INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1980,88

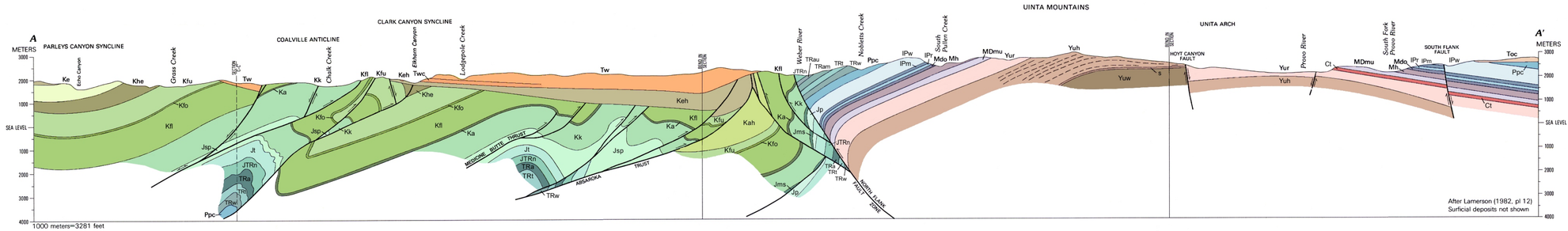
Projection: UTM Zone 12
Units: Meters
Datum: NAD 1927
Spheroid: Clarke 1866

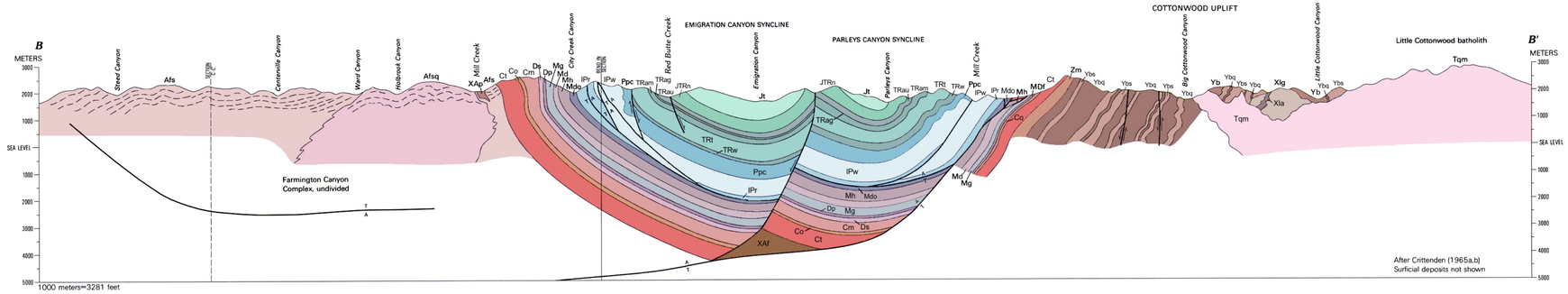
SCALE 1:100,000

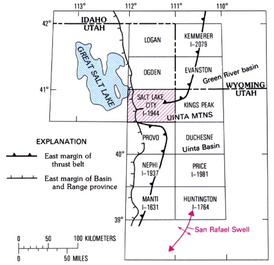
5 0 5 10 15 Kilometers

5 0 5 Miles

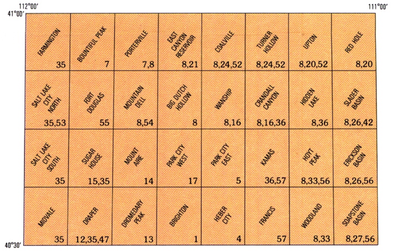
CONTOUR INTERVAL 50 METERS



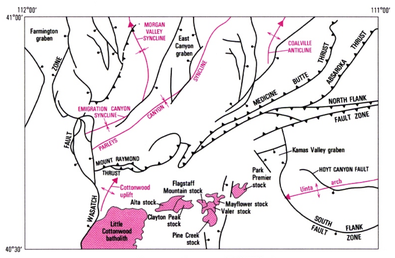




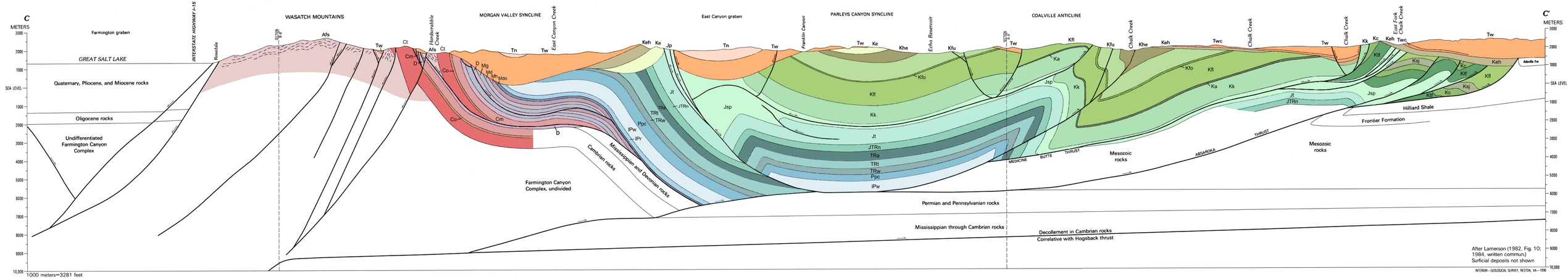
MAP SHOWING LOCATION AND TECTONIC SETTING OF THE SALT LAKE CITY 30′ × 60′ QUADRANGLE (PATTERNED) AND ADJACENT 30′ × 60′ GEOLOGIC QUADRANGLES



