layers; thickens southward from 410 to 600 feet (125-180 m) along leading edge of thrust sheet.
- i bbu Blacksmith and Ute Formations - As mapped locally includes part of the Bloomington Formation and the Langston Dolomite; this combined unit only used in Browns Hole quadrangle.
- i bl Blacksmith Dolomite (Middle Cambrian) -- Medium-gray, very thick- to thick-bedded, coarsely crystalline dolostone; forms cliffs and ridges; about 400 to 760 feet (120-230 m) thick; thickens to east and then southward on leading edge of thrust sheet.
- i ul Ute and Langston Formations -- This combined unit only used in the Huntsville and Mantua quadrangles; about 800 feet (245 m) thick.
- i u Ute Formation (Middle Cambrian) -- Gray to dark-gray, thin- to thick- bedded limestone with tan-, yellow-, and red-weathering, wavy, silt layers, and olive-gray to tan-gray, thin-bedded, micaceous shale and argillite; and minor, medium-bedded, gray to light-gray dolostone; estimate 450 to 800 feet (140-245 m) thick; may be thinner on leading edge of thrust sheet.
- i l Langston Dolomite (Middle Cambrian) -- Gray, dark-gray, and gray-brown, thin- to thick-bedded, sandy limestone and dolostone in upper part and greenish gray, red-weathering shale and tan, dolomitic sandstone in lower part; 200 to 340 feet (60-100 m) thick.

## CAMBRIAN AND PROTEROZOIC

i gc, i gcu, i gcl

Geertsen Canyon Quartzite (Middle and Lower Cambrian and possibly upper Proterozoic) -- In west mostly buff quartzite, with some brown-weathering argillite locally and common at top; upper part (i gcu) 2,400 to 2,700 feet (730-825 m) thick; lower part (i gcl) mostly arkosic, 1,640 feet (500 m) thick; total about 4,200 feet (1,280 m) thick.

Divided in east into different members.

i gu Upper member – Tan, white, and light-gray, medium- to coarse-grained, cross-bedded, thick-bedded quartzite in upper part; becomes increasingly conglomeratic and arkosic in lower part; base of member is marked by a resistant, purple-weathering, quartz-pebble conglomerate containing white and pink quartz and rare jasper clasts; about 3,200 feet (975 m) thick in Horse Ridge and Dairy Ridge quadrangles. This is likely the entire

Geertsen Canyon with the Browns Hole absent and the base being the Mutual Formation.

- i gl Lower member – White, fine- to coarse-grained, locally vitreous, thick-bedded quartzite in upper part; lower part contains interbeds of red and green argillite; up to 1,500 feet (460 m) thick, but base is truncated by Willard thrust in Horse Ridge and Dairy Ridge quadrangles. This is likely the Caddy Canyon Quartzite with the Inkom absent and grading, at the base, into the Kelley Canyon Formation.

#### PROTEROZOIC

- Zb Browns Hole Formation (upper Proterozoic) -- Upper part quartzite, 60 to 285 feet (20-85 m) thick; lower part metavolcanic rocks, 0 to 460 feet (0-140 m) thick.
- Zm Mutual Formation (upper Proterozoic) -- Purplish quartzite, locally arkosic; 435 to 2,600 feet (135-790 m) thick; thins to southeast and thinnest in Browns Hole.
- Zi Inkom Formation (upper Proterozoic) -- Argillite to psammite (metasandstone over metasilstone) with basal metatuff lenses; 16 to 450 feet (5-140 m) thick, thickest near Huntsville.
- Zcc Caddy Canyon Quartzite (upper Proterozoic) -- Mostly vitreous, almost white quartzite; 1,000 to 2,500 feet (305-760 m) thick, thickest near Geertsen Canyon.
- Zpc Papoose Creek Formation (upper Proterozoic) -- Argillite to psammite (metasilstone interbedded with quartzose metasandstone); only mapped in Mantua quadrangle and 750 to 1,500 feet (230-460 m) thick; lateral relations uncertain but seems to grade laterally into upper Kelley Canyon.
- Zkc Kelley Canyon Formation (upper Proterozoic) -- Argillite to phyllite, with rare metacarbonate; grades into overlying Caddy Canyon quartzite with increasing quartzite near Huntsville; only 600 feet (185 m) thick in Mantua quadrangle, where Papoose Creek takes up most of this interval, but 2,000 feet (610 m) thick near Huntsville.
- Zmc, Zmcc, Zmcg Maple Canyon Formation (upper Proterozoic) -- Upper (Zmcc) - Quartzite to metaconglomerate at top and bottom with thin argillite in middle, 100 to 500 feet (30-150 m) thick; Lower (Zmcg) - Green arkosic metasandstone with argillite partings and local quartzite, 500 to 1,000 feet (150-305 m) thick; 1,000 to 1,500 feet (305-460 m) total thickness.
- ZYp, ZYpg, ZYpm, ZYpd, ZYpb, Zypi Formation of Perry Canyon (upper and possibly middle Proterozoic) -- “Sandstone” member (ZYpg) - Metasilstone and metasandstone with some

argillite, 3,000 feet (915 m) thick; "Mudstone" member (ZYpm) - Argillite and slate, 1,650 to 3,300 feet (500-1,005 m) thick; Diamictite member (ZYpd) - Diamictite, quartzite, and granitoid clasts in sandy argillite matrix, with local meta-pillow lava (ZYpb) and metalimestone at and near base, 0 to 1,650 feet (0-500 m) thick; local altered intrusive diorite (ZYpi).

Xf, Xfq, Xfs, Xfd, Xfls, Xfgn

Facer Formation (lower Proterozoic) -- Contains (in order of abundance): quartzite (Xfq), quartz-hematite schist (Xfq), pelitic phyllite and schist (Xfs), and quartz-muscovite schist (Xfq), with sparse metacarbonate (Xfd, Xfls) and meta-arkose (Xfgn, leucocratic gneiss); estimate 2,500 feet (760 m) total thickness; metamorphosed at same time as Farmington Canyon complex and, based on lithology, might be a lower grade assemblage of Farmington Canyon rocks.

SUB-WILLARD THRUST -- OGDEN CANYON (Transitional Shelf Sequence; some names from outer shelf sequence may not be appropriate, but are those traditionally used)

#### MISSISSIPPIAN

Mh Humbug Formation -- Dolomite, sandstone, and dolomitic sandstone; about 800 to 1,000 feet (245-305 m) thick.

Mde Deseret Limestone -- Dolomite and limestone, phosphatic at base; 200 to 250 feet (60-75 m) thick.

Mg Gardison Limestone -- Limestone and dolomite; ledge forming; about 300 to 850 feet (90-260 m) thick.

DEVONIAN (named on western Willard thrust sheet so names probably not appropriate)

Dbhw Beirdneau, Hyrum, and Water Canyon Formations

Db Beirdneau Sandstone -- Sandstone, siltstone, dolomitic sandstone, and dolomite; 165 to 330 feet (50-100 m) thick.

Dhw Hyrum and Water Canyon Formations --300 to 400 feet (90-120 m) thick.

Hyrum Dolomite -- Dolomite and minor limestone and limy siltstone; about 200 to 350 feet (60-107 m) thick; thins over Stansbury uplift.

Water Canyon Formation -- Thin-bedded sandy dolomite, siltstone and minor sandstone; slope forming; 3 to 100 feet (1-30 m) thick; thins over Stansbury uplift.

Laketown Dolomite is missing over Stansbury uplift, so missing at Ogden Canyon and to east on Crawford thrust sheet.

ORDOVICIAN (named on eastern Paris-Willard thrust sheet so names may not be appropriate)

- Ofg Fish Haven and Garden City Formations (Swan Peak Formation is missing over Tooele arch, so missing at Ogden Canyon)  
Fish Haven Dolomite -- Dolomite; cliff forming; 130 to 265 feet (40-80 m) thick at Ogden Canyon, so not thinned here over Tooele arch.  
Garden City Formation -- Dolomite and sandy dolomite with siltstone partings; 200 to 330 feet (60-100 m) thick; thins over Tooele arch.

ORDOVICIAN AND CAMBRIAN (named on eastern Paris-Willard thrust sheet so names may not be appropriate)

- i sn St. Charles and Nounan Formations
- i sc St. Charles Formation -- Dolomite; Worm Creek member at base; 330 to 660 feet (100-200 m) thick and thickens to north; thins over Tooele arch.

CAMBRIAN (Nounan and Bloomington names may not be appropriate since named on Paris-Willard thrust sheet)

- i n Nounan Dolomite -- Dolomite; cliff forming; 330 to 825 feet (100-250 m) thick and thinning over Tooele arch.
  
- i bm Calls Fort Shale Member of Bloomington Formation and Maxfield Limestone –  
Calls Fort Shale contains shale, limestone, and silty limestone; intraformational conglomerate common; 40 to 165 feet (12-50 m) thick and thickens to north; thins over Tooele arch.
  
- i bmu Calls Fort Shale Member of Bloomington Formation and upper Maxfield Limestone
  
- i m Maxfield Limestone (Middle Cambrian) -- Limestone and shale; total thickness about 600 to 1,150 feet (180-350 m). Where possible divided into subunits.
  - i mu Upper member - Mostly dolomite overlying mostly limestone, about 300 to 525 feet (90-160 m) thick.
  - i mml Middle and lower members
  - i mm Middle member- Silty limestone, with shale partings and limestone nodules, and shale, 165 to 330 feet (50-100 m) thick.
  - i ml Lower member - Limestone and possibly dolomite, 100 to 165 feet (30-50 m) thick.
  
- i o Ophir Formation (Middle Cambrian) -- Highly deformed; total thickness about 300 to 660 feet (90-200 m). Contains: Upper shale and limestone; slope forming; thickness highly variable. Middle limestone, 15 to 165 feet (5-50 m) thick. Lower argillite and siltstone; slope forming; thickness highly variable but about 100 to 145 feet (30-45 m) thick.

- i t Tintic Quartzite (Middle and Lower Cambrian) -- Quartzose, very-well-cemented, cliff-forming sandstone with lenses and beds of quartz-pebble conglomerate; arkosic lenses near base; 1,000 to about 1,500 feet (305-460 m) thick.

## PROTEROZOIC

- Xfc Farmington Canyon Complex (lower Proterozoic) - divided into
- Xfcm Migmatitic gneiss
  - Xfch Hornblende-plagioclase gneiss -- Only found in footwall of Ogden thrust
  - Xfcb Biotite-rich gneiss
  - Xfcq Quartz-rich gneiss
  - Xfcu Meta-ultramafic gneiss
  - Xfcg Granitic gneiss
  - Xfcs Mica-rich schist and gneiss
  - Xfcc Chloritic gneiss, mylonite and phyllonite
  - XJKq Quartz veins (Proterozoic, Jurassic, and/or Cretaceous) -- Quartz veins and pods of uncertain age generally associated with hydrothermally altered chloritic gneiss (Xfcc).
  - Xa Amphibolite (intrusive?)

CRAWFORD AND OTHER THRUST SHEETS -- Durst Mountain and Lost Creek areas, and terrain to the east (Exposed Paleozoic rocks are part of Transitional Shelf Sequence)

## CRETACEOUS

- Kwc Weber Canyon Conglomerate (Upper Cretaceous-Campanian/late Santonian) - Red, gray and tan, boulder to cobble conglomerate with minor sandstone and mudstone interbeds; exposed above the buried Crawford thrust trace in Lost Creek drainage and along the Right Fork of South Ogden River east of Causey Dam; clasts are from the Tintic Quartzite, Weber Quartzite, Nugget Sandstone, Lodgepole Limestone, Park City Formation, and Twin Creek Limestone; contains progressive intraformational unconformities; at least 1,900 feet (580 m) thick near Devils Slide and forms cliffs.

Echo Canyon Conglomerate (Upper Cretaceous-Santonian/Coniacian)

Keu Upper member -- Red, massively bedded, pebble to boulder conglomerate, minor gray and tan sandstone and gray mudstone; conglomerate clasts are dominated by sandstone and quartzite derived from Jurassic, Triassic, and upper Paleozoic strata of the Durst Mountain block above the Crawford thrust; 790 feet (240 m) thick in Echo Canyon.

Kel Lower member -- Light gray and tan pebble to boulder conglomerate, light-gray to tan sandstone and pebbly sandstone, and minor varicolored mudstone; conglomerate clasts include sandstone and quartzite from Jurassic and upper Paleozoic formations, up to 20% limestone clasts mainly derived from

Mississippian strata, as well as distinctive Cambrian and Proterozoic quartzites of the Willard thrust sheet; 950 feet (290 m) thick in Echo Canyon.

- Khen Henefer Formation (Upper Cretaceous-Coniacian/Turonian?) -- 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; up to 2,500 feet (760 m) thick.
- Kf Frontier Formation (Upper Cretaceous-Turonian/Cenomanian), where possible divided into:
- Kfu Upper member – Gray to yellowish-gray, calcareous, fine-grained sandstone interbedded with gray, calcareous shale; mapped east of Henefer; probably lateral equivalent of Upton Sandstone, Judd Shale, Meadow Creek Sandstone, and, possibly, the upper part of the Dry Hollow Members of the Coalville area; about 1,100 feet (335 m) thick near Henefer.
  - Kfup Upton Sandstone – Gray to yellowish-gray, calcareous, fine-grained sandstone; 221 feet (67 m) thick in the Huff Creek area, Castle Rock quadrangle.
  - Kfj Judd Shale – Gray, calcareous shale; poorly exposed; about 225 feet (70 m) thick in the Huff Creek area, Castle Rock quadrangle.
  - Kfm Meadow Creek Sandstone – Light-yellowish-gray, calcareous, fine-grained, cross-bedded sandstone; about 285 feet (87 m) thick in the Huff Creek area, Castle Rock quadrangle.
  - Kfg Grass Creek Member -- Gray calcareous shale; poorly exposed; about 235 feet (72 m) thick in the Huff Creek area, Castle Rock quadrangle.
  - Kfd Dry Hollow Member -- Tan and reddish-gray, very thick-bedded, cobble conglomerate east of Henefer; conglomerate includes clasts of Cambrian(?) and Upper Paleozoic quartzite, Mississippian limestone, Mesozoic sandstone and siltstone, and chert; conglomerate zone thickens markedly northward from 520 feet (160 m) at Bald Rock Canyon to over 1,200 feet (365 m) in Harris Canyon. In Huff Creek area, Castle Rock quadrangle, member contains light-yellowish-gray, fine-grained, calcareous sandstone in upper 70 feet (21 m); gray-brown and tan, calcareous siltstone and shale in middle part; and contains interbedded lenses of light-gray, coarse-grained sandstone and chert- and quartzite-pebble conglomerate in lower 100 feet (30 m); total thickness in Huff Creek area is about 550 feet (168 m).
  - Kfo Oyster Ridge Sandstone – Light-yellow- to orange-gray, fine-grained, calcareous sandstone with local pebble layers and disarticulated pelecypod shells; thins northward in the Henefer area from 260 to 140 feet (80-43 m); about 80 feet (25 m) thick along Huff Creek, Castle Rock quadrangle.
  - Kfac Allen Hollow and Coalville Members – Gray, calcareous shale in upper