INDEX SHOWING MAJOR SOURCES OF GEOLOGIC DATA
(Numbers refer to entries in sources of geologic data)



TECTONIC MAP OF THE SALT LAKE CITY 30′ × 60′ QUADRANGLE



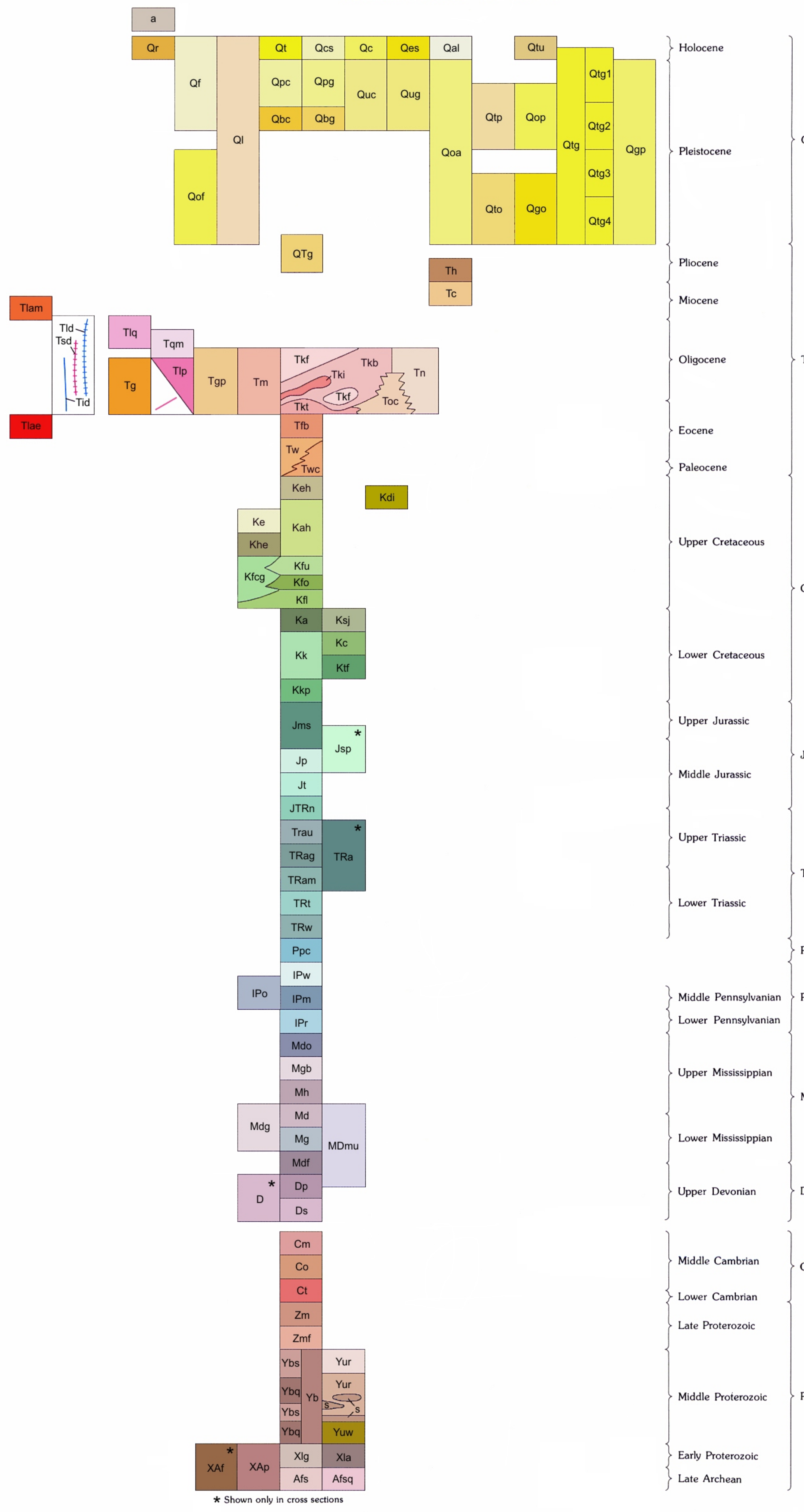
INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1990

GEOLOGIC MAP OF THE SALT LAKE CITY 30′ × 60′ QUADRANGLE, NORTH–CENTRAL UTAH, AND UINTA COUNTY, WYOMING

By
Bruce Bryant

1990

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

[Isotopic ages have been recalculated from decay constants accepted by the U.S. Geological Survey in 1984]

a **Artificial fill (Holocene)**—Boulder to pebble gravel, sand, and silt used as fill beneath highways and industrial and airport sites, as well as in dams and mine dumps

Qr **Rock glacier (Holocene)**—Angular boulders and cobbles at the surface that are embedded in a matrix of sand, silt, and possibly ice below the surface. Deposit has a convex cross profile. Maximum thickness several tens of meters

Qt **Talus (Holocene)**—Angular pebble- to boulder-sized rocks; as mapped, may include some colluvium. Maximum thickness about 10 m

Qcs **Clay, silt, and sand (Holocene)**—Thick- to thin-bedded clay, silt, and very fine sand; mainly deltaic and lacustrine beds deposited in Great Salt Lake at higher lake levels than at present. Locally contains peat beds and matted plant remains from marsh deposits. Thickness 1–4 m

Qc **Colluvium (Holocene)**—Boulders in a silt and sand matrix; locally mostly silt. Massive to crudely bedded. Thickness 1–2 m

Qes **Eolian sand (Holocene)**—Silty to slightly clayey, fine- to medium-grained sand; forms dunes, some as high as 7 m

Qal **Alluvium (Holocene)**—Boulder to pebble gravel, sand, silt, and clay deposited in channels and flood plains of streams. Thickness as much as 3 m