- part; and medium-bedded, light-yellow-gray, calcareous sandstone with interbedded carbonaceous shale and coal in lower part; poorly exposed; 550 to 625 feet (168 - 190 m) thick where exposed near Henefer.
- Kfa Allen Hollow Member – Gray calcareous shale; poorly exposed; about 780 feet (240 m) thick along Huff Creek.
- Kfc Coalville Member – Yellow-gray calcareous sandstone with interbedded carbonaceous shale and coal; about 225 feet (70 m) thick along Huff Creek, Castle Rock quadrangle.
- Kfcc Chalk Creek Member - Red and tan-gray, very thick-bedded, cobble conglomerate east of Henefer; conglomerate includes clasts of Cambrian(?) and Upper Paleozoic quartzite, Mississippian limestone, Mesozoic sandstone and siltstone, and chert; conglomerate thickens markedly northward from 460 (140 m) feet thick at Bald Rock Canyon to about 1,960 feet (600 m) thick in Harris Canyon. In Huff Creek area, Castle Rock quadrangle, member contains 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; 3,150 feet (960 m) thick to south at Coalville.
- Kfl 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 near Henefer; basal 250 feet (75 m) mapped above Aspen Shale on southeast flank of Porcupine Ridge.
- Ka Aspen Shale (Albian) – 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.
- Kbr Bear River Formation (Albian) -- Gray, medium- to coarse-grained, calcareous sandstone; black, fossiliferous, carbonaceous shale; and gray to gray-brown, gastropod and pelecypod, limestone coquina; limited extent in subsurface and only exposed east of Bear River; 0 to 1,300 feet (0-395 m) thick, and possibly as much as 3,000 feet (915 m) thick in the subsurface.
- Kk Kelvin Formation (Lower Cretaceous-Albian/Aptian) -- Near Devils Slide - upper part mainly light-gray, tan, and light-reddish-gray, coarse-grained sandstone interbedded with gray, tan, and minor red mudstone and siltstone. Lower third dominantly red-weathering, with red and tan mudstone and siltstone; thin, discontinuous, gray and lavender nodular limestone; gray and red, coarse-grained, pebbly sandstone, with reddish-gray, chert-pebble conglomerate toward base; at least 5,700 feet (1,740 m) thick, but base not exposed.

Members are mapped in eastern part of map area.

Kku Upper member -- Brown, gray, and minor reddish-gray, coarse-grained sandstone and pebbly sandstone; interbedded with gray, green, and tan mudstone; partly correlative to Bear River Formation; about 1,500 feet (460 m) thick along Porcupine Ridge.

Kkc Conglomerate member - 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; about 1,500 feet (460 m) in Porcupine Ridge area, but base not exposed.

Kg Gannett Group (Cretaceous and(?) Jurassic) -- Upper part - Gray mudstone with brownish-weathering sandstone; lower part - Red, pink, and green mudstone with brownish-weathering sandstone; only exposed near Woodruff Narrows Reservoir; 400 to 500 feet (120-150 m) thickness exposed; subsurface thickness up to 3,400 feet (1,035 m).

## JURASSIC

Jsp Stump and Preuss Formations -- (Upper and Middle Jurassic) -- Poorly exposed; about 800 feet (245 m) thick at Toone Canyon; subsurface thickness up to 1,500 feet (460 m) with an additional 0 to 1,200 feet (0-365 m) of salt at base.

Js Stump Sandstone (Upper and Middle Jurassic) -- Pale red, yellow, gray, and green-gray shale and calcareous sandstone, locally glauconitic; 60 to 420 feet (20-130 m) thick, thinning northward.

Jp Preuss Redbeds (Middle Jurassic) -- Red and purple-red sandstone, siltstone, and shale, with halite near base in subsurface; mapped separately at the head of Lost Creek and along the East Canyon fault zone.

### Twin Creek Limestone (Middle Jurassic)

Jtgc Giraffe Creek Member -- Gray, greenish-gray and tannish-gray, calcareous sandstone, lime grainstone, with intraformational conglomerate in Woodruff Creek area; structurally thickened in synclinal hinges between Lost Creek Dam and Woodruff Creek; 108 to 225 feet (35-70 m) thick.

Jtl Leeds Creek Member -- Light-gray, thin- to very thick-bedded, soft, clay-rich, micritic limestone with tan, silt partings; locally exhibits bedding-normal, pencil cleavage; forms barren, scree-covered slopes; 1,000 to 1,300 feet (300-395 m) thick.

Jtw Watton Canyon Member -- Dark-gray, lime micrite and wackestone and minor oolite packstone; forms prominent ridges; locally exhibits bedding-normal, stylolitic, spaced cleavage; about 400 feet (120 m) thick.

Jtb Boundary Ridge Member -- Gray, very thick-bedded, ridge-forming, oolitic, lime grainstone to wackestone beds in middle and upper part that separate red and purple siltstone and gray, silty limestone beds in middle and lower part; 100 to 250 feet (30-75 m) thick.

Jtr Rich Member -- Light-gray, thin- to very thick-bedded, soft, clay-rich,

micritic limestone in upper part and gray lime wackestone in lower part; locally exhibits bedding-normal, pencil cleavage; forms barren, scree-covered slopes; about 425 to 540 feet (130-165 m) thick.

Jts Sliderock Member -- Dark-gray, very thick-bedded, lime wackestone in upper part and dark-gray, pelecypod and crinoid grainstone in lower part; forms small ridges; 100 to 227 feet (30-70 m) thick.

Jtgs Gypsum Spring Member -- Red siltstone and sandstone, and gray, vuggy dolomite, with anhydrite in subsurface; up to 208 feet (65 m) thick.

Jn Nugget Formation (Lower Jurassic) -- Pale-grayish-orange, pinkish, and locally white, well-cemented, cross-bedded, quartz sandstone with frosted sand grains; from 1,100 to 1,500 feet (305-460 m) thick.

## TRIASSIC

Ta Ankareh Formation, Higham Grit, and Timothy Sandstone and Portneuf Limestone Members of Thaynes Formation, undivided (Triassic) – Mixture of shale, siltstone, sandstone, and limestone; 1,100 feet (335 m) exposed thickness at Devils Slide; subsurface thickness 750 to 1,100 feet (230-335 m); structurally thinned where exposed near leading edge of Willard thrust; subdivided in Francis Canyon and Devils Slide quadrangles.

Taw Wood Shale Tongue of the Ankareh Formation (Triassic) -- Bright orange-red shale, siltstone and sandstone; locally micaceous; 515 feet (155 m) exposed near Devils Slide.

Tht Higham Grit; and Timothy Sandstone and Portneuf Limestone Members of the Thaynes Formation (Triassic) -- Gray and greenish-gray, micaceous, quartz-granule sandstone at top; greenish-gray, lithic-pebble conglomerate with green siltstone clasts and wood fragments in middle; and locally gray and lavender, mottled limestone at base; 43 to 200 feet (15-60 m) thick.

Tal Lanes Tongue of the Ankareh Formation (Triassic) -- Purple and brownish-red shale, siltstone, and sandstone; 465 feet (140 m) exposed near Devils Slide.

Tt Thaynes Formation (Lower Triassic) -- Calcareous siltstone and limestone in upper and lower part, separated by resistant limestone ridge; 2,200 feet (670 m) exposed thickness at Devils Slide; subsurface thickness 700 to 1,650 feet (215-500 m); subdivided in Francis Canyon and Devils Slide quadrangles.

Ttu Upper member – Brownish-gray, thin-bedded, calcareous siltstone and thin-bedded, gray, fossiliferous limestone; about 750 feet (260 m) thick.

Ttm Middle member – Gray, thin-bedded, calcareous, silty shale in upper half; gray, thick- to medium-bedded, fossiliferous, ridge-forming limestone in lower half; about 210 feet (63 m) thick.

Ttl Lower member -- Gray to brownish-gray, thin-bedded, calcareous siltstone to silty shale in upper part; gray to grayish-brown, thick- to thin-bedded, fossiliferous limestone in lower part; about 575 feet (175 m) thick.

- Twd Woodside and Dinwoody Formations (Lower Triassic)-- Dark-red, sandy shale and siltstone and greenish-gray calcareous siltstone and silty limestone; about 1,000 feet (305 m) thick; structurally thinned where exposed near leading edge of Willard thrust sheet in Dairy Ridge quadrangle; divided in Devils Slide quadrangle.
- Tw Woodside Formation -- Dark-red, sandy shale and siltstone, with some sandstone; 800 feet (245 m) exposed thickness; 550 to 800 feet (170-245 m) thick in subsurface.
- Rd Dinwoody Formation -- Greenish-gray and tan, calcareous siltstone and silty limestone; 500 feet (150 m) exposed thickness; 200 to 250 feet (60-75 m) thick in subsurface.

#### PERMIAN

- Pp Park City and Phosphoria Formations, undivided – Total thickness 857 and 675 feet (260 and 205 m) and Devils Slide and Durst Mountain, respectively; divided into subunits south of Weber River in Devils Slide quadrangle.
- Ppf Franson Member of Park City and Rex Chert Member of the Phosphoria Formation -- Interbedded gray to pinkish-gray to dark-gray, vuggy, cherty limestone, with lesser gray shale and calcareous sandstone, and dark-gray and black, bedded chert; about 240 to 300 feet (75-90 m) thick.
- Ppm Meade Peak Phosphatic Shale Member of the Phosphoria Formation -- Gray limestone, dark-gray to black, phosphatic siltstone and shale, and gray, calcareous sandstone; 170 to 300 feet (50-90 m) thick.
- Ppg Grandeur Member of Park City Formation – Light-gray, thick-bedded, dolomitic sandstone with gray chert nodules; about 220 to 312 feet (65-95 m) thick.

#### PERMIAN AND PENNSYLVANIAN

- PIPw Wells Formation (Lower Permian and Pennsylvanian) -- Light-gray to tannish-gray, very thick-bedded, cross-bedded, fine-grained sandstone; about 1,050 feet (320 m) thick, but the base of the Wells is truncated by the Willard thrust. Present in Dairy Ridge quadrangle below leading edge of Willard thrust sheet.

#### Pw, Pwu, IPwl

Weber Quartzite (Lower Permian and Pennsylvanian) (at least partial equivalent of Wells to north and east) -- Gray, indurated, quartzose sandstone with dolomite and siltstone in lower part; 2,500 to 3,000 feet (760-915 m) thick; divided into upper (IPwu) and lower (IPwl) parts at Durst Mountain.

#### PENNSYLVANIAN

- IPm Morgan Formation (Pennsylvanian) (possibly equivalent to lower part of Wells Formation to north) -- Sandstone, siltstone and limestone that grades northward into lower part of Weber Quartzite; 0 to 1,000 feet (0-305 m) thick in Morgan

quadrangle.

- Pr** Round Valley Limestone (Pennsylvanian and possibly Mississippian) (possibly equivalent to lowest Wells Formation to north) -- Mostly light-gray, fine-grained limestone; about 400 feet (120 m) thick in Morgan quadrangle.

## MISSISSIPPIAN

Mdo, Mdu, Mdl

Doughnut Formation (Mississippian) (possibly equivalent to upper Monroe Canyon to north; unconformity to east) -- Upper (Mdu) - Limestone and siltstone, about 290 feet (90 m) thick at Durst Mountain. Lower (Mdl) - Siltstone, shale, and limestone, 100 to 200 feet (30-60 m) thick at Durst Mountain.

- Mmc** Monroe Canyon Limestone (Mississippian-Chesterian and Meramecian) -- Tannish-gray, fossiliferous, vuggy, sandy dolostone; incomplete section about 1,200 feet (365 m) thick in Horse Ridge quadrangle, top not exposed.

Mh, Mhu, Mhl

Humbug Formation (Mississippian) (unconformity to east; roughly equivalent to lower Monroe Canyon Limestone and upper Little Flat Formation to north) -- Upper (Mhu) - Limestone with sandstone beds near base, about 300 to 350 feet (90-105 m) thick at Durst Mountain. Lower (Mhl) - Sandstone with limestone and dolomite interbeds, about 400 to 600 feet (120-185 m) thick at Durst Mountain.

- Mlf** Little Flat Formation (Mississippian-Meramecian and Osagean) -- White to light-tan, light-orange to tan weathering, fine-grained, calcareous sandstone; 970 feet (295 m) thick in Horse Ridge quadrangle.

- Mde** Deseret Limestone (Mississippian) (probably equivalent to most of Little Flat Formation to north) -- Limestone, dolomite and sandstone, with phosphatic shale at base; about 500 feet (150 m) thick at Durst Mountain; not present in Horse Ridge quadrangle.

- MI** Lodgepole Limestone (Mississippian-Osagean and Kinderhookian)(roughly equivalent to Gardison in Ogden Canyon) -- Dark-gray, thin-bedded, lime micrite to wackestone, locally cherty; about 650 to 800 feet (200-245 m) thick, but structurally thickened in Horse Ridge quadrangle.

DEVONIAN (Beirdneau, Hyrum, and Water Canyon names are from Willard thrust sheet and are probably not appropriate, but traditionally have been used)

- Db** Beirdneau Sandstone (Upper Devonian) -- Tan, reddish-tan, and yellowish-gray, calcareous sandstone, siltstone, and sandy dolostone and limestone; about 175 to 400 feet (55-120 m) thick; one bed of brownish-gray dolostone resembling Hyrum Dolomite in middle part in Horse Ridge quadrangle.

- Dhw Hyrum and Water Canyon Formations
- Dh Hyrum Dolomite (Upper and Middle Devonian) -- Dark- to medium-brownish-gray and gray, medium-bedded, coarsely crystalline dolostone; weathers distinctive, dark-chocolate brown; about 136 to 200 feet (40-60 m) thick at Durst Mountain; but, 725 feet (220 m) thick and base not exposed in Horse Ridge quadrangle, so may include Water Canyon Formation.
- Dwc Water Canyon Formation -- Interbedded calcareous sandstone and sandy dolomite(?); estimated thickness 300 to 400 feet (90-120 m) at Durst Mountain.

Silurian and Ordovician missing, along with part of Cambrian ("St. Charles"), in these quadrangles due to thinning over Tooele arch.