Qtu **Calcareous tufa (Holocene)**—Mapped only near Midway in south-central part of quadrangle. At least several meters thick

Qf **Alluvial-fan and debris-fan deposits (Holocene and Pleistocene)**—Gravel, sand, and silt; locally bouldery. Crudely bedded to nonbedded and poorly sorted. Maximum thickness probably 10 m

Ql **Landslide deposits (Holocene and Pleistocene)**—Poorly sorted; particle size ranges from clay to blocks, depending on material involved in sliding; include mudflow, debris-avalanche, and slump deposits

Qtg **Terrace gravels (Holocene and Pleistocene)**—Pebble and cobble gravel, sand, and silt occurring a few to several tens of meters above modern flood plains. In valleys that have more than one terrace level, terraces are numbered Qtg1, Qtg2, Qtg3, and Qtg4 from lowest to highest. Some deposits probably include glacial outwash. Generally a few meters thick; maximum thickness about 40 m in Kamas Valley

Qoa **Old alluvium (Pleistocene)**—Gravel, silty gravel, and sandy silt in dissected alluvial fans and alluvium. Includes local marsh deposits. Much of the unit in the valley near Keetley is more than 730,000 years old (Sullivan and Nelson, 1983). In Salt Lake valley, upper Pleistocene alluvial deposits merge with regressive-phase deposits of Lake Bonneville. More than 100 m thick in valley near Keetley; 2–7 m thick in Salt Lake valley

Deposits of regressive phase of Lake Bonneville (Pleistocene)

Qpc **Silt and clay deposits**—Sandy clay to clayey silt and silty clay. Massive to thinly bedded. Includes deposits attributed by Miller (1980) to Stansbury lake stand. Thickness 2–5 m

Qpg **Sand and gravel deposits**—Sandy gravel, gravelly sand, and silty gravel. Includes deposits attributed by Miller (1980) to Stansbury lake stand. Thickness 1–4 m

Deposits of the high stand of Lake Bonneville (Pleistocene)

Qbc **Silt and clay deposits**—Sandy, clayey silt, sand, or silty clay. Massive to thinly bedded. Thickness as much as 8 m

Qbg **Sand and gravel deposits**—Sand, silty sand, sandy pebble and cobble gravel, and gravelly sand. Thickness 1–30 m

High-stand and regressive-phase deposits of Lake Bonneville, undivided (Pleistocene)

Quc **Silt and clay deposits**—Maximum thickness 3 m

Qug **Sand and gravel deposits**—Mapped near Bountiful. Maximum thickness 6 m

Qtp **Till of Pinedale age (Pleistocene)**—Poorly sorted bouldery till that forms prominent moraines. As mapped, may include some colluvium, talus, and landslide debris. A few meters thick except in moraines where maximum thickness is 180 m

Qop **Outwash deposits of Pinedale age (Pleistocene)**—Poorly sorted gravel and sand. Mapped along Weber and Provo Rivers adjacent to the Uinta Mountains. Maximum thickness probably more than 10 m

Qto **Older till (Pleistocene)**—Poorly sorted bouldery till having subdued morainal topographic expression and found downvalley from or topographically higher than till of Pinedale age (unit Qtp)

Qgo **Older outwash gravel (Pleistocene)**—Gravel, sand, and silt in a smooth-topped, but dissected, deposit on Beaver Creek in southeastern part of quadrangle. Maximum thickness probably about 10 m

Qof **Older alluvial-fan and debris-fan deposits (Pleistocene)**—Poorly sorted gravel, sand, and silt; locally bouldery. Crudely bedded to nonbedded. Occur above present drainage and are inactive. Maximum thickness about 10 m

Qgb **Pediment gravel (Pleistocene)**—Boulder, cobble, and pebble gravel in a sand and silt matrix. Maximum thickness a few meters

QTg **Gravel (Pleistocene or Pliocene)**—Unconsolidated pebble, cobble, and boulder gravel on Porcupine Ridge and adjacent areas near northeast corner of quadrangle. Apparently gravel is a lag concentrate from underlying conglomerate (unit Toc). Also mapped on Slader Ridge in east-central part of quadrangle. Maximum thickness possibly a few tens of meters

Th **Hooper Canyon Formation (Pliocene?)**—Boulders, cobbles, and pebbles in a matrix of sand and silt. Coarse clasts are predominantly subrounded to subangular limestone and quartzite. Caps ridges north of City Creek and lies on erosion surface cut on deformed conglomerate (Tc). Maximum thickness 15 m

Tc **Conglomerate (Miocene?)**—Pale-brown and light- to medium-gray, well- to poorly cemented, pebble and cobble conglomerate and sandstone. Generally contains coarse, subrounded to subangular clasts of limestone and quartzite, but near Mill Creek southeast of Bountiful, clasts of metamorphic rocks from the Farmington Canyon Complex are numerous. Thickness greater than 500 m

Tlam **Lamproite (Miocene)**—Phenocrysts of phlogopite and, locally, of olivine in matrix of sanidine and diopside. Near Whites Creek northwest of Uinta Mountains. Phlogopite has K-Ar age of 13.5 Ma (Best and others, 1968)

Tld **Lamprophyric dikes (Miocene and Oligocene)**—Reddish-brown-weathering rocks composed of biotite and albite-oligoclase. Intrudes unit Tsd and older rocks. Biotite from a dike in Big Cottonwood Canyon has K-Ar age of 36.7 Ma (James and McKee, 1985)

Tsd **Siliceous dikes (Miocene? and Oligocene)**—White to light-gray, very fine grained rock composed of quartz, potassic feldspar, and albite. Cuts unit Tlq and older rocks