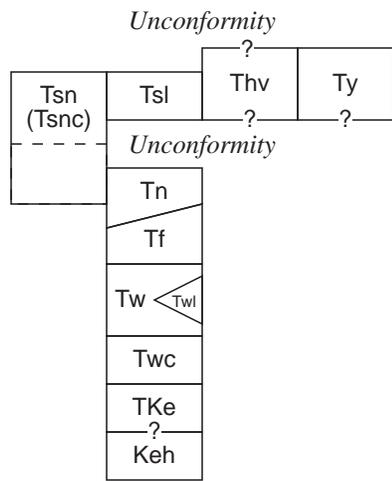
#### CAMBRIAN (exposed in Durst Mountain and Morgan quadrangles)

- i n Nounan Formation -- Medium-dark-gray, thick-bedded dolomite(?); estimated thickness 300 to 400 feet (90-120 m).
- i m Maxfield Limestone -- Limestone and calcareous siltstone; estimated thickness 600 feet (180 m); Calls Fort Shale Member of Bloomington Formation is not present in Morgan and Durst Mountain quadrangles.
- i o Ophir Formation -- Upper slope-forming brown-weathering shale; middle, ledge-forming, gray limestone; and lower brown-weathering, olive-gray shale with lesser limestone and siltstone, and mainly siltstone and sandstone in lower 60 feet (20 m); estimated total thickness 200 to 400 feet (60-120 m) thick.
- i t Tintic Quartzite -- Tan quartzite, conglomeratic in lower half with Precambrian quartzite pebbles and cobbles; basal 50 to 100 feet (15-30 m) arkosic conglomerate of Farmington Canyon complex material; about 800 to 1,500 feet (245-460 m) thick.

#### PROTEROZOIC

- Xfcs Farmington Canyon Complex -- Muscovite schist at Durst Mountain; contains pods of amphibolite and pegmatite.

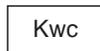




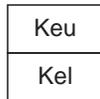
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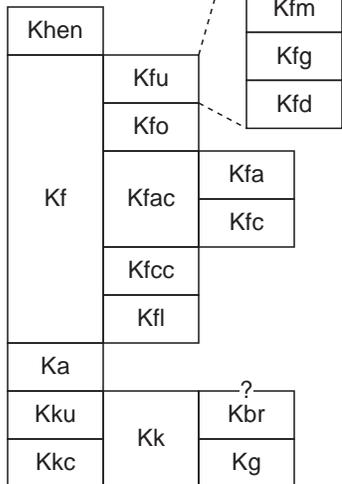
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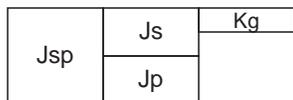
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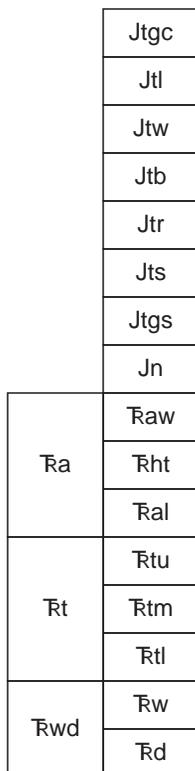
*Unconformity*



*Unconformity*



*Unconformity*



*Unconformity*

## TERTIARY AND MESOZOIC

*Unconformity*

Pp
PPw

*Unconformity?*

Mmc	Mml
?	
Mlf	
MI	

*Unconformity*

Dle
-----

*Unconformity*

Db
----

*Unconformity*

Dhw	Dh
	<i>Unconformity</i>
	Dwc

*Unconformity*

SOlf	SI
	Ofs
	Ogc

*Unconformity*

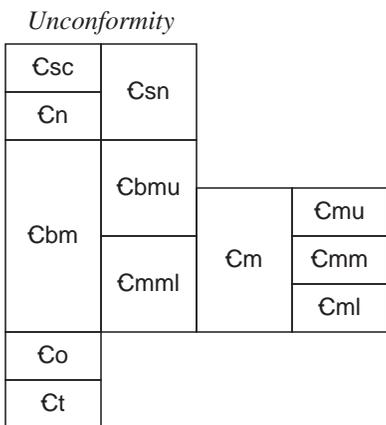
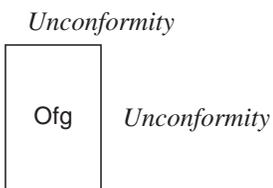
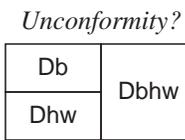
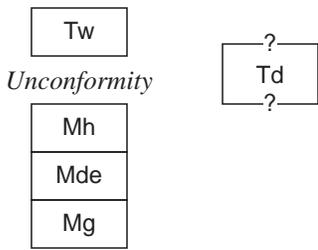
*Unconformity*

Csn	Csc	
	Cn	
Cbo	Cbc	
	Cbm	
	Cbh	
Cbbu	Cbl	
	Cu	
Cgc	Cul	
	Cl	
Cgc	Cgcu	
	Cgcl	
Zb	Cgu	
		Zm
		Zi
		Zcc
Zpc	Zkc	
Zmc	Zmcc	
	Zmcg	
ZYp	ZYpg	
	ZYpm	
	ZYpd	
	ZYpi	
	ZYpb	

*Unconformity*

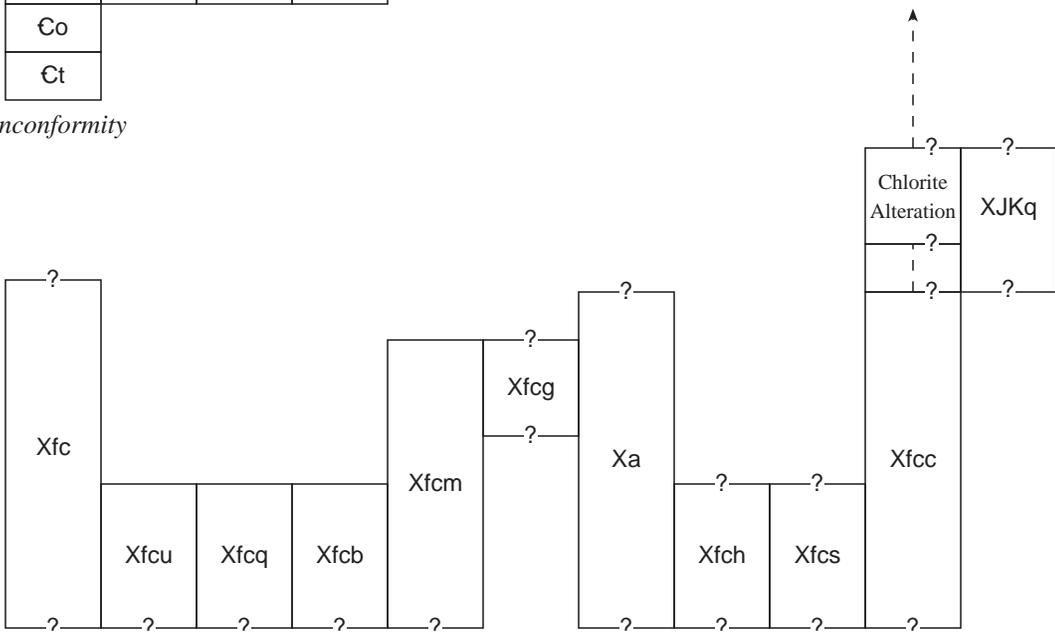
Xf	Xfd, Xfls
	Xfs
	Xfq
	Xfgn
	Xfs

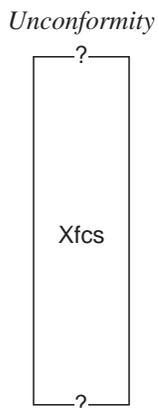
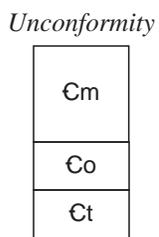
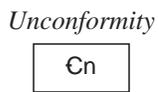
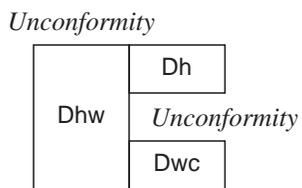
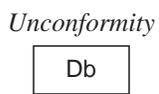
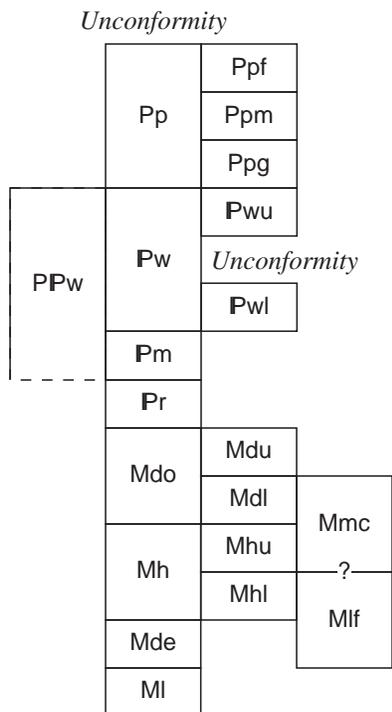
# WILLARD THRUST SHEET