Tlq **Leucocratic quartz monzonite (Miocene? and Oligocene)**—Fine-grained, light-colored quartz monzonite composed of plagioclase, quartz, potassic feldspar, and biotite; locally contains phenocrysts of quartz. Intrudes and locally grades into unit Tqm

Tqm **Quartz monzonite (Oligocene)**—Very light gray, porphyritic, biotite quartz monzonite containing phenocrysts of potassic feldspar 1–5 cm long and small amounts of hornblende. Forms the Little Cottonwood batholith and is about 26 Ma old (Crittenden and others, 1973)

Tg **Granodiorite (Oligocene)**—Light-gray, biotite-hornblende granodiorite of the Alta stock. K-Ar ages of biotite and hornblende and fission-track ages of sphene and zircon are about 33 Ma (Bromfield and others, 1977; Crittenden and others, 1973)

Tlp **Porphyritic latite (Oligocene)**—Dark- to light-greenish-gray latite containing abundant phenocrysts of plagioclase, hornblende, and biotite and rare phenocrysts of pyroxene. Intrudes the Keetley Volcanics. K-Ar ages of biotite and hornblende from the Park Premier stock are about 35.5 Ma; hornblende age from Indian Hollow plug is about 37.0 Ma (Bromfield and others, 1977)

Tid **Intermediate dikes (Oligocene and Eocene?)**—Generally contain hornblende and biotite phenocrysts in a very fine-grained matrix. Intrudes rocks older than unit Tqm

Keetley Volcanics (Oligocene and Eocene?)—Intrusive and flow rock, breccia, lahar, and tuff, as well as volcaniclastic and nonvolcanic sandstone and conglomerate. Intrusive rocks, flows, and breccias range from black, red, and brown to light gray. All the volcanic rocks contain phenocrysts of plagioclase and hornblende, many contain clinopyroxene, and a few contain biotite; all phenocrysts are in a microcrystalline to glassy groundmass. Andesite and rhyodacite by field classification, but a few chemical data indicate that the rocks range in composition from trachyandesite and latite to silica-poor rhyodacite (Bromfield and others, 1977). K-Ar ages of biotite and hornblende range from 33.6 to 37.5 Ma (Bromfield and others, 1977; Crittenden and others, 1973). Thickness exceeds 500 m

Tkb, Tkb( ) **Light-gray to gray lahar, flow breccia, and tuff**—Proportion of tuff increases with distance from volcanic centers. Sandstone and conglomerate composed of volcanic clasts occur distal to volcanic centers. Zircon fission-track age of 35.3 Ma and biotite K-Ar age of 37.5 Ma obtained from flow breccia north of Salt Lake City (Van Horn, 1981). Thickness as much as 500 m in Keetley region. Large exotic blocks mapped separately: (n) - Nugget Sandstone, (au) - upper member of Ankareh Formation, (ag) - Gartra Member of Ankareh Formation, (am) - Mahogany Member of Ankareh Formation

Tki **Intrusive rock and breccia**—May include some extrusive rock

Tkf **Flow rock and breccia**

Tkt **Tuff**—Interbedded light-yellow and yellowish-gray, fine-grained tuff, lapilli tuff, volcanic gravel, and thin lahar. Interbedded with and intertonguing upwards into coarse breccia of unit Tkb. Contains early Oligocene vertebrates near Peoa (Nelson, 1972). Thickness as much as 250 m

Tn **Norwood Tuff (Oligocene and Eocene)**—Gray to white tuff, volcanic sandstone and conglomerate, some lahars, and a very few thin flow breccias. Unit has interbeds of polymictic conglomerate containing clasts of sedimentary rock. East Canyon graben contains a facies that is transitional between breccia of the Keetley Volcanics to the south and finer grained tuff and tuffaceous sediment of the type Norwood Tuff in the Morgan Valley to the north. About 1,000 m thick in deepest part of East Canyon graben and south end of Morgan Valley near Porterville. Lithic-crystal tuff about 600 m above the base in East Canyon graben has biotite K-Ar age of 29.6 Ma (R.F. Marvin, U.S. Geological Survey, written commun., 1982) and zircon fission-track age of 28.6 Ma (C.W. Naeser, U.S. Geological Survey, written commun., 1983). North of Porterville near a late Eocene fossil locality (Nelson, 1972), K-Ar age of biotite and sanidine from tuff about 700 m above the base is 38.5 Ma (Evernden and others, 1964). Along and north of City Creek Canyon north of Salt Lake City, the unit consists of light-gray to moderate-yellowish-brown, tuffaceous siltstone and mudstone, gray to pale-brown sandstone, light-gray, tuffaceous limestone, and tuff; the tuff has a zircon fission-track age of 37.4 Ma (Van Horn, 1981). In Porcupine Ridge area near northeast corner of quadrangle, unit contains white to light-gray, tuffaceous and calcareous sandstone and siltstone, lenses of pebble conglomerate, and scattered beds of tuff

Toc **Conglomerate (Oligocene and Eocene?)**—Boulder, cobble, and pebble conglomerate containing fragments of sandstone derived from Mesozoic and upper Paleozoic formations; clasts of Nugget Sandstone (unit JTRn) are conspicuous. Contains a few lahars and beds of tuff and volcanic gravel. Locally rich in clasts of volcanic rock in Porcupine Ridge area in northeastern part of quadrangle. In the adjoining Ogden 30′ × 60′ quadrangle to the north, unit is mapped as basal member of Norwood Tuff. Maximum thickness about 300 m

Tgp **Granodiorite porphyry (Oligocene or Eocene?)**—Light- to dark-gray granodiorite porphyry and quartz monzonite porphyry and, in the Alta stock, granodiorite and porphyritic granodiorite. The porphyries contain phenocrysts of plagioclase, biotite, hornblende, and, locally, quartz in a fine-grained matrix of potassic feldspar, plagioclase, and quartz; porphyry forms a large composite pluton northwest of Heber Valley. On the basis of biotite K-Ar ages, unit is probably about 35–37 Ma old; hornblende K-Ar ages are 40–42 Ma (Bromfield and others, 1977)

Tm **Monzonite (Oligocene or Eocene?)**—Dark-gray, fine- to medium-grained, hypersthene-bearing, augite-hornblende-biotite monzonite; forms Clayton Peak stock. On the basis of biotite K-Ar ages, unit is about 35.6 Ma old; zircon fission-track ages are about 40 Ma (Bromfield and others, 1977; Crittenden and others, 1973)

Tlae **Lamproite (Eocene)**—Dikes, plugs, and flows containing phenocrysts of phlogopite and diopside in a groundmass of phlogopite, diopside, analcite, and glass. Coarser grained varieties also have sanidine and amphibole. At Moon Canyon on southwest margin of Uinta Mountains, phlogopite from intrusive rock has K-Ar age of 40.9 Ma, and phlogopite from flow has an age of 37.9 Ma (Best and others, 1968)

Fowkes Formation (Eocene)—Occurs only in Porcupine Ridge area in northeastern part of the quadrangle

Tfb **Bulldog Hollow Member**—White to light-brown tuff, sandy tuff, and tuffaceous sandstone

Tw **Wasatch Formation (Eocene and Paleocene)**—Moderate-red, grayish-red, pale-red, reddish-brown, and gray sandstone, conglomerate, siltstone, and claystone; contains scattered, thin, lenticular beds of light-purplish-gray to light-gray, nonmarine limestone. Conglomerate clasts range from pebble to boulder size and have a varied lithology from diverse sources. Maximum stratigraphic thickness about 1,500 m in the Mountain Dell-Porterville area on the east side of the Wasatch Range and about 1,200 m north of the Uinta Mountains. In Chalk Creek area, yellowish-gray-weathering conglomerate forms a basal unit as much as 100 m thick overlain by a sequence of variegated sandstone and siltstone. This sandstone and siltstone is overlain by or interfingers with coarse conglomerate to the south, which was derived from Paleozoic and Precambrian rocks of the Uinta uplift. Palynomorphs indicate the lower 200–300 m is of late Paleocene age (Lamerson, 1982; Jacobson and Nichols, 1982; and this report)

Twc **Conglomerate dominant**

Keh **Hams Fork Member of the Evanston Formation (Upper Cretaceous)**—Medium- to light-gray and greenish-gray siltstone and claystone, light-gray to yellowish-gray and brownish-gray sandstone, and basal pebble to cobble, locally boulder conglomerate. Sandstone contains reddish-brown-weathering concretions in places. Conglomerate contains clasts of Precambrian quartzite derived from the Willard thrust sheet to the north of the map area. Thickest section is about 800 m on northeast side of Cherry Canyon, east of Wanship in the central part of the quadrangle. Pollen indicate a late Campanian to early Maastrichtian age

Kdi **Diorite (Cretaceous)**—Hornblende diorite, biotite quartz diorite, and gabbro. K-Ar age of hornblende is 72.4±2.1 Ma from a sample near Mill A Gulch on the north side of Big Cottonwood Creek (James and McKee, 1985)

Kah **Adaville and Hilliard Formations (Upper Cretaceous)**—Yellowish-gray to white, thinly laminated, crossbedded sandstone containing some scattered pebbles and beds of pebble conglomerate; clasts are predominantly sandstone, siliceous shale of the Aspen Shale, and chert. A few beds have reddish-brown-weathering concretions as much as 5 cm in diameter. Gray siltstone, claystone, and marine shale. Unit mapped only in the lower plate of the Absaroka thrust in the Crandall Canyon-Neil Creek area. Probably at least 1,500 m thick, but estimated thickness is complicated by structural complexities

Ke **Echo Canyon Conglomerate (Upper Cretaceous)**—Pale-red to yellowish- gray to light-yellowish-brown cobble conglomerate containing discontinuous lenses of coarse-grained sandstone. Contains very sparse intervals of gray sandstone, siltstone, and claystone, some of which contain pollen of Coniacian to Santonian Age. Clasts in conglomerate are predominantly sandstone derived from Mesozoic or upper Paleozoic rocks. Limestone and chert clasts are sparse. On northwest side of East Canyon graben, unit contains angular to subrounded fragments of Paleozoic limestone and upper Paleozoic and Mesozoic sandstone. Boulders are as much as 3 m in diameter in lower part. Thickness about 800 m

Khe **Henefer Formation (Upper Cretaceous)**—Light-gray clay, siltstone, sandstone, and conglomerate; red siltstone and clay; and gray calcareous siltstone containing a few thin lenses of coal. Beds and lenses of pebble and cobble conglomerate numerous near top. Thickness about 800 m

Frontier Formation (Upper Cretaceous)

Kfu **Upper member**—Light-yellowish-gray marine sandstone, gray marine shale, gray to brown siltstone and silty shale, and coal. Conglomerate, which occurs at the base of the unit as a bed 6–30 m thick in the Coalville area, contains rounded pebbles and cobbles of sandstone and limestone. Conglomeratic beds are numerous along the Weber River valley at Franklin Canyon. In Coalville area unit contains middle Coniacian fauna 330 m above base and at top (Ryer, 1976). Thickness 800–1,100 m in Coalville area. Thickness 1,600 m in East Canyon Creek area

Kfo **Oyster Ridge Sandstone Member**—Light-yellow to gray marine sandstone and pebbly sandstone locally overlain by nonmarine sandstone, siltstone, and silty shale. Contains early middle Turonian ammonite, *Collignoniceras woolgari* (Cobban and Reeside, 1952). Thickness 60–100 m