*Unconformity*

# OGDEN CANYON

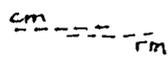


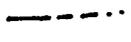


# CRAWFORD and OTHER THRUST SHEETS

OGDEN 30' x 60' PRELIMINARY MAP SYMBOLS

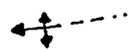
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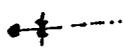
Contact, dashed where approximately located or gradational, dotted where concealed
- 

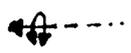
Marker Bed, shown in upper Wasatch Formation in northeast part of quadrangle
- 

Fault, dashed where approximately located, dotted where concealed, sense of movement unknown
- 

Normal Fault, bar and ball on downthrown side, dotted where concealed
- 

Thrust Fault, teeth on upper plate, dotted where concealed
- 

Anticline Axis, dashed where approximately located, arrow shows plunge, dotted where concealed
- 

Syncline Axis, dashed where approximately located, arrow shows plunge, dotted where concealed
- 

Overturned Anticline Axis, arrow shows plunge, dashed where approximately located, dotted where concealed
- 

Overturned Syncline Axis, arrow shows plunge, dotted where concealed
- 

Broad Syncline Axis, approximately located
- 

Monocline (flexure)
- 

Overturned Monocline
- 

Younger Shorelines in Great Salt Lake Basin  
Gilbert
- 

4217 (4,217 feet [1,286 m])
- 

historic highstand
- 

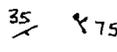
Lake Bonneville Shorelines  
Bonneville
- 

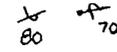
Provo
- 

regressive
- 

Mass-Movement Scarp
- 

Moraine Ridge
- 

Sinkhole
- 

Strike and Dip of Bedding  
Upright (top known on right)
- 

Overturned (top known on right)
- 

Vertical
- 

Horizontal
- 

Determined by Photogrammetry (upright)

# WILLARD THRUST SHEET

AGE	MAP SYMBOL	MAP UNIT	THICKNESS		SCHEMATIC COLUMN	OTHER INFORMATION	
			FEET	METERS			
Q.	Q- various	Alluvial and lake deposits	0-500	0-150			
CRET. TERT.	Tsl	Salt Lake Formation	0-500	0-150		ANGULAR UNCONFORMITY 37.5 Ma K-Ar	
	Tn	Norwood Tuff	0-1,100	0-335			
CRET.	Tw	Wasatch Formation	0-3,400	0-1,035		Twl - limestone	
PERM.	Pp	Franson Member, Park City Formation	400+	120+		MAJOR UNCONFORMITY Includes Rex Chert, Retort Shale Phosphate	
		Meade Peak Member, Phosphoria Fm	230-260	70-80			
		Grandeur Member, Park City Formation	250-280	75-85			
IP.	PIPw	Wells Formation	400	120		UNCONFORMITY?	
MISS.	Mmc	Monroe Canyon Limestone	700-1,000	210-305		Mml - Lower Monroe Canyon	
		Mlf	Little Flat Formation	800-1,100	245-335		Delle Phosphate Member
		MI	Lodgepole Limestone	750-900	230-275		Fossiliferous
DEV.	Db	Beirdneau Sandstone	0-500	0-150		Dle - Leatham Formation Absent to west	
	Dh	Hyrum Dolomite	50-675	15-205		Thins to west	
	Dwc	Water Canyon Formation	50-400	15-120		Thins to west and south	
S.	SOlf	SI	Laketown Dolomite	500-1,500	150-460	Thins to south	
		Ofs	Fish Haven Dolomite	0-165+	0-50+	Absent to south	
ORD.	Ogc	Swan Peak Formation	0-250	0-75		Absent to south and east	
		Garden City Formation	400-1,200	120-365		Thins to south Intraformational conglomerate	
		Csc	St. Charles Formation	500-970	150-295		Worm Creek quartzite
CAMBRIAN	Cn	Nounan Formation	500-1,150	150-350		Thins to south	
		Cbo	Bloomington Formation	Cbc	Calls Fort Shale Member	75-125	35-40
	Cbm			Middle limestone member	425-850	130-260	Thins to north
	Cbh			Hodges Shale Member	410-600	125-180	
	Cbl	Blacksmith Dolomite	400-800	120-245		Limestone in places	
	Cu	Ute Formation	450-800	140-245			
	Cl	Langston Dolomite	200-300	60-90			
	Cgc	Geertsen Canyon Quartzite	3,000-4,200	915-1,280			
	Zb	Browns Hole Formation	Quartzite member	0-285	0-85		590 Ma basaltic andesite
			Volcanic member	0-460	0-140		
Zm	Mutual Formation	435-2,600	135-790		Purple to pink Cross bedded Some feldspar locally		
Zi	Inkom Formation	0-450	0-140		Meta-tuff lenses		
Zcc	Caddy Canyon Quartzite	1,000-2,500	305-760				
Zpc	Papoose Creek Formation	0-1,500	0-460		Olive meta-siltstone Zpc seems to grade laterally into upper Zkc Argillitic to phyllitic		
Zkc	Kelley Canyon Formation	600-2,000	185-640				
Zmc	Maple Canyon Formation	Zmcc	Conglomerate member	100-500	30-150		Thin limestone locally
		Zmcg	Green arkose member	500-1,000	150-305		
Zyp	Formation of Perry Canyon	ZYpg	"Sandstone" member	3,000	915		Mixed conglomerate, shale, and sandstone Glacial
		ZYpm	"Mudstone" member	1,650-3,300	500-1,005		
		ZYpd	Diamictite member	0-1,650	0-500		
Xf	Facer Formation	est 2,500	est 760		Varicolored quartzite and schist		

Diagram is schematic--- no fixed thickness scale

WILLARD THRUST

## SUB-WILLARD THRUST -- OGDEN CANYON

AGE	MAP SYMBOL	MAP UNIT	THICKNESS		SCHEMATIC COLUMN	OTHER INFORMATION	
			FEET	METERS			
MISSISSIPPIAN	Mh	Humbug Formation	800-1,000	245-305		MAJOR UNCONFORMITY	
	Mde	Deseret Limestone	200-250	60-75		Basal phosphorite	
	Mg	Gardison Limestone	300-850	90-260		UNCONFORMITY?	
DEV.	Db	Bierdneau Sandstone	165-330	50-100		UNCONFORMITY	
	Dhw	Hyrum Dolomite	200-350	60-107		UNCONFORMITY	
Water Canyon Formation		3-100	1-30				
ORD.	Ofg	Fish Haven Dolomite	130-265	40-80		UNCONFORMITY	
		Garden City Formation	200-330	60-100		UNCONFORMITY	
	Csc	St. Charles Formation	330-800	100-245		UNCONFORMITY	
CAMBRIAN	Cn	Nounan Dolomite	330-825	100-250		Worm Creek quartzite	
	Cb	Calls Fort Member, Bloomington Formation		40-300	12-90		Intraformational conglomerate
		Cm	Maxfield Limestone	600-1,150	180-350		Boundstone
	Co	Ophir Formation	300-660	90-200		<i>Elrathia</i> <i>Ehmaniella</i> <i>Glossopleura</i>	
	Ct	Tintic Quartzite	1,000-1,500	305-460		MAJOR UNCONFORMITY	
EARLY PROTER.	Xfc	Farmington Canyon Complex	indeterminable			1,790 Ma Gneiss	