Kfl **Lower member**—Light- to dark-gray marine shale, sandstone, conglomeratic sandstone, and silty shale; coal; and gray, light-red, grayish-red, and green claystone. Contains earliest Turonian fossils about 1,000 m above base and early middle Turonian fossils in the upper 240 m in Coalville area (Ryer, 1976). Thickness 1,370 m in Coalville area and about 1,800 m along East Canyon Creek

Kfcg **Conglomerate facies**—Conglomerate containing interbeds of sandstone and, rarely, of red and gray clay. Conglomerate contains rounded pebbles and cobbles of sandstone and limestone from the Mesozoic and upper Paleozoic section. Locally contains boulders as much as 1 m in diameter. Three tongues of conglomerate in East Canyon Creek area merge to the west into a body 1,300 m thick

Ksj **Sage Junction Formation (Lower Cretaceous)**—Light-gray and pinkish-gray mudstone; yellowish-gray, light-brown, and gray siltstone and fine-grained sandstone; and interbeds of white, green, and pink porcellanite. Exposed only near and south of Porcupine Ridge as incomplete sections

Kc **Cokeville Formation (Lower Cretaceous)**—Interbedded dark-gray, carbonaceous, shaly mudstone and siltstone, yellowish-gray-weathering sandstone, and very fossiliferous gray to tan limestone and coquina. Occurs only in upper Chalk Creek area. About 500 m thick

Ktf **Thomas Fork Formation (Lower Cretaceous)**—Pale-red and reddish-brown mudstone and gray and yellowish-gray sandstone and gritty sandstone. Occurs only in upper Chalk Creek area where incomplete section is at least several hundred meters thick

Ka **Aspen Shale (Lower Cretaceous)**—Dark-gray siliceous shale and silty shale containing abundant scales of teleost fish. Maximum thickness about 160 m north of Peoa; thins to west and north

Kelvin Formation (Lower Cretaceous)

Kk **Upper member**—Yellowish-gray, grayish-red, and light- to moderate-red sandstone; gray, reddish-brown, and grayish-red siltstone and claystone; and conglomerate. Conglomerate beds thicker and more numerous west of East Canyon Creek; contains pebbles and cobbles of sandstone, siltstone, and minor amounts of limestone. Unit about 1,300 m thick in Turner Hollow area; thins to west and south. About 470 m thick near head of Parleys Canyon

Kkp **Parleys Member**—Light- to pale-gray limestone associated with pale-lavender-gray siltstone containing limestone nodules; reddish-brown siltstone, pale-brown to pale-reddish-brown sandstone, and conglomerate. About 50 m thick

Jms **Morrison and Stump Formations (Upper and Middle Jurassic)**—Mapped only north and west of Peoa below the Absaroka thrust

Morrison Formation (Upper Jurassic)—White to grayish-purple sandstone, moderate-red to grayish-purple siltstone, moderate-reddish-orange silty sandstone, and gray limestone. A few beds of chert-pebble conglomerate near top. Thickness 80 m

Stump Formation (Upper and Middle Jurassic)—Pale-red and yellow shale and sandstone and gray to yellowish-gray sandstone; greenish-gray, glauconitic limestone at base. Locally contains pelecypods. Thickness 60 m

Jp **Preuss Sandstone (Middle Jurassic)**—Reddish-brown, grayish-red, and light- to moderate-red silty sandstone, sandstone, and silty shale. Contains anhydrite and salt in the subsurface in the Chalk Creek area and east of Franklin Canyon (Lamerson, 1982). About 300 m thick, but locally has been thickened due to deformation and flowage of salt, anhydrite, and associated shales

Jsp **Stump Formation and Preuss Sandstone**—Shown only in cross sections *A–A′* and *C–C′*

Jt **Twin Creek Limestone (Middle Jurassic)**—Thin- to medium-bedded, gray, light-gray, and purplish-gray limestone and some beds of grayish-red to brown siltstone and sandstone. Locally fossiliferous. Thickness ranges from 850 m near Parleys Canyon to 400 m near Peoa

JTRn **Nugget Sandstone (Jurassic? and Triassic?)**—Pale-grayish-orange, fine-grained sandstone, and white quartz sandstone. Crossbedded in upper part, planar bedded in lower part. Thickness ranges from 400 m in Parleys Canyon area to 280 m near Peoa

TRa **Ankareh Formation (Upper and Lower Triassic)**—Map unit TRa shown only in cross sections *A-A′* and *C-C′*

TRau **Upper member (Upper Triassic)**—Moderate-red, grayish-red, and grayish-purple mudstone and fine-grained sandstone. Thickness about 210 m in Wasatch Range and 110 m in western Uinta Mountains

TRag **Gartra Member (Upper Triassic)**—White to pale-purple, massive, crossbedded, coarse-grained to pebbly quartzite. Thickness as much as 70 m in Wasatch Range and 20–30 m in Uinta Mountains

TRam **Mahogany Member (Lower Triassic)**—Purplish-gray and pale-red sandstone, mudstone, and a few thin limestone beds. Thickness ranges from 260 m in Wasatch Range to 225 m on northwest flank of Uinta Mountains

TRt **Thaynes Limestone (Lower Triassic)**—Light-gray, thin- to thick-bedded limestone and brownish-gray siltstone containing beds of light-gray sandstone, pale-red silty limestone, light-gray shaly limestone, and dark-greenish-gray siltstone and shale. Locally contains pelecypods, gastropods, and ammonites. Thickness ranges from 600 m north of Red Butte Creek to 215 m on northwest flank of Uinta Mountains

TRw **Woodside Formation (Lower Triassic)**—Grayish-red, grayish-purple, reddish-brown, and moderate-red shale, siltstone, and fine-grained sandstone; thin white limestone beds; and grayish-red siltstone. Locally, a few tens of meters of green or greenish-gray shale and siltstone at the base. Thickness ranges from 120 m north of Red Butte Creek east of Salt Lake City to 300 m near Park City

Ppc **Park City Formation and related rocks (Permian)**—Fossiliferous and cherty, gray to pinkish-gray limestone, calcareous siltstone, and cherty sandstone; near middle of unit is a dark-gray, phosphatic shale which is about 30 m thick (Meade Peak Phosphatic Shale Member of Phosphoria Formation). Thickness ranges from 200 m at Mill Creek southeast of Salt Lake City to 600 m at South Fork Dry Creek northeast of Salt Lake City

IPw **Weber Sandstone (Pennsylvanian)**—Pale-yellowish-gray to white, crossbedded, quartzitic and calcareous sandstone containing a few beds of light-gray to white limestone and dolomite. Thickness generally 300–500 m, but ranges from 150 to 750 m south of City Creek Canyon, where thinned by bedding faults and thickened by folding or fault repetition, and 600 m east of head of American Fork Canyon along the south-central edge of the quadrangle. Unit is Middle Pennsylvanian in Wasatch Range (Van Horn and Crittenden, 1988), but in Uinta Mountains upper part may be younger

IPo **Oquirrh Formation (Pennsylvanian)**—Fine- to medium-grained, thin- to thick-bedded sandstone interbedded with cherty limestone. An incomplete section of the lower part is exposed at the south edge of the quadrangle southwest of Silver Lake

IPm **Morgan Formation (Middle Pennsylvanian)**—Grayish-red calcareous siltstone and silty limestone, light-greenish-gray siltstone, grayish-red and reddish-brown sandstone, gray fossiliferous limestone containing gray, yellowish-gray, reddish-brown, and pinkish-orange chert, and white to light-gray sandstone. Occurs only on flanks of Uinta Mountains. About 100 m thick

IPr **Round Valley Limestone (Lower Pennsylvanian)**—Light-gray-weathering, gray to dark-gray, fossiliferous limestone containing gray and reddish-gray chert and interbeds of gray and light-green shale and siltstone, grayish-red silty shale, and sandstone and sandy limestone. Pale-reddish-orange silicified fossils are characteristic. Thickness ranges from 300 m in Wasatch Range in City Creek area to 60 m on eastern edge of quadrangle

Mdo **Doughnut Formation (Upper Mississippian)**—Medium-gray, thin-bedded limestone containing pods of dark-gray to black chert and abundant fossils; a 10–30-m-thick zone of black, greenish, or locally reddish shale at the base contains thin beds of greenish-gray to rusty-weathering, silty limestone. Black shale containing thin beds of dark-gray limestone and rusty-weathering sandstone occurs in Uinta Mountains. Thickness about 130 m in Wasatch Range and 65 m in Uinta Mountains

Mgb **Great Blue Formation (Upper Mississippian)**—Pale-gray, thick-bedded, fine-grained limestone. Identified only in a fault slice near Black Mountain northeast of Salt Lake City. Thickness 100 m

Mh **Humbug Formation (Upper Mississippian)**—Medium- to dark-gray limestone, dolomite, and limestone breccia containing beds of reddish-brown- to yellowish-gray-brown-weathering sandstone and rare interbeds of red siltstone. Thickness 120–280 m

Md **Deseret Limestone (Upper and Lower Mississippian)**—Thick-bedded dolomite and limestone locally containing abundant lenses and pods of dark-gray chert. A 10–12m-thick zone of black phosphatic shale and thin-bedded limestone at base. Occurs only in Wasatch Range. Thickness 140–295 m

Mg **Gardison Limestone (Lower Mississippian)**—Medium- to dark-gray, thin- to thick-bedded, fossiliferous limestone. Occurs only in Wasatch Range. Thickness about 200 m

Mdg **Deseret and Gardison Limestones, undivided**

MDmu **Madison Limestone (Upper and Lower Mississippian) and Upper Devonian rocks**—Dark-gray, fine- to coarse-grained dolomite and limestone locally containing abundant gray and white chert. Dark-to light-gray, thin- to medium-bedded, fossiliferous limestone near base. In many places, basal few meters is dolomite underlain by dolomitic shale and sandstone and conglomerate; basal rocks correlate with lower part of Fitchville Formation and the Pinyon Peak Limestone of Late Devonian age (Spreng, 1979). Occurs in Uinta Mountains. Thickness as much as 300 m

MDf **Fitchville Formation (Lower Mississippian and Upper Devonian)**—Upper part is dark-gray, massive dolomite containing a 1-m-thick bed of white-weathering, gray dolomite at top; lower part consists of pale-gray, massive dolomite with a 0.2–1.3-m-thick bed of locally pebbly sandstone at base. Occurs in Wasatch Range. Thickness about 35 m

Dp **Pinyon Peak Limestone (Upper Devonian)**—Pale-tan to pale-gray, thin-bedded, nodular limestone containing interbeds of gray shale. Occurs only north and northeast of Salt Lake City. Thickness 50–60 m

Ds **Stansbury Formation (Upper Devonian)**—Pale-gray to yellowish-gray, coarse-grained, crossbedded sandstone and calcareous siltstone; yellowish-weathering silty limestone; and grayish-red to bright-red shale. Basal part contains pale-gray to white, laminated dolomite; dark-gray, coarse-grained dolomite; and a quartzite bed 1 m thick at the base. Occurs only north and northeast of Salt Lake City. Thickness about 150 m

D **Devonian rocks, undivided**—Shown only in cross section *C–C′*

Cm **Maxfield Limestone (Middle Cambrian)**—Contains upper member of dark-gray, medium-bedded, oolitic dolomite; middle member of mottled dolomite, limestone, and nodular shale; and lower member of massive, dark-gray, mottled dolomite and limestone having yellowish-gray silty laminae. Occurs only in Wasatch Range. Thickness is 360 m north of City Creek