Diagram is schematic--- no fixed thickness scale

# CRAWFORD AND OTHER THRUST SHEETS

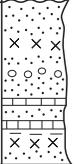
AGE	MAP SYMBOL	MAP UNIT	THICKNESS		SCHEMATIC COLUMN	OTHER INFORMATION		
Q.	Q-various	Alluvium, lake beds, mass movements	0-500	0-150				
TERTIARY PALEOCENE-EOCENE	P.	QT	Alluvium, gravel		0-1,000	0-305		
	Tn, Tf	Norwood Tuff, Fowkes Formation		up to 5,000	up to 1,525		Altered tuff <i>Protoreodon</i> 37.5 Ma K-Ar	
	Tw	Wasatch Formation		up to 4,500	up to 1,370		Twc - basal conglomerate	
	TKe	Evanston Formation		0-1,000	0-305			
CRETACEOUS	Keh	Hams Fork Member of Evanston Formation		0-1,200	0-365			
	Kwc	Weber Canyon Conglomerate		0-1,900	0-580			
	Keu	Echo Canyon Conglomerate	Upper	0-790	0-240			
	Kel		Lower	0-950	0-290			
	Khen	Henefer Formation		up to 2,500	up to 760		ANGULAR UNCONFORMITY	
	Kf	Kfu	Frontier Formation, upper part		up to 7,500	up to 2,285		Upton Sandstone Judd Shale Meadow Creek Sandstone Grass Creek Member Dry Hollow Member
		Kfo	Oyster Ridge Member					
			Frontier Formation, lower part					Allen Hollow and Coalville Members Chalk Creek Member lower member
	Ka	Aspen Shale		0-300	0-90			
	Kk	Kelvin Formation		3,000+	915+		Bear River Formation (Kbr) and Gannet Group (Kg) in northeast	
JURASSIC	Js	Stump Sandstone		60-420	20-130			
	Jp	Preuss Sandstone		400-1,500	120-460		UNCONFORMITY Salt in subsurface UNCONFORMITY	
	Jtgc	Twin Creek Limestone (Jtc)	Giraffe Creek Member		110-225	35-70		
	Jtl		Leeds Creek Member		1,000-1,300	300-395		
	Jtw		Watton Canyon Member		400	120		
	Jtb		Boundary Ridge Member		100-250	30-75		
	Jtr		Rich Member		425-540	130-165		
	Jts		Sliderock Member		100-230	30-70		
	Jtgs		Gypsum Spring Member		50?-210	15?-65		
	Jn	Nugget Sandstone		1,100-1,500	305-460		Chinle equivalent	
TRIASSIC	Raw	Wood Shale Tongue of Ankareh Fm		515	155		Chinle equivalent	
	Rht	Hingham Grit, and Mbrs of Thaynes Fm		43-200	15-60			
	Ral	Lanes Shale Tongue of Ankareh Fm		465	140			
	Rt	Thaynes Formation		2,200-2,500	670-760			
	Rw	Woodside Shale		~800	~245			
	Rd	Dinwoody Formation		~500	~150		UNCONFORMITY Includes Rex Chert	
PERM.	Pp	Ppf	Franson Member of Park City Formation		240-300	75-90		
		Ppm	Meade Peak Member of Phosphoria Fm		170-300	50-90		Wells Formation?
		Ppg	Grandeur Member of Park City Formation		220-310	65-95		
PENN.	IPw	Weber Sandstone		2,500-3,000	760-915		UNCONFORMITY	
	IPm	Morgan Sandstone		0-1,000	0-305		Absent to north	
	IPr	Round Valley Limestone		400	120			
MISS.	Mdo	Doughnut Formation		500	150		Monroe Canyon Limestone (Mmc) and Little Flat Formation (Mlf) in north	
	Mh	Humbug Formation		700-900	215-275			
	Mde	Deseret Limestone		500+	150+		Delle Phosphatic Member Fossiliferous	
	MI	Lodgepole Limestone		650-800	200-245			
DEV.	Db	Bierdneau Sandstone		175-400	55-120			
	Dh	Hyrum Dolomite		200-725	60-220			
	Dwc	Water Canyon Formation		~330	~100		← MAJOR UNCONFORMITY	
	Cn	Nounan Formation		~330	~100			
CAMB.	Cm	Maxfield Limestone		600	180		<i>Skolithus</i>	
	Co	Ophir Formation		200-400	60-120			
	Ct	Tintic Quartzite		800-1,500	245-460		CRAWFORD THRUST	

Diagram is schematic--- no fixed thickness scale

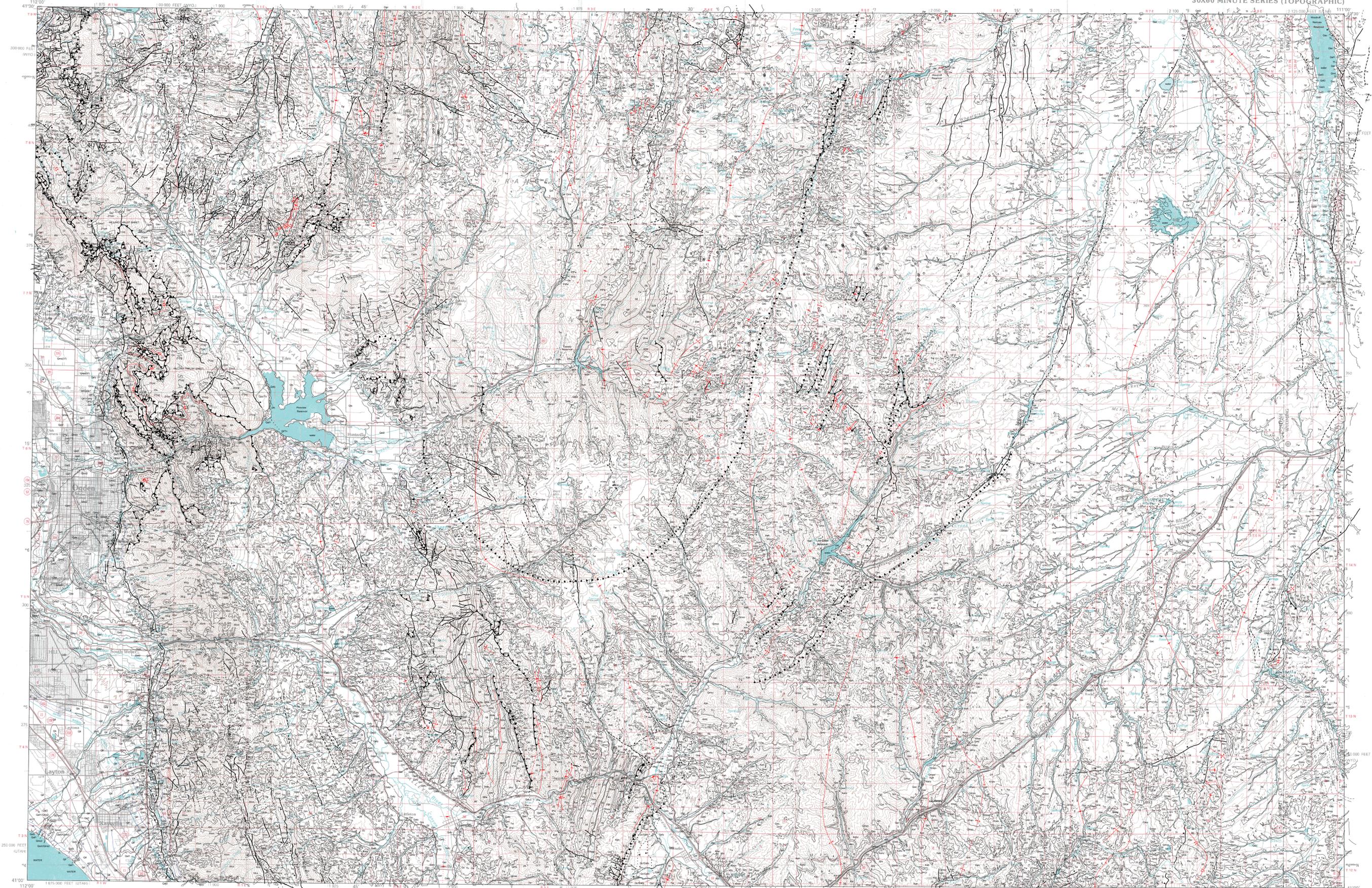
Progress Report Geologic Map of the Ogden 30' x 60' Quadrangle,  
Utah and Wyoming - Year 3 of 3  
by  
James C. Coogan and Jon K. King  
2001