Co **Ophir Formation (Middle Cambrian)**—Contains upper member of blocky-weathering, calcareous sandstone; middle member of thin-bedded limestone having yellowish-gray silty laminae; and lower member of olive-gray, micaceous shale. Thickness is 125 m in Big and Little Cottonwood Canyons area. North of City Creek, members are not distinguishable and thickness is only 57 m

Ct **Tintic Quartzite (Middle and Lower Cambrian)**—Medium- to thick-bedded, fine- to coarse-grained, white, pale-yellowish-gray, and pale-reddish-brown quartzite; conglomeratic beds in lower 100 m. Thickness 250–600 m in Wasatch Range. Discontinuous lenses of unit as much as 100 m thick locally are preserved below pre-Late Devonian unconformity around Uinta Mountains

Zm **Mutual Formation (Late Proterozoic)**—Grayish-red to red-purple shale and quartzite locally grading into coarse boulder conglomerate. Maximum thickness 400 m

Zmf **Mineral Fork Tillite (Late Proterozoic)**—Reddish-brown-weathering, black sandstone containing cobbles and boulders of quartzite, limestone, schist, and granitic rock. Interbedded with black shale, dark-gray quartzite, and conglomerate. Maximum thickness about 1,000 m

Yb, Ybq, Ybs **Big Cottonwood Formation (Middle Proterozoic)**—White, green, and gray, pale-reddish-brown-weathering quartzite (q) interbedded with shale and siltstone (s) that are grayish red and olive green in upper part, brown or greenish gray in middle part, and blue gray in lower part. Thickness about 4,800 m

Uinta Mountain Group (Middle Proterozoic)

Yur **Red Pine Shale**—Grayish-black to olive-drab siltstone and shale and thin, discontinuous quartzite and arkose beds. About 900 m thick on South Fork of Weber River. Whole-rock Rb-Sr age 952 Ma (Crittenden and Peterman, 1975)

Yuh, s **Hades Pass unit of Wallace (1972; Sanderson, 1984)**—Pale-red, grayish-red, pale-reddish-brown, light-gray, and yellowish-gray quartz sandstone, arkose, and shale; thick, moderate-red, lenticular shale beds on the north flank of the Uinta Mountains and thin, discontinuous shale bed on the south flank. Shale (s) shown where thick and continuous. About 1,800 m thick

Yuw **Mount Watson unit of Wallace (1972; Sanderson, 1984)**—Thick-bedded, yellowish-gray to grayish-white, lithic arkose and fine-grained quartzite containing thin, lenticular, olive-drab shale and siltstone beds. About 1,000 m thick

Little Willow Formation (Early Proterozoic?)

Xlg **Biotite-muscovite-quartz schist, quartz schist, muscovite-biotite-plagioclase-quartz gneiss, muscovite-biotite-quartz-plagioclase gneiss, and rare beds of quartz-pebble schist**—Some schist layers converted to andalusite-bearing hornfels near subjacent Tertiary stock

Xla **Amphibolite**—Concordant layers and lenses as much as 100 m thick

Farmington Canyon Complex (Early Proterozoic? and Archean)

XAp **Pegmatite (Early Proterozoic or Archean)**—White, very light gray to very pale orange, plagioclase-quartz-microcline pegmatite. Mapped in one area on Mill Creek southeast of Bountiful. May have been emplaced during amphibolite-facies metamorphism in the Early Proterozoic

Afs **Schist and gneiss (Archean)**—Biotite-feldspar-quartz gneiss, garnet-biotite-feldspar-quartz gneiss, sillimanite-biotite schist, sillimanite-garnet-biotite schist and gneiss, hornblende-biotite schist, and less abundant layers of white, coarse-grained quartzite; lenses and layers of amphibolite. Pegmatite dikes and sills; pegmatites with sharp contacts tend to be discordant and to cut those with indistinct contacts. Discordant pegmatites with sharp contacts are generally 10–30 m long, but a few are several hundred meters long

Afsq **Schist, gneiss, and quartzite (Archean)**—Includes biotite-feldspar-quartz schist, sillimanite-biotite schist, sillimanite-garnet-biotite schist and gneiss, and interlayered, coarse-grained, white to pale-yellowish-green quartzite in beds as much as 10 m thick. Quartzite dominates much of the unit, has a grain size of 4–5 mm; contains some light-green muscovite and a few heavy mineral partings. Contact with unit Afs is gradational

XAf **Farmington Canyon Complex, undivided**—Shown only in cross section *B–B′*

Contact—Dashed where gradational

Fault—Dashed where approximate or inferred; dotted where concealed. Many faults have a complex history; only the sense of most recent movement shown on map. Relative movement shown on cross section by arrow; double-headed arrow indicates opposite movement sense at different times. A, away from observer; T, toward observer

High-angle—Bar and ball on downthrown side

Thrust—Sawteeth on upper plate

Folds—Arrow shows direction of plunge where known. Dashed where approximate or inferred; dotted where concealed

Anticline

Overturned anticline

Syncline

Overturned syncline

Strike and dip of bedding

30 **Inclined**

60 **Overturned**

Vertical

Horizontal

Strike and dip of foliation and compositional layering where parallel

70 **Inclined**

Strike and dip of foliation

50 **Inclined**

Strike and dip of cataclastic foliation

30 **Inclined**

10 **Bearing and plunge of mineral lineation**—May be combined with planar symbols

D6612 **Palynomorph locality**—Showing U.S. Geological Survey Denver catalog number. See sheet 2

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[Sources marked by asterisk are shown in index]

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