Open-File Report 380  
Progress Report Geologic Map of the  
Ogden 30' x 60' Quadrangle, Year 3 of 3

Utah Geological Survey  
a division of  
Utah Department of Natural Resources  
in cooperation with U.S. Geological Survey  
STATEMAP Agreement Nos. HQ-96-AG1521  
HQ-97-1797, and 98HQAG2067

OGDEN, UTAH-WYOMING

30X60 MINUTE SERIES (TOPOGRAPHIC)



This progress report makes the results of the third year of mapping on a three year project available to the public. This map consists of original mapping by Coogan and King with previous mapping compiled from many sources by King. Because the report is subject to review and may not conform to USGS policy and editorial standards, it may be premature for an individual or group to take action based on the contents. This material will not be reproduced when the final product has been released.

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.

SCALE 1:100,000  
1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND  
CONTOUR INTERVAL 50 METERS

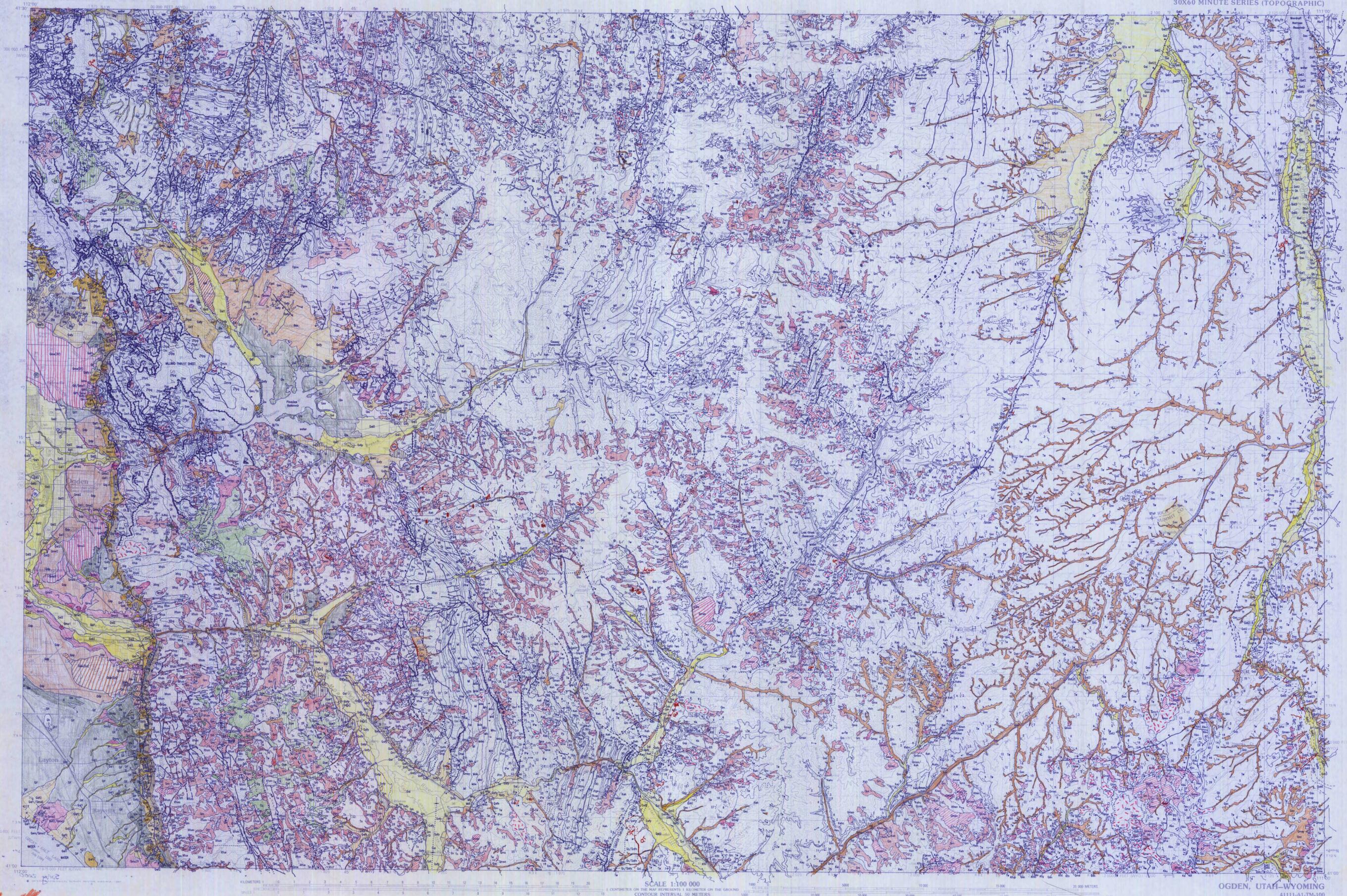
OGDEN, UTAH-WYOMING  
41111-A1-TM-100

1986

Map plot at 1:100,000 scale of VRdata converted to dxf file.  
Base is a digital raster graph of U.S. Geological Survey Ogden 30' x 60' quadrangle topographic map.



Color map



SCALE 1:100 000  
1 CENTIMETER ON THE MAP REPRESENTS 1 KILOMETER ON THE GROUND  
CONTOUR INTERVAL 50 METERS

OGDEN, UTAH-WYOMING  
4111-A1-TM-100

1986

This progress report releases to the public the results of the first year of mapping on a three year project. This map consists of original mapping by Coogan combined with previous mapping compiled from many sources by King. Parts of the map are incomplete and other parts have not been reviewed. Inconsistencies, errors, and omissions have not been resolved. It may be premature for an individual or group to take action based on the contents.

**Progress Report Geologic Map of the Ogden 30'x60' Quadrangle,  
Utah and Wyoming -- Year 2 of 3.**

By

James C. Coogan and Jon K. King

